

# Monitoring social inclusion in Europe

EDITED BY ANTHONY B. ATKINSON,  
ANNE-CATHERINE GUIO AND ERIC MARLIER

2017 edition



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Luxembourg: Publications Office of the European Union, 2017

PDF: ISBN 978-92-79-43623-9 doi: 10 2785/60152 Cat. No: KS-05-14-075-EN-N

Print: ISBN 978-92-79-43624-6 doi: 10 2785/6030 Cat. No: KS-05-14-075-EN-C

**Theme: Population and social conditions**

**Collection: Statistical books**

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## Foreword

Social inclusion is at the heart of Europe's commitment to build a stronger social Europe. The economic recovery and growth we are slowly starting to witness across Europe needs to reach everybody, including the most disadvantaged of our citizens. But we are far from reaching this goal.

Poverty reduction is one of the key targets of the Europe 2020 Strategy. But poverty and social exclusion across Europe continued to grow since the target was first set in 2010, affecting almost 25% of citizens in Europe, and has only stabilised recently. Our target to lift at least 20 million people from poverty and social exclusion by 2020 remains the most difficult one to achieve. The current levels of poverty and social exclusion that we are witnessing today are not acceptable in 21<sup>st</sup> century Europe. Everybody together — the European Commission and all 28 Member States — need to put their shoulders to the wheel.



It is essential that the EU continues to shed light on the living conditions of European citizens by monitoring progress in each Member State towards the Europe 2020 target. We have a key EU statistical instrument to gather these data: the European Statistics on Income and Living Conditions (known as EU-SILC). It is with this essential instrument that the present book is concerned. It has two aims: firstly, to provide evidence about the state of poverty and deprivation as seen at mid-decade, following the recession, and about the contribution being made by employment, social protection and other policies to achieving the Europe 2020 objectives; and secondly, to examine the strengths and weaknesses of existing EU-SILC statistics and to make recommendations for further development.

'Monitoring social inclusion in Europe' is the outcome of an EU-funded Network of statisticians and social scientists who form a partnership that has wide experience in the production and analysis of the EU-SILC data. It is also one of the last works that Sir Tony Atkinson leaves us, testament to his ground-breaking and life-long work on poverty and social exclusion.

The present volume is intended for policy-makers, statisticians, and all those concerned with ensuring that economic and social progress in Europe go hand in hand. Having good data is key to translate our Europe 2020 priority on social inclusion into targeted policies and concrete action to help our citizens get better lives.

**Commissioner Marianne Thyssen**

*Employment, social affairs, skills and labour mobility  
Responsible for Eurostat*



## Remembering Tony

Sir Tony Atkinson passed away on 1 January 2017. My heart is heavy. Tony's demise represents an incalculable loss to all those who fight for social justice throughout the world.

For almost 50 years, Tony was at the forefront of research on income and wealth distribution in general, and inequality and poverty in particular. In analysing these issues, he combined his unique theoretical expertise and practical experience with a deep commitment to empirical work in order to propose evidence-based policy ideas and strategies to best address them. He was very concerned with the design of social policies and with the promotion of inclusive economic growth.

Tony was a forward-thinking and innovative intellectual. His major contributions are many and cover very different areas. These include the improvement of the quality of data on income and wealth, optimal taxation, microsimulation and welfare economics. Another of Tony's fundamental contributions was his commitment to improving European social monitoring - in particular, the methodological framework which still provides the basis for developing the social indicators used by the European Commission and European Union (EU) Member States to monitor progress towards the EU common objectives relating to social protection and social inclusion.

The book in front of you is an integral part of this European commitment. Issued too late, unfortunately, for Tony to see the published version, this book is the final outcome of the second Network for the Analysis of EU-SILC (Net-SILC2). Up until a couple of weeks before his death, even though his health had deteriorated considerably, Tony and I were still in touch to discuss the very final edits to the book before sending it to print. Tony's role in Net-SILC2 (as well as in its predecessor, Net-SILC1<sup>(\*)</sup>) was crucial. Not only was he a co-editor of this book, he also provided detailed feedback on all the papers produced by Net-SILC2 colleagues throughout the 4.5 years of the project and advised on the programme of the two international conferences organised by the Network.

Tony had a brilliant mind and a great heart. His humility and generosity were extraordinary. All those who met him will remember how very interested he always was in real exchanges and interactions - truly caring about people as well as sharing his views and carefully listening to those of others. This book is one of many examples of how much Tony was interested in collaborative work.

Tony spent most of his life developing the tools to measure, understand and tackle poverty and inequality. It is important that we now ensure that his unique contribution lives on and is deepened further by continuing to challenge them.

Tony was a giant in every possible way upon whose academic shoulders so many, including myself and several contributors to this book, have stood. Like many people around the world, I will deeply miss him.

This book is dedicated to him.

Eric Marlier (Luxembourg Institute of Socio-Economic Research (LISER))

Net-SILC2 Project Director

8 January 2017

(\*) Atkinson, A.B. and Marlier, E. (eds) (2010), *Income and living conditions in Europe*, Publications Office of the European Union, Luxembourg.





## Acknowledgements by editors

The *second Network for the Analysis of EU-SILC* (Net-SILC2) was an ambitious 20-partner Network bringing together expertise from both data producers (directly involved in the collection of EU-SILC data) and data users. It was established in response to a call for applications by the Statistical Office of the European Union (Eurostat) in 2011. We would like to thank Eurostat not only for funding Net-SILC2 but also for their very active and efficient support throughout the project.

This book represents a major output from Net-SILC2 and is a successor to that produced by the first *Network for the Analysis of EU-SILC* (Net-SILC), entitled *Income and Living Conditions in Europe*, published in 2010. Not all of the scientific work produced by Net-SILC2 could be included in this book. More comprehensive and technical material, as well as the very rich output from two Net-SILC2 international methodological workshops (see below), are available from the Net-SILC2 web page on the Eurostat website. Most of this material was published in the series *Eurostat methodologies and working papers*. We wish to thank all the Net-SILC2 members and the institutions they belong to for their contribution to the project (for a list of Net-SILC2 members, see Appendix 1).

The initial Net-SILC2 findings were presented at two international conferences on *Comparative EU Statistics on Income and Living Conditions* (in Vienna (6-7 December 2012) and in Lisbon (16-17 October 2014)), which were organised jointly by Net-SILC2 and Eurostat. We would like to thank Statistics Austria for kindly hosting the first conference and both Statistics Portugal and the Bank of Portugal for hosting the second one. Special thanks also go to Rolf Aaberge, Nuno Alves, Carlos Farinha Rodrigues, Sigita Grundiza, Björn Halleröd, Orsolya Lelkes, Pedro Mira, Cathal O'Donoghue, Wiemer Salverda and Ursula Till-Tentschert for discussing thoroughly the papers at these conferences.

In addition to these two conferences, two methodological workshops were organised to deepen some of the fields briefly presented in this book: one on 'Standard error estimation and other related sampling issues' (Luxembourg, 29-30 March 2012) and one on 'The Use of Registers in the Context of EU-SILC' (Vienna, 5 December 2012). A training workshop was also organised with a view to building expertise in the statistical and analytical analysis of the longitudinal/ panel component of EU-SILC (Vienna, 9-12 July 2012).

Isabelle Bouvy and Begoña Leviceles have provided invaluable secretarial and bibliographical help.

It should be stressed that the book does not represent in any way the views of Eurostat, the European Commission or the European Union. It also does not represent in any way the views of the persons and bodies thanked above. All the authors have written in a strictly personal capacity, not as representatives of any Government or official body. Thus they have been free to express their own views and to take full responsibility for the judgments made about past and current policy and for the recommendations for future policy.

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# About the book, its policy context and the EU-SILC instrument





# 1

## Monitoring social inclusion in Europe

Anthony B. Atkinson, Anne-Catherine Guio and Eric Marlier <sup>(1)</sup>

### 1.1 Aim of the book

This book aims to contribute to our understanding of substantive issues that face Social Europe and to the development of methods that can be applied to yield new insights into issues related to income, material deprivation and work. The book assembles 26 research studies carried out as part of the European Union (EU) funded 'Second Network for the analysis of EU-SILC' (Net-SILC2) project. It is expected to provide an important input into the strengthening of the social dimension of the EU, including the monitoring of the EU social inclusion target which EU Heads of state and government agreed upon in 2010 as part of the Europe 2020 strategy <sup>(2)</sup>.

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- (2) The Europe 2020 strategy on smart, sustainable and inclusive growth includes five 'headline targets' to be achieved by 2020. One of them is a specific and time bound social inclusion target for the EU as a whole: 'promoting social inclusion, in particular through the reduction of poverty, by aiming to lift at least 20 million people out of the risk of poverty and social exclusion in the EU' (European Council 2010). This target is measured on the basis of an indicator of 'at-risk-of-poverty-or-social-exclusion' (AROPE), which consists of three indicators: a) the EU 'at-risk-of-poverty' indicator (see Chapter 3 in this book); b) an indicator of 'severe material deprivation' (people lacking at least four out of nine items covering some key aspects of living conditions; see Chapter 10); and c) a measure of 'very low

The book covers a wide variety of fields and is organised as follows:

- foreword;
- about the book, its policy context and the EU Statistics on Income and Living Conditions (EU-SILC) instrument (Chapters 1 and 2);
- income measurement and income distribution (Chapters 3 to 9);
- material deprivation and multidimensional poverty (Chapters 10 to 13);
- employment and (quasi-)joblessness, income poverty and the Europe 2020 'at-risk-of-poverty-or-social-exclusion' (AROPE) indicators (Chapters 14 to 19);
- dynamics of poverty and social exclusion (Chapters 20 to 25);
- technical issues in the development of household social surveys (Chapters 26 to 29).

household work intensity' referred to as '(quasi-)joblessness' (see Chapter 16). The EU target is based on the 2008 survey year (most recent data available when the target was adopted (in 2010)), which relates to incomes and job status in the year 2007 for all countries except for the UK and Ireland (see Chapter 2, Section 2.3.2). For a detailed discussion of the target, see Frazer et al. (2014). For a thorough discussion of the social challenges linked to the Europe 2020 strategy, see the various contributions included in Marlier, Natali and Van Dam (2010).

The next section (Section 1.2) provides a brief summary of each chapter, so that the reader can obtain an impression of the contents. In Section 1.3, we consider some of the key issues raised by the Net-SILC2 researchers for the future development of EU-SILC and of the EU social indicators. There are evident implications for the European institutions and for Member States. In the final Section 1.4, we look more broadly at the goals of European social policy in the light of the global perspective adopted as part of the United Nations (UN) Sustainable Development Goals. How should the EU respond to meet the challenges set by the September 2015 global agreement?

## 1.2 Outline of the contents

The book opens with an account of the key statistical instrument: EU-SILC. In Chapter 2, Emilio Di Meglio, Didier Dupré, Fabienne Montaigne and Pascal Wolff describe how EU-SILC is currently implemented in 34 countries. Every year in Europe more than 200 000 households and 500 000 individuals are interviewed and the microdata are sent to Eurostat. EU-SILC has a legal basis which is binding on EU Member States and is based on a common 'framework' that consists of common procedures, concepts and classifications, including a harmonised list of target variables to be transmitted to Eurostat. EU-SILC has a cross-sectional component pertaining to a given time period and a longitudinal component allowing to measure changes at individual person/ household level over a 4-year period. It is a multidimensional instrument covering income, housing, labour, health, demography, education and deprivation. EU-SILC has become the key EU reference for data on income and living conditions.

In Chapter 3, Anthony B. Atkinson, Anne-Catherine Guio and Eric Marlier bring together the EU-SILC-based social indicators with the macroeconomic (national accounts) analysis of aggregates. The authors argue that both are essential. The national accounts are necessary to provide an overall perspective; the distributional data in EU-SILC are necessary to measure income poverty. The chapter begins with the EU-SILC-based income poverty indicator (the headline EU 'at-risk-of-poverty' indicator), and then considers its relation to the level of

household real income as presented in the national accounts. Moving step by step, it seeks to identify the reasons for differences between EU-SILC and national accounts measures of real incomes. From this, it makes a number of recommendations about possible improvements in the underlying data and in the construction of the social indicators. The substantive results help illuminate the differing experience of the 3-year period preceding the 2008 financial and economic crisis and subsequent 3-year period.

Chapter 4 by Maria Iacovou examines across EU countries the relationship between household structure, on the one hand, and income poverty and subjective hardship, on the other hand. The chapter compares two perspectives, the first considering how the risk of poverty varies by household type, and the second considering the composition of the poor population. In terms of the risk of poverty, single-adult households and lone-parent households are at the highest risk of poverty in all countries. However, in terms of composition the household types with the highest risks of income poverty and/or subjective hardship are proportionally much more numerous in the Nordic and North-Western countries than they are in the Southern and Eastern regions. In the latter countries, households with dependent children constitute by far the largest share of the (income) poor or living-in-hardship population; households with adult children and extended-family households also account for a large percentage of the poor or living-in-hardship population. The chapter shows that, to the extent that differences in household composition do affect poverty and hardship rates, this effect does not come via substantial differences in the relative risks of poverty or hardship between one household type and another in the different countries, but primarily via differences in household composition between countries. There are evidently important implications for the design of policy to combat poverty and social exclusion.

Different features of the income distribution — poverty, affluence and dispersion — are brought together in Chapter 5 by Rolf Aaberge, Anthony B. Atkinson and Henrik Sigstad. The aim of the chapter is to bring together the different concepts in a single framework that allows ready comparisons.

Such a unified framework contributes both to the policy debate and to the theoretical understanding of inequality. There are at present largely separate literatures on the measurement of poverty, and (to a limited degree) affluence, and on bi-polarisation. In relation to the EU social indicators, the chapter may be seen as providing complementary information. A major purpose of this information is to test the robustness of the conclusions drawn to the choice of indicator. Another is to set the indicators in context. How should the evolution of the income poverty rate be seen in terms of the changes in the income distribution as a whole? For these purposes, the income quintile share ratio <sup>(3)</sup> and the Gini coefficient <sup>(4)</sup> while together informative, may not be sufficient. In particular, they do not address two of the issues that have surfaced in recent debate: the 'squeezing of the middle' and the 'racing away' of the top 1 %.

Affluence and high incomes are further investigated by Veli-Matti Törmälehto in Chapter 6, which examines the top tails of the national income distributions. Given that EU-SILC is based on sample surveys and split into 'survey' and 'register' countries (see also Chapter 28), the chapter begins with issues related to data quality, including under-estimation of top incomes. The data are then used to compute several income-based affluence measures, such as simple headcounts, top income shares, and affluence gaps. Finally, the chapter addresses the link between non-income information and high incomes, finding that identification of the affluent only on the basis of relative incomes is not sufficient. It concludes that EU-SILC is a useful complementary source on high incomes, in particular when the aim is to measure the size of the economically very well-off group and their living conditions, rather than concentration of income within the group.

(3) The income quintile share ratio (S80/S20) is an income inequality indicator. It is the ratio between the share of equivalised income in the highest income quintile (80 % and higher) and that in the lowest income quintile (lower than 20 %).

(4) The Gini coefficient is an income inequality indicator based on the cumulative share of income accounted for by the cumulative percentages of the number of individuals, with values ranging from 0 per cent (complete equality) to 100 per cent (complete inequality, i.e. one person has all the income, all others have none).

An important issue in the use of EU-SILC is the measurement of the imputed rents that arise from the economic benefits of owner-occupied and social housing. Known to be one of the most significant components of household disposable income, information about imputed rents has been available in EU-SILC since 2007. In Chapter 7, Veli-Matti Törmälehto and Hannele Sauli examine how the incorporation of imputed rents into disposable income would affect income levels, income inequality and income poverty risk. In general, net imputed rents tend to decrease income inequality, reduce income poverty rates among the elderly, and improve consistency of income poverty and social exclusion measures. Over the years, the quality of EU-SILC data on imputed rents has improved in many respects, but there are still shortcomings in terms of stability and completeness of the data and transparency of the estimation methods. Consequently, the authors conclude that further methodological studies and improvements are necessary before the inclusion of imputed rents in disposable income can be considered.

Extending the concept of income is equally the subject of Chapter 8 by Rolf Aaberge, Audun Langørgen and Petter Lindgren, who study the impact of including the value of public healthcare, long-term care, education and childcare on estimates of income inequality and poverty. The valuation of public services and the identification of target groups rely on group-specific accounting data for each country. To account for the fact that the receipt of public services like education and care for the elderly is associated with particular needs, the authors introduce a theory-based common equivalence scale for European countries (needs-adjusted EU scale). Extending the income concept to include the value of public in-kind transfers reduces at-risk-of-poverty estimates by approximately 50 % and estimated Gini coefficients by approximately 20 %. This underlines the importance of public services.

The standard approach to measuring economic well-being assumes that all incomes are pooled within the household and that all the household members benefit from the same level of economic well-being. A few datasets, including the 2010 EU-SILC thematic module on 'Intra-household al-

location of resources', provide evidence that significant shares of individuals living in multi-person households keep at least some of their income separate. In Chapter 9, Sophie Ponthieux proposes a measure of individual 'modified' equivalised income, using the information provided by the 2010 module. The analysis is limited to one-couple households. The results show that departing from the assumption of full income pooling within households leads to increased levels of inequality, as could be expected. The magnitude of the increase illustrates the potential bias resulting from the standard assumptions of full income pooling and equal sharing within households. For a better understanding of intra-household inequality, the author suggests that EU-SILC should collect both more detailed data on income components at individual level and information on intra-household arrangements.

The next two chapters deal with the measurement of material deprivation (MD) as part of the EU indicators development process. In Chapter 10, Anne-Catherine Guio and Eric Marlier present an alternative MD indicator which consists of 13 items — six are common to the current 9-item MD indicator and seven are new. The alternative indicator is derived from a theory-based analytical framework for developing robust (i.e. suitable, reliable, valid and additive) aggregate indicators that could be used for analytical and monitoring purposes at national and EU levels. The framework has been applied to EU-SILC data collected in 2009 (which included a thematic module specifically devoted to MD) in a systematic item by item analysis carried out at both EU and country levels. Chapter 10 examines the impact of the move from the current indicator to the alternative indicator on the level of MD in the different Member States and on the Europe 2020 social inclusion target, which is a key policy issue for individual countries and the EU as a whole. The analysis shows that, whereas the move results in a significantly more robust indicator, the impact of this move on the size and socioeconomic composition of the deprived population is limited in most countries and for the EU as a whole. Chapter 11 by Anne-Catherine Guio, David Gordon and Eric Marlier is concerned with measuring child MD in the EU taking into account information specific to children available from the 2009 EU-SILC thematic module

on MD. The chapter summarises the main results of the in-depth analysis of these data, identifies an optimal set of children MD items, and recommends a child-specific MD indicator for use by EU Member States and the European Commission in their regular social monitoring.

Multidimensional approaches to poverty and MD have a long and distinguished history in conceptual and philosophical work. In Chapter 12, Sabina Alkire and Mauricio Apablaza illustrate the study of multidimensional poverty. They calculate a multidimensional poverty index based on the Alkire Foster methodology, which can accommodate different indicators, weights and cut-offs. They draw on existing Europe 2020 indicators, as well as on indicators of health, education and the living environment. Aggregated and country cross-sectional results are presented. A short analysis of dynamics of multidimensional poverty is also included.

The Europe 2020 social inclusion target is measured according to work attachment, income and MD indicators using EU-SILC. However, there has been increasing interest in recent years in whether expenditure and consumption provide more appropriate measures of material living standards than income. The aim of Chapter 13 by Paola Serafino and Richard Tonkin is to compare people's exposure to poverty using three different measures: income, expenditure and MD. However, no single data source provides joint information on all these variables. Therefore, expenditure from the Household Budget Survey is statistically matched with income and MD contained within EU-SILC using data for Austria, Belgium, Finland, Germany, Spain and the UK. These matched datasets are used to analyse the overlap between income poverty, expenditure poverty and MD, as well as the relationship between income poverty, expenditure poverty and other measures of social exclusion.

In the next chapters (Chapters 14-19), the focus switches to employment — in relation to the Europe 2020 strategy. Chapter 14 by Andrea Brandolini and Eliana Viviano examines the notion of employment rate, one of the targets of the Europe 2020 strategy. As currently defined by the International Labour Office, 1 hour of work during a reference week is sufficient to be classified as employed. This is a rather crude measure, in the face of the wide

diversity of working times and contract durations observed in the EU. The authors demonstrate how to modify the employment rate to measure not only how many people work but also how much they work. Their 'work intensity'-adjusted employment rate is based on the total annual number of hours of work as approximated by the number of months worked per year and the number of hours worked per week. They use this alternative measure to compare employment rates across the EU Member States and find that the gap between Northern countries and Southern and Eastern countries narrows, after adjusting for work intensity, for both individuals and households. Though these results are based on estimates which can be improved in many respects, they neatly highlight the importance of exploring new flexible labour market statistics.

At the level of individual citizens and the households in which they live, participation in the labour market significantly diminishes the risk of income poverty. However, what seems evident at the level of individuals and households is less evident at the country level. Prior to the 2008 crisis, the Lisbon strategy could be regarded as a qualified success in the field of employment, at least if one assumes there to have been causal relationships between the Lisbon agenda and growing employment rates across Europe. Yet, the Lisbon strategy largely failed to deliver on its ambitious promise concerning (income) poverty. Notwithstanding generally higher employment rates, many Member States did not succeed in reducing poverty. Hence, it is important to understand the missing links between employment policy success (or failure) and inclusion policy success (or failure). This is the subject of Chapter 15 by Vincent Corluy and Frank Vandembroucke, which explores those missing links, relying on the EU Labour Force Survey and EU-SILC. The authors examine (i) if the differences between changes in individual employment and changes in household employment offer an adequate explanation for changes in poverty, and (ii) how these different changes can be decomposed in underlying factors, such as polarisation of employment. Their decomposition analysis yields interesting insights into the trajectories that EU welfare states have followed during the 'good economic years' and during the 'crisis period'. Changes in the distribution

of employment over households and decreasing household sizes constitute important structural background features for evolving EU welfare states. However, the impact of this evolution on the explanation of differences in the Member States' performance with regard to poverty risk reduction is rather limited and diverse, both before and after 2008.

Household joblessness in Europe has been of central policy concern, and it is one of the three dimensions making up the Europe 2020 social inclusion target. In Chapter 16, Sophie Ponthieux presents a methodological assessment of the (quasi-) jobless indicator. There are large cross-country differences in the composition of (quasi-)joblessness (QJ), suggesting that the notion captures different phenomena in different countries. The evolution of QJ over time is difficult to interpret. The contribution of this indicator to the Europe 2020 social inclusion target is relatively small in most countries, and presents some weaknesses from a conceptual point of view. The analysis also shows that some technical choices in the implementation of the QJ concept affect the level, the structure and the evolution of the indicator.

What happened to those in work during the 2008 crisis? Chapter 17 by Andrea Brandolini and Alfonso Rosolia analyses the evolution of the distribution of earnings in the Euro Area during the crisis and the determinants of this evolution. The authors show that the wage adjustment between 2007 and 2011 was substantially larger according to the EU-SILC data than that measured by national accounts, and driven mainly by the dynamics of earnings in periphery countries (Greece, Ireland, Italy, Portugal and Spain). Based on their estimates, the real monthly full-time equivalent gross earnings in periphery countries has decreased on average by over 4 % relative to levels in core countries (Austria, Belgium, Finland, France, Germany, Luxembourg and the Netherlands), but the relative costs of low wage labour have fallen far more in the periphery, by some 6-8 %. The changing composition of the pool of salaried employees boosted earnings growth, thus obscuring a sizeable downward real wage adjustment, especially at the bottom of the wage distribution.

The risk of poverty depends not only on pay but also on household structure. In Chapter 18, Maria

Iacovou investigates the relationship between household structure and the three components of the AROPE indicator: income poverty, severe MD, and (quasi-)joblessness. She finds that the incidence of all three indicators varies by household type, with lone parents and single adults being at elevated risk, and non-elderly couples (with or without children) being at the lowest risk. There are also substantial variations in risk within household types, depending on which of the three target components we look at. Among lone parents, the risks of poverty and (quasi-)joblessness is particularly high among those with larger numbers of children and among those with young babies, while couples with larger numbers of children are also at a higher risk on all three indicators. The three components of the AROPE indicator do not move together during the life cycle: among single-person and couple households, the risk of income poverty is very high among young adults, while the risk of (quasi-)joblessness is highest at older ages. This suggests that among the young, having a job may not offer failsafe protection from poverty, while at older ages, a lack of employment is not necessarily synonymous with disadvantage, and raises questions about the ability of the (quasi-)joblessness indicator on its own to effectively identify disadvantaged groups.

Since the at-risk-of-poverty rate is one of the three indicators used for monitoring progress towards the Europe 2020 social inclusion target, timeliness of this indicator is critical for monitoring the effectiveness and distributional aspects of policy interventions under the current economic conditions. However, due to the complicated nature of microdata collection and processing as well as to the complexity of measuring the total annual household income concept, income poverty estimates only become available with a 2-year delay (3 years until a couple of years ago, before major timeliness efforts by the European Statistical System). The aim of Chapter 19 by Chrysa Leventi, Olga Rastrigina, Holly Sutherland and Jekaterina Navicke is to present a microsimulation-based methodology for nowcasting changes in the distribution of income over years for which EU-SILC statistics are not yet available. The term 'nowcasting' here refers to the estimation of current indicators using data on a past income distribution together with various other sources of information,

such as macroeconomic statistics. Enhancing the EU-SILC based input data of the tax-benefit microsimulation model EUROMOD with up-to-date macro-level statistics, income poverty rates are estimated for twelve EU countries for the period 2009-2013. The performance of the method, assessed by comparing the nowcasted estimates with the 'true' EU-SILC indicators suggests that this approach provides useful provisional information until official statistics become available.

The 2008 crisis had a dramatic impact on European citizens, leading to more people experiencing MD. The next two chapters explore how MD indicators capture the evolution of people's living conditions, using the longitudinal component of EU-SILC. The key objective of Chapter 20 by Anne-Catherine Guio, Eric Marlier and Marco Pomati is to analyse the evolution of MD over time across the EU and to estimate the impact of the crisis on this evolution. Both cross-sectional and longitudinal EU-SILC data are used. The chapter analyses the changes in national trajectories of MD (before and during/after the crisis) — considering in turn incidence, severity and persistence aspects. By looking at both entry into MD and exit from MD, it allows for a better understanding of national differences in the levels of annual and persistent MD. It explains in particular why countries with similar annual MD rates can have different persistent MD rates and how the increase in entry rates and the decrease in exit rates came into play to explain MD increases in the countries most affected by the crisis. Finally, it also explores the impact of different 'trigger events' and individual/ household characteristics on entry rates into MD. The main contribution of Chapter 21 by Anne-Catherine Guio and Marco Pomati is to understand which items people have to go without as their resources decrease, using the longitudinal component of EU-SILC. By definition, curtailment is a temporal process which to be fully understood necessitates longitudinal data. Although only a subset of MD items is available in the longitudinal dataset, this allows the authors to compare the order of curtailment obtained by using longitudinal and cross-sectional data. An Item Response Theory model is also estimated on cross-sectional data and used to confirm and aid the interpretation of the results. Interestingly, the results suggest a large degree of homogeneity across the EU in



how households curtail expenditure, despite the large differences in material and social contexts between Member States.

The longitudinal component of EU-SILC is also used in official EU statistics — to compute the persistent at-risk-of-poverty rate, which to date is the only longitudinal indicator included in the EU portfolio of social indicators used by EU countries and the European Commission for measuring progress towards the EU social protection and social inclusion objectives (Social Protection Committee 2015) <sup>(5)</sup>. Evidence about (income) poverty persistence is undoubtedly an important complement to information about poverty prevalence at a point in time. However, sample drop-out from the longitudinal samples ('attrition') reduces sample size thereby decreasing the precision of estimates of persistent poverty indicators, and may be selective and lead to bias. In Chapter 22, Stephen P. Jenkins and Philippe Van Kerm examine these issues. They show that rates of attrition from the 4-year EU-SILC samples used to calculate persistent poverty rates vary substantially across Member States, and there is also substantial cross-national diversity in the characteristics of individuals lost to follow-up. They provide evidence that application of longitudinal weights does not fully account for the effects of attrition, and that different assumptions about the poverty status of those lost ('attritors') lead to wide bounds for estimates of persistent poverty rates for most Member States.

Likewise taking advantage of the longitudinal component of EU-SILC, Chapter 23 by Céline Thévenot investigates the lessons that can be drawn from observing year on year changes in working age adults' labour market situation and their related poverty status. It highlights that, among non-employed individuals, taking up a job might not be enough to get out of poverty. The type of job, household

structure or inadequate income support can explain such a feature. The chapter explores the transition from unemployment to employment by itself, with a special focus on the role of unemployment benefits coverage. By comparing groups of individuals with similar profiles, such as gender, education and time spent at work over the last 3 years, it shows that those unemployed covered by unemployment benefits schemes perform better in finding a job. Therefore, well-designed unemployment benefit coverage can support transitions to employment and contribute to preventing entries into poverty.

In Chapter 24, Francesco Andreoli and Alessio Fusco take a different approach, studying inequality of opportunity. Opportunities are equally distributed when individuals of the same 'type' (i.e., sharing similar circumstances of origin for which they cannot be held responsible), who make similar 'effort' choices (for example in terms of hours worked, educational choices...), also face identical opportunity profiles. Otherwise, a form of inequality of opportunities prevails. This chapter aims at quantifying the degree of inequality of opportunity across the EU, and assessing its evolution, using the information provided by the thematic modules on intergenerational transmission of disadvantage included in the 2005 and 2011 Waves of EU-SILC. It proposes new indicators that are consistent with the normative perspectives on equality of opportunity. These indicators coincide with the expected change in economic (dis)advantage experienced by individuals later in life that is induced by a change in the circumstances of origin. The authors find substantial heterogeneity across European countries in terms of inequality of opportunity, which does not perfectly mirror the portrait drawn from official poverty and social exclusion indicators.

Using the same 2005 and 2011 modules on intergenerational transmission of disadvantage, Chapter 25 by Luna Bellani and Michela Bia examines the causal impact of growing up poor on the individual's economic outcomes as an adult. The authors find that experiencing financial problems in childhood decreases the level of income in adulthood and increases the average probability of being at risk of poverty. They also find substantial country differences in the impact.

<sup>(5)</sup> The most recent EU objectives for social protection and social inclusion were agreed in 2011 (Council of the European Union, 2011). A set of commonly agreed EU social indicators is used for monitoring progress towards these objectives. This set is continuously fine-tuned and complemented with new measures. The EU body in charge of developing these EU social indicators is the Indicators Sub-Group of the EU Social Protection Committee (<http://ec.europa.eu/social/main.jsp?catId=830&langId=en>). On the use of EU social indicators and the methodological EU framework under which these are developed, see also: Atkinson et al. (2002) and Marlier et al. (2007).

The last four chapters (Chapters 26-29) look at various technical issues in the development of household social surveys. When using sample estimates to monitor poverty and social exclusion, it is crucial to take the sampling variance into account. Otherwise, small changes in estimates may be wrongly interpreted as real changes in the population. In Chapter 26, Yves Berger, Guillaume Osier and Tim Goedemé present standard error estimates and confidence intervals for cross-sectional measures, longitudinal measures and measures of changes between two waves. The proposed variance estimators are simple and flexible, yet theoretically sound. They can accommodate a wide class of sampling designs using standard statistical techniques. The suggested approach can be implemented with standard statistical procedures. It can also be extended to complex estimators through linearisation. The numerical results obtained using this approach must however be read with caution given the lack of sampling design information in the EU-SILC *Users' Databases (UDB)* and potential quality problems with the current design variables. Throughout the whole book, the method proposed in this chapter is applied whenever feasible, in order to provide the reader with confidence intervals and appropriate significance testing.

In Chapter 27, Maria Iacovou and Peter Lynn review the regulation relating to the EU-SILC 'following rules' (that determine which particular member(s) of sample households should be traced and re-interviewed, and under what circumstances), and examine the implementation of these rules. There are large differences between Member States, particularly in respect of individuals or whole households who change address; and the authors show that this may have important implications for research on groups of people who have a higher-than-average risk of moving. They discuss 'best practice' in minimising attrition in longitudinal surveys. They also discuss the challenges of producing the EU-SILC longitudinal data from the perspective of National Statistical Institutes, and the value of the longitudinal component of EU-SILC from the perspective of the research community. They make recommendations relating to the future design and implementation of the longitudinal component of the EU-SILC.

The use of registers in EU-SILC is the subject of Chapter 28 by Veli-Matti Törmälehto, Markus Jäntti and Eric Marlier. This chapter reviews the use of registers in EU-SILC, summarising the main outcomes of the international Workshop on 'The use of registers in the context of EU-SILC' organised by Net-SILC2 in December 2012 in Vienna (see Jäntti, Törmälehto and Marlier, 2013).

Finally, Chapter 29 by Emilio Di Meglio and Didier Dupré describes the planned future developments of EU-SILC. The 2008 crisis, the Europe 2020 strategy, the European Commission's 'Social Investment Package' and the 'Beyond GDP' initiative have raised significantly the importance of social statistics. In order to increase responsiveness, Eurostat is currently revising EU-SILC as part of a larger programme aimed at modernising European social statistics. A key objective of this programme is the better integration of surveys by standardisation of variables, precision requirements based on standard errors, and more systematic use of registers and multi-mode data collection. For poverty and social exclusion, the EU-SILC revision aims at: (i) modularising and adapting the periodicity to the needs; (ii) improving timeliness, with a global availability of EU-SILC data at the latest in June of the year following the survey and for MD and other non-income data at the end of the survey year; (iii) nowcasting and releasing early estimates of key indicators and income evolutions; (iv) better integrating EU-SILC indicators with macroeconomic variables; (v) possibly extending the rotational panel from 4 to 6 years, for better studying long-term phenomenon, transitions and recurrences; and (vi) allowing for more regional breakdowns.

### 1.3 Future developments of EU-SILC and EU social indicators

The extensive use made of the EU-SILC data as part of the Net-SILC2 project means that we have learned a lot about its strengths and weaknesses. The first of these — the strengths — should be stressed. EU-SILC is a remarkably successful statistical instrument. It provides an essential input into

the policy-making process. Without such a rich source of data, the EU would not have been able to set a quantified social inclusion target as part of the Europe 2020 strategy, nor to develop an evidence-based 'Beyond GDP' initiative. The whole EU social indicators process would have been impossible without this investment in statistics.

At the same time, there are a number of areas where the instrument could profitably be developed or where it needs to adapt to the changing world. Moreover, there are significant implications for the monitoring of Social Europe — both for the EU portfolio of social indicators and for the EU comparative analysis of income and living conditions. In what follows, we highlight six of these: (i) linking EU-SILC data and the national accounts; (ii) combining survey and register data; (iii) confronting income and expenditure data; (iv) putting in perspective income-based and MD indicators; (v) questioning the employment and (quasi-)joblessness concepts; and (vi) improving the measurement and understanding of the dynamics of poverty and social exclusion.

### 1.3.1 Linking micro- and macro-

For many years, as noted at the outset of Chapter 3, there has been a sharp separation between, on the one hand, the macroeconomic evaluation of economic policy and, on the other hand, the analysis of the impact of policy on the living standards of households. On one side are the national accounts, where performance is judged in terms of Gross Domestic Product (GDP); on the other side are the statistics on households' living conditions with which we are primarily concerned in this book. It has however become increasingly clear that the two sides need to be brought together. In particular, we need to understand the relation between the aggregate story told by household statistics and that contained in the national accounts. Put simply, if we add up the household incomes in EU-SILC, appropriately weighted, do we arrive at the same amount as the aggregate household incomes that feature in the national accounts? Or, put in growth terms, do the household statistics tell the same story about the rise or fall of living standards as do the household income aggregates in the national accounts?

This question has acquired greater significance since 2014, when the Social Protection Committee (SPC) and its Indicators Sub-Group adopted an aggregate indicator of (unadjusted) <sup>(6)</sup> real gross household disposable income as part of the EU portfolio of social indicators. This indicator covers household income (aggregate for the household sector) and is described as 'providing a link between macroeconomic developments and household income developments' (Social Protection Committee 2015). It is measured by the growth rate in unadjusted real gross household disposable income. This indicator — in contrast to the other EU social indicators — is taken from the national accounts. This immediately raises the question as to how the growth rate compares with that found if one makes a comparable calculation using the household income data in EU-SILC.

The linking of micro- and macro- statistics is an active area of research by Eurostat and OECD, by National Statistical Institutes, and by academic researchers. There are therefore good grounds for expecting an improvement in our understanding. At the same time, there are specific issues that are of particular concern in relation to EU-SILC and the EU social indicators. A number of these are covered by the specific recommendations in Chapter 3. For example, while the national accounts may include non-profit institutions serving households as part of the household sector, it is important that they be separated out for use in constructing social indicators. A second example concerns the under-statement in household surveys of certain forms of income, including property income, self-employment income, and social transfers. Specific consideration needs to be given within EU-SILC to the possible use of corrective factors, or to the supplementation of the information collected in the surveys (including the modelling of the receipt of cash transfers). A third example is provided by the choice of price index to deflate money incomes to real terms, where the choice appropriate for the national accounts may not apply to the social indicators.

<sup>(6)</sup> 'Unadjusted' refers to the fact that no allowance is made for the receipt of social transfers in kind.

### 1.3.2 Combining survey and register information

The current trend in European statistics is to encourage the use of administrative data, and there has been an expansion in the use of register data in EU-SILC in recent years. The use of registers offers several advantages, including shorter questionnaires, lower demands on respondents and hence higher response rates, more accurate measurement and greater possibilities for cross-validation. At the same time, the partial transition to the use of register data poses problems. To quote from Jäntti, Törmälehto and Marlier, 'the research findings suggest that the differential use of registers may affect comparability across countries, while country-case studies tend to show that the transition to register income data may affect within-country comparability across time' (2013, p. 33). This is illustrated in Chapter 3 by Figure 3.6, which compares EU-SILC income with that in the national accounts. For three 'register countries' (Netherlands, Finland and Sweden) the EU-SILC income is above 85 % of the national accounts figure, whereas for non-register countries the ratio is below. In France, the adoption of a register basis in 2007 led to a jump in the ratio. This shows that the use of registers increases the consistency between micro and macro data. This also shows that the transition to use of register data needs therefore to be handled carefully. This does not mean that there should be any doubts about this move. We agree with Jäntti, Törmälehto and Marlier that 'for cost and quality reasons, the way forward is to increase utilisation of registers in EU-SILC' (2013, p. 33). As they note, the 'greatest potential gains may stem from replacing survey questions on social benefits and employment income with valid register data in as many EU-SILC countries as possible' (2013, p. 32).

### 1.3.3 Confronting income and expenditure data

The EU social indicators for the risk of poverty are based on household incomes. As has been extensively discussed in the literature, there are grounds for using household expenditure, rather than income, as the measure of the standard of living. These grounds are set out in Atkinson, Cantillon, Marlier and Nolan (2002, pp. 82-83), where the au-

thors recognise that there are arguments on both sides but conclude that the EU indicators should be based on household income. One important consideration was the availability of validated income data from the EU household surveys (then the European Community Household Survey (ECHP), now EU-SILC). Information on household expenditure is available from the Household Budget Surveys, but in order to make a comparison with the income indicators it is necessary to merge the two sources.

In this context, the investigation via merged datasets of the relation between income poverty, expenditure poverty and MD presented in Chapter 13 is very informative, and we quote their conclusion at length: 'on one level, the results of this analysis do not appear to directly support the assertion that expenditure provides a better measure of material living standards than income, at least for the countries examined. Comparisons with MD and a number of other related measures of living conditions in general suggest a slightly stronger relationship between these measures and income poverty than expenditure poverty'. At the same time, the expenditure measures provide an alternative perspective which should be further explored.

### 1.3.4 Putting in perspective income-based and material deprivation indicators

Material deprivation indicators, which are included in the EU portfolio of social indicators only since 2009, have been extremely useful in the monitoring of living standards across the EU. Before the crisis, they decreased substantially in many Eastern countries, showing an improvement of living standards. During the crisis, they helped capture the impact of the crisis on the actual living conditions of people. As shown in Chapter 20, looking at the persistence of MD and at the entry and exit rates before/after the crisis allow for a better understanding of national differences in the levels of annual and persistent MD; it also shows how the increase in entry rates and the decrease in exit rates came into play to explain MD increases in the countries most affected by the crisis. Without complementing the analysis of cross-sectional and longitudinal income-based indicators with that of

cross-sectional and longitudinal MD variables, part of the explanation behind these trends would have been missed.

The analyses presented in Chapters 13 and 20 remind us of the interest of using also the 'standard' EU indicator on MD (which is based on a threshold of three lacks out of a list of nine) and not only the severe MD indicator included in the social inclusion target (based on a 4-lack threshold). Indeed, in most EU countries suffering from three deprivations is a sufficient condition for not having a decent life; this therefore deserves analysis.

Despite the fact that the current EU MD indicators have proved very useful in complementing the EU income-based indicators, the revision of the list of MD items along the lines summarised in Chapter 10 will increase the robustness of the measure (for the full analyses that led to this proposal developed in the context of Net-SILC2, see Guio, Gordon and Marlier 2012). The 13 items included in the proposed alternative EU indicator better capture MD, including some of the social aspects of MD. The high degree of homogeneity across the EU in how households curtail their expenses when facing financial difficulties, despite the large differences in material and social contexts between Member States, further highlights the interest of using a common basket of items at the EU level (Chapter 21). It is very encouraging that the European Statistical System has decided to follow the Net-SILC2 proposal — since 2014, all 13 MD items are included in the primary EU-SILC target variables and thus collected annually in all EU Member States.

Complementing the EU portfolio of social indicators with a child-specific MD indicator that would take account of the specific living conditions of children, which may differ from their parents' living standards, would be an important step forward (see Chapter 11 for the proposed indicator developed in the context of Net-SILC2; see also Guio, Gordon and Marlier 2012 for the full analyses). Regularly collecting this information on the specific living conditions of children is crucial to follow the evolution of child well-being across the EU. Here again, EU progress is encouraging. The child-specific MD items selected by Net-SILC2 were in-

cluded in the 2014 Wave of EU-SILC and will be part of a regular thematic EU-SILC module (most likely repeated every third year). The inclusion of a child-specific MD indicator in the EU portfolio of social indicators is on the 2016 agenda of the SPC Indicators Sub-Group.

### 1.3.5 The concepts of jobs and (quasi-)joblessness

The analyses presented in the chapters of this book that deal with labour market issues have identified a number of problems with the measurement of employment and (quasi-)joblessness. These problems reflect both the complexity of the concepts and the changing nature of the labour market.

Increasing the rate of employment has long been a central concern of the EU. The European Employment Strategy, launched at the Luxembourg Jobs Summit in 1997, was translated into specific targets in the Lisbon agenda in 2000; and the Europe 2020 strategy launched 10 years later seeks to ensure that 75 % of the population aged 20-64 'should be employed' by 2020 (European Commission, 2010). But, as shown in Chapter 14, if the employment rate is defined as a simple headcount of those at work, then it can be highly misleading. Moreover, in many countries the labour market is evolving in ways that render irrelevant the simple concept of a 'job'. It is no longer enough to count 'jobs'. In our view, the EU employment targets and indicators need to be re-considered to account not only for the number of workers but also for their work intensity. Work intensity can be based on the number of months worked per year and the number of hours worked per week. With such a measure, as shown in Chapter 14, we would obtain a different picture.

Household joblessness in Europe has also been of central policy concern, and it is one of the three dimensions making up the Europe 2020 social inclusion target. It is addressed in Chapters 15, 16 and 18. Chapter 16, in particular, makes concrete suggestions for improving the Europe 2020 indicator of (quasi-)joblessness.

### 1.3.6 Improving the measurement and understanding of the dynamics of poverty and social exclusion

Chapters 20-25 and 27 explore different ways of improving the measurement and understanding of the dynamics of poverty and social exclusion using EU-SILC data. The analysis of the longitudinal (panel) component of EU-SILC shows that similar trends in social indicators may result from different dynamic processes (see Chapters 20 and 23). For example, when considering the Europe 2020 social inclusion target, it is important not only to monitor national trends in the overall target and its three components (income poverty, material deprivation and (quasi-)joblessness) but also to analyse entry and exit rates in these different indicators — i.e., to analyse the dynamic processes at stake.

As explained in Chapter 29, the EU-SILC instrument is currently being revised. It is crucial that this revision benefits to the full from the experiences of analysing its longitudinal data; that it builds on what researchers have identified as strengths and weaknesses of EU-SILC panel data so these data can be further improved in future. So, Chapters 22 and 27 show the importance of harmonising strict following rules, of monitoring procedures for minimising non-response and attrition, and of adequate weighting to correct for selective attrition.

The time window during which individuals are currently followed in EU-SILC is only 4 years. As explained in Chapter 27, an extension of the panel length from 4 to 6 years 'would permit a broader range of analyses and greater power to identify the precursors, causes and effects of various dynamic processes such as changes in income poverty, material deprivation, (quasi-)joblessness and changes in health status; EU-SILC would provide a unique opportunity to make cross-national comparisons of these processes, causes and effects and to better understand variation between Member States.' Examples of the potential added value of such an extension are evident from Chapters 20 and 23.

A life cycle approach to poverty and social exclusion can also help understand the dynamics of poverty and social exclusion. Using the 2005 and

2011 EU-SILC thematic module on the intergenerational transmission of disadvantages, Chapters 24 and 25 analyse the long-term impact of poverty in childhood and suggest new indicators and analyses in this field, which are crucial to better highlight the long-term responsibility of the society in the fight against child poverty and social exclusion.

## 1.4 European social goals in the global perspective of 2030

Much of the research reported in this book has been concerned with the goals set in the Europe 2020 agenda. At the time the book went to press, half that decade has passed. We need therefore to be looking further into the future. In this last section, we suggest that the UN agreement on the new Sustainable Development Goals provides a longer-term horizon and an impetus to consider Europe's goals up to 2030.

### 1.4.1 The sustainable development goals

In September 2015, the United Nations agreed to the new Sustainable Development Goals (SDGs), the follow-up to the Millennium Development Goals. As indicated by the official title, 'Transforming our world: the 2030 Agenda for Sustainable Development', the SDGs set the world objectives for the next 15 years. The goals are ambitious, not only in what they seek to achieve in the developing world, but also because they are now global in scope. As described by the UN, 'this is an Agenda of unprecedented scope and significance. It is accepted by all countries and is applicable to all, taking into account different national realities, capacities and levels of development and respecting national policies and priorities. These are universal goals and targets which involve the entire world, developed and developing countries alike.'

The global reach of the SDGs may be seen from the two targets concerning poverty and inequality:

- a) *Goal 1: End poverty in all its forms everywhere.* The first two elements of this goal consist of the following:
- 1.1 by 2030, eradicate extreme poverty for all people everywhere, measured as people living on less than USD 1.90 per capita a day (previously USD 1.25);
  - 1.2 by 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.
- b) *Goal 10: Reduce inequality within and among countries.* The first two elements of this goal consist of the following:
- 10.1 by 2030, progressively achieve and sustain income growth of the bottom 40 % of the population at a rate higher than the national average;
  - 10.2 by 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

The second feature of the new SDGs is the incorporation of national poverty objectives. Goal 1.1 refers to the ambition for the abolition of extreme poverty, measured by the global poverty line of USD 1.90 per capita a day expressed in standardised purchasing power <sup>(7)</sup> but Goal 1.2 is framed in terms of poverty as measured by national definitions. The SDGs are not only about the developing world but also about rich countries. The SDGs are a challenge to the Member States of the EU — and to the United States (U.S.), Japan and others of the 80 countries defined by the World Bank as ‘high income’. (The criterion for ‘high income’ is a Gross National Income per head of more than USD 12 735 in 2014, or some USD 35 a day.)

This raises a third feature of the SDGs. In the surrounding documents, there are frequent references to national governments. The UN refers to ‘each

Government setting its own national targets guided by the global level of ambition but taking into account national circumstances. Each Government will also decide how these aspirational and global targets should be incorporated into national planning processes, policies and strategies’ (2015, para. 55). There is however little or no reference to politico-economic unions of national governments, such as the EU. A search of the document UN (2015) for ‘EU’ (in capitals) reveals no matches. Yet, the role of regional groupings has been of importance in the study of poverty and in the provision of statistical information on income distribution. Reference should be made, for example, to the work of the UN Economic Commission for Latin America and the Caribbean (ECLAC), and of the Asian Development Bank. In the case of the EU, the process of adopting agreed social indicators has advanced considerably and the Europe 2020 agenda represents the common agreement of Member States on the poverty target for the decade.

We therefore believe that the EU should seize the opportunity created by the SDGs to establish the existing Europe 2020 social inclusion goal as that relevant to Goal 1.2 of the SDGs (for the period 2015-2020). Moreover, it should use the occasion as the basis for setting a more ambitious set of goals for 2030.

#### 1.4.2 Extreme poverty in the EU

The Europe 2020 goal of reducing the number of people at risk of poverty or social exclusion (AROPE) by at least 20 million, a reduction by around 17 % in 10 years, should remain the priority concern of the EU until 2020. At the same time, there are challenges that go beyond the Europe 2020 social inclusion target. The first of these is the need to continue after 2020 to bring down the proportion of the population living in households with total equivalised disposable income below 60 % of the median (the income poverty component of the target). Together, the income poverty and AROPE indicators should be the primary focus.

At the same time, the agreement on the SDGs points to the need for the EU to also consider extreme poverty. To date, the World Bank when calculating the number below the USD 1.90 line (Ferreira et al.,

(7) On the basis of Purchasing Power Parities (PPP), Purchasing Power Standards (PPS) convert the amounts expressed in a national currency to an artificial common currency that equalises the purchasing power of different national currencies (including for those countries that share a common currency).

2015) has simply inserted zero for high income countries. But this is very much open to question. In the U.S., Shaefer and Edin (2013 and 2014) and Edin and Shaefer (2015) have argued that, as a consequence of the scaling back of welfare, 'a new group of American poor has emerged: families with children who are living on virtually no income' (2014, p. 28). The size of this group depends on the definition of extreme poverty and on the sources of data. Chandry and Smith note that 'a variety of different data sources and definitions (...) generate estimates of the number of Americans living under \$2 a day that range from 12 million all the way down to zero' (2014, p. 3). They go on to argue that 'the inability to obtain a more precise estimate of \$2 a day poverty in the U.S. ought to be addressed' (2014, p. 17).

The EU must ask the same question — how much extreme poverty is there in the EU? With the migration crisis, this has become an even more pressing issue. As in the U.S., to respond to the question we need to consider both definitions and sources. A key definitional issue is that already discussed in the previous section: the choice between income and expenditure when measuring poverty. There is a good case for measuring extreme poverty in terms of consumption, and hence for basing the estimate on expenditure rather than income. At the same time, there are important differences between expenditure and consumption, and it is not evident that the latter is adequately captured in Household Budget Surveys. This is particularly the case when we consider a second issue: the non-coverage in surveys of the non-household population. In its estimates of global poverty, the World Bank uses sources that in some countries attempt to cover the non-household population, but there remains a major problem. Carr-Hill (2013) has made estimates of the numbers missing globally from the sampling frames of household surveys in the form of the institutional population (hospitals, prisons and refugees), slum population and pastoralists. While the resulting number may be a relatively small proportion of the total population, they may constitute a much more serious percentage of those at risk of extreme poverty.

Any steps in this direction must be cautious, since measuring extreme poverty in the EU is a complex endeavour. Progress may be possible in the case of specific groups, such as taking forward the EU

work on homelessness. The topic as a whole could profitably be the subject of a future Horizon 2020 international research project.

### 1.4.3 A more ambitious goal for 2030?

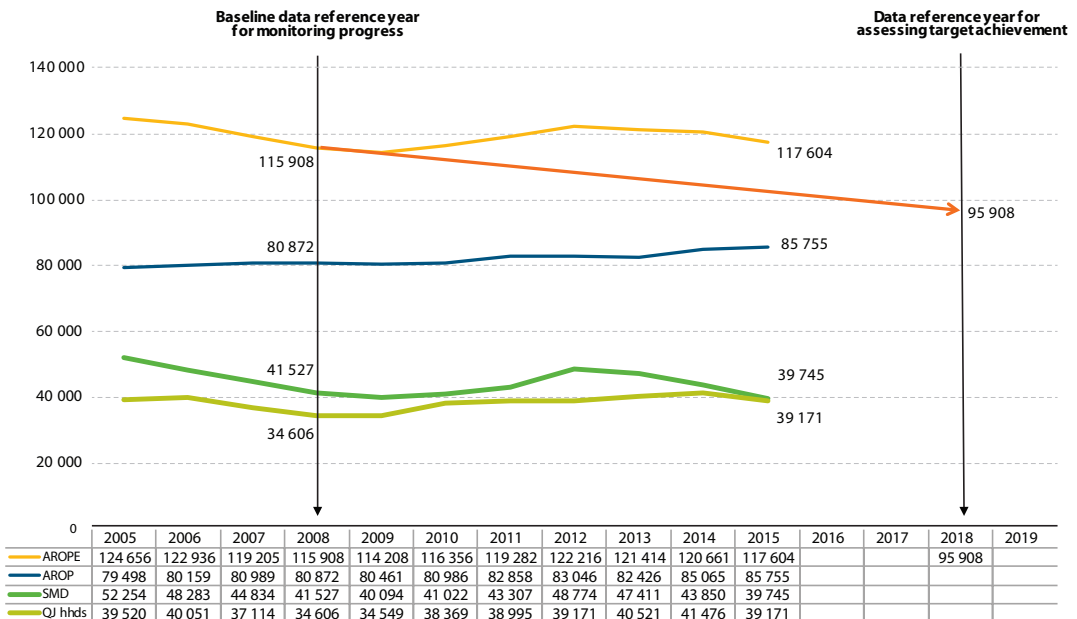
The setting of the SDGs for 2030 provides a natural focus for considering the establishment of EU targets for the next decade. Here we should note that the SDG aim of reducing poverty as measured nationally by a half is twice as ambitious as the Europe 2020 social inclusion target. In broad terms, the Europe 2020 target is to reduce the number at risk of poverty and social exclusion EU-wide by around a sixth between 2010 and 2020; the equivalent over 15 years (2015-2030) would be a reduction of a quarter. The SDG is therefore setting a more ambitious goal.

In thinking beyond 2020, we have to recognise that progress to date has been extremely disappointing. We see no grounds for disagreeing with one of the Key Messages of the Social Protection Committee in its 2014 annual report, 'the EU is still not making any progress towards achieving its Europe 2020 poverty and social exclusion target of lifting at least 20 million people from poverty and social exclusion by 2020. (...) Furthermore, national targets continue to vary in their ambition and do not add to the EU collective headline target.' (2015a, p. 12). Figure 1.1 shows that the overall AROPE figure, rather than falling from 116 million (rounded to the nearest million) in the reference year 2008, has risen to more than 120 million in 2012-2014 and is still as high as 118 million in 2015, taking us away from the line, marked with an arrow, indicating where we should be heading. The target of 96 million is further away. The same applies to the individual components. For instance, the number of people at risk of poverty (AROP), i.e. the number of income-poor people, has risen from 81 million to 86 million. A chart like Figure 1.1 should be on the desk of every Minister of Social Affairs, every Minister of Employment and every Minister of Finance in the EU.

Faced with such failure, Europe's leaders may simply decide to throw in the towel, and write off 2010-2020 as a 'lost decade'. The Europe 2020 objective of a reduction of a sixth may simply be pushed 10 years into the future. Such an outcome would be



**Figure 1.1: Progress towards the EU social inclusion target, 2005-2015**  
(in thousands)



*Reading note:* In 2008, the reference (survey) year for the Europe 2020 social inclusion target agreed upon in 2010, 80.872 million were at risk of poverty (AROP), 41.527 million were severely materially deprived (SMD) and 34.606 million lived in (quasi-)jobless households (QJ). The sum of these three figures is higher than the number of people who were at risk of poverty or social exclusion that year (AROPE, 115.908 million) because a number of persons AROPE combine two or even all three difficulties considered in this aggregate indicator. The target to be reached by 2020 (based on 2018 EU-SILC data) is 95.908 million people AROPE, i.e. a reduction by 20 million compared to 2010 (based on 2008 EU-SILC data).

*Source:* Eurostat, EU-SILC (codes *t2020\_50*, *t2020\_51*, *t2020\_52*, *t2020\_53*), downloaded on 31 January 2017.

extremely disappointing to those concerned with the social dimension of Europe, and devastating for the millions of Europe's citizens living at risk of poverty or social exclusion. We believe that the SDGs, with their greater ambition, should be the basis for setting Europe's commitment for 2030. Halving poverty by 2030 should not be beyond the resources of a rich continent.

#### 1.4.4 A new income inequality indicator?

At present the EU portfolio of social indicators contains two indicators of income inequality: the income quintile share ratio S80/S20 and the Gini coefficient (see definitions above). The SDGs however are proposing a different indicator, which is defined

in terms of the income growth of the bottom 40 % of the population.

The SDG indicator could be implemented in different ways. The simplest is to consider the income share of the bottom 40 %. The World Development Indicators of the World Bank show for instance that in 1986 the bottom 40 % in the U.S. received 16.6 % of total income but that this figure had fallen to 15.4 % by 2013. However, the reference to 'income growth' in the formulation of Goal 10.2 suggests that we need to take account of the level of income. The share of the bottom 40 % needs not only to be rising but also for their real incomes to be increasing.

This suggests that the new inequality indicator should be combined with the indicator adopted by the SPC Indicators Sub-Group in 2014: the growth of the (unadjusted) real household disposable income of the bottom 40 %, compared with the

already existing indicator on the growth of the corresponding variable for the population as a whole.

### 1.4.5 An integrated approach

In the discussion so far, we have focused on the two SDGs concerned with poverty and inequality, but they form part of a package of objectives and need to be seen in this context. The policies pursued need to be assessed in terms of their contribution to all goals.

In this regard, the Europe 2020 strategy, with its five overarching goals (in the fields of social inclusion, employment, R & D/innovation, climate change and education), has provided a good lead. However, when evaluating policy options we need to consider all five in conjunction.

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# 2

## Investing in statistics: EU-SILC

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### 2.1 Introduction

This chapter introduces the EU-SILC instrument, which has become the reference source for comparative statistics on income distribution and social inclusion in the EU. Its aim is to provide the reader of this book with a conceptual and practical insight into the background of this instrument and its main characteristics.

Reliable and timely statistics and indicators, computed from a pan-European harmonised data source and reflecting the multi-dimensional nature of poverty and social exclusion, are essential for monitoring the social protection and social inclusion process at national and EU level. Furthermore, the social consequences of the economic and financial crisis have given increased importance to data on the income distribution and the social situation across Europe.

EU-SILC is currently implemented in 34 countries. Every year in Europe more than 200 000 households and 500 000 individuals are interviewed and the complete microdata are sent to Eurostat.

### 2.2 The EU-SILC instrument and its governance

#### 2.2.1 Scope and geographical coverage

As with most household surveys, EU-SILC covers only people living in private households; persons living in collective household or institution are not included in the instrument. This needs to be borne in mind when carrying out statistical analyses and when interpreting indicators, both within a given country and between countries.

EU-SILC was launched in 2003 in seven countries and was then gradually extended to all EU countries and beyond. In 2015, the EU-SILC instrument is implemented in 34 countries: the 28 EU countries, the former Yugoslav Republic of Macedonia, Iceland, Norway, Serbia, Switzerland and Turkey; it is tested in Montenegro. Small areas of the national territory amounting to no more than 2 % of the national population are excluded from EU-SILC as are the following national territories: the French Overseas Departments and territories, the Dutch West Frisian Islands with the exception of Texel, and lastly the Scilly Islands.

#### 2.2.2 Main characteristics of EU-SILC

All EU Member States are required to implement EU-SILC, which is based on the idea of a common 'framework' as opposed to a common 'survey'. The common framework consists of common procedures, concepts and classifications, including har-

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monised lists of target variables to be transmitted to Eurostat.

Two types of annual data are collected through EU-SILC and provided to Eurostat:

- Cross-sectional data pertaining to a given time period, including variables on income, poverty, social exclusion and other living conditions. The data collected in year  $N$  have to be transmitted to Eurostat by November of year  $(N+1)$  even if many countries manage to send their data before this deadline.
- Longitudinal data measuring changes over time at the individual level. These are collected over a 4-year period. They are confined to income information and a reduced set of other variables, designed to identify the incidence and dynamic processes of persistent poverty and social exclusion among subgroups of the population. The longitudinal data corresponding to the period between year  $(N-3)$  and year  $N$  are currently to be transmitted to Eurostat by March of year  $(N+2)$ .

Eurostat proposed an integrated design with a 4-year rotational panel to those countries that had launched a new survey <sup>(9)</sup>. Rotational design refers to the sample selection based on a number of sub-samples or replications, each of them similar in size and design, and representative of the whole population. From year to year, some replications are maintained, while others are dropped and replaced by new replications. The fundamental characteristic of the integrated design is that the cross-sectional and longitudinal statistics are produced from essentially the same set of sample observations <sup>(10)</sup>, thus avoiding the unnecessary duplications which would be involved if entirely separate cross-sectional and longitudinal surveys were used.

<sup>(9)</sup> Most of the EU Member States have adopted the 4-year rotational design recommended by Eurostat. Only France (9 years) and Norway (8 years) have longer panels. Luxembourg used to have a longer panel as well, but has moved to a 4-year rotational panel.

<sup>(10)</sup> Currently only the United Kingdom derives cross-sectional and longitudinal data from two different survey instruments.

### 2.2.3 Legal basis

One of the strengths of the EU-SILC instrument is the existence of a legal basis which is binding on EU Member States as well as a requirement for accession countries. The development of the common framework, including the conception of the annual ad hoc modules (see below), is discussed on a permanent basis with the main stakeholders, in particular within the EU Working Group for Statistics on Living Conditions chaired by Eurostat.

Specifically, the EU-SILC legal basis consists of three main components:

- A Framework Regulation <sup>(11)</sup> which covers the scope, definitions, time reference, characteristics of the data, data required, sampling rules, sample sizes, transmission of data, publication, access for scientific purposes, financing, reports and studies for the EU-SILC instrument. This Regulation was amended by Regulation Nos 1553/2005 <sup>(12)</sup> and 1791/2006 <sup>(13)</sup> in order to extend the EU-SILC instrument to include the 'new' Member States (i.e. countries that joined the EU in May 2004 or after).
- Five Commission Regulations, which specify some technical aspects of the instrument: 'Definitions' <sup>(14)</sup>, 'Fieldwork aspects and imputation procedures' <sup>(15)</sup>, 'Sampling and tracing rules' <sup>(16)</sup>, 'List of primary (annual) target variables' <sup>(17)</sup> and 'Quality reports' <sup>(18)</sup>.

<sup>(11)</sup> Regulation (EC) No 1177/2003 of the European Parliament and of the Council of 16 June 2003 concerning Community statistics on income and living conditions (EU-SILC).

<sup>(12)</sup> Regulation (EC) No 1553/2005 of the European Parliament and of the Council of 7 September 2005 amending Regulation (EC) No 1177/2003 concerning Community statistics on income and living conditions (EU-SILC).

<sup>(13)</sup> Council Regulation (EC) No 1791/2006 of 20 November 2006 adapting certain Regulations and Decisions by reason of the accession of Bulgaria and Romania.

<sup>(14)</sup> Commission Regulation (EC) No 1980/2003 of 21 October 2003 — updated by Commission Regulation (EC) No 676/2006 — implementing Regulation (EC) No 1177/2003 as regards definitions and updated definitions.

<sup>(15)</sup> Commission Regulation (EC) No 1981/2003 of 21 October 2003 implementing Regulation (EC) No 1177/2003 as regards the fieldwork aspects and the imputation procedures.

<sup>(16)</sup> Commission Regulation (EC) No 1982/2003 of 21 October 2003 implementing Regulation (EC) No 1177/2003 as regards the sampling and tracing rules.

<sup>(17)</sup> Commission Regulation (EC) No 1983/2003 of 7 November 2003 implementing Regulation (EC) No 1177/2003 as regards the list of target primary variables.

<sup>(18)</sup> Commission Regulation (EC) No 28/2004 of 5 January 2004 implementing Regulation (EC) No 1177/2003 as regards the detailed content of intermediate and final Quality reports.

- Annual Commission Regulations on the list of secondary target variables, i.e. the ad hoc thematic modules which cover a different topic each year and can be repeated every 5 years or less frequently.

The EU-SILC instrument is also implemented in the former Yugoslav Republic of Macedonia, Iceland, Norway, Serbia, Switzerland and Turkey. For accession and candidate countries, the implementation of EU-SILC is not compulsory until they join the EU, but it is strongly encouraged if the specific situation of a given country so permits.

In order to take stock of the initial years of implementation and to improve the outcome of EU-SILC, a revision of the legal basis is under discussion (see Chapter 29 of this volume).

## 2.2.4 Common guidelines

The way to implement the EU-SILC legal basis is agreed between Eurostat and the national statistical institutes — in particular in the EU Working Group for Statistics on Living Conditions and the Task-Forces reporting to this Group. This includes common procedures and concepts, as well as an increasing number of recommendations on how to word the underlying questions. The full set of guidelines is publicly available <sup>(19)</sup>. The guidelines are updated yearly in order to fine-tune the data collection on particular topics or in order to further improve methodological aspects with the final aim of continuously improving the comparability between countries; these guidelines are agreed by the Working Group. Strategic issues regarding the development of EU-SILC are discussed in the meetings of the Directors of Social Statistics and the European Statistical System Committee.

## 2.3 Methodological framework

### 2.3.1 Contents of EU-SILC

EU-SILC is a multi-dimensional instrument focused on income that also covers housing, labour, health,

demography, education and deprivation, so as to allow for the analysis of the multidimensional phenomena of poverty and social exclusion, and for the joint analysis of its different dimensions. It consists of primary (annual) and secondary (ad hoc modules) target variables, all of which are forwarded as micro-data sets by Member States to Eurostat.

Given the principle of flexibility of the implementation of EU-SILC at national level, the sequence of questions needed to construct one target variable may vary from country to country. Nevertheless, recommended wordings of questions are available for the ad hoc modules as well as the health and material deprivation variables, although countries are not obliged to follow these recommendations.

The primary target variables relate to either household or individual (for persons aged 16 or more) information. They are grouped as follows:

- at household level: basic/core data, income, housing, social exclusion and labour information;
- at the personal level: basic/demographic data, income, education, labour information and health.

The secondary target variables are introduced every 5 years or less frequently only in the cross-sectional component. One ad hoc module per year has been included since 2005:

- 2005: inter-generational transmission of poverty;
- 2006 and 2015: social and cultural participation;
- 2007 and 2012: housing conditions;
- 2008: over-indebtedness and financial exclusion;
- 2009 and 2014: material deprivation;
- 2010: intra-household sharing of resources;
- 2011: inter-generational transmission of disadvantages;
- 2013: well-being;
- 2016: access to services.

<sup>(19)</sup> See in particular annual guidelines available on: <https://circabc.europa.eu> in the EU-SILC dedicated interest group.

### 2.3.2 Income concept

An important objective of EU-SILC is to adhere as closely as possible to the recommendations of the international Canberra Group on the definition of household income <sup>(20)</sup>. The income concept in the sense of the Canberra recommendations has only been fully implemented since 2007.

Two main aggregates are computed from EU-SILC: total gross household income (GI) and total disposable household income (DI), which are defined as:

- $GI = EI + SEI + PP + CTR + OI$
- $DI = GI - CTP$

Where:

**EI** = Employee income (cash or near-cash employee income and non-cash employee income; employers' social insurance contributions are not included).

**SEI** = Self-employment income (but not goods produced for own consumption).

**PP** = Pensions received from individual private plans.

**CTR** = Current transfers received (social benefits and regular inter-household cash transfers received).

**OI** = Other sources of income received (such as capital income).

**CTP** = Current transfers paid (tax on income and social insurance contributions, on wealth and regular inter-household cash transfers paid).

#### Employee income

In EU-SILC, employee income is covered thanks to the collection of information on 'Gross cash or near-cash employee income', 'Gross non-cash employee income' and 'Employers' social insurance contributions'. For non-cash employee income, only company cars have been recorded since the beginning of EU-SILC and included into the income concept. Information covering all other goods and services provided free of charge or at reduced price

by employers to their employees and compulsory component of employers' social insurance contributions are to be collected, but are not (yet) included into the main income aggregates.

#### Self-employment income

Self-employment income is broken down into 'Gross cash profits or losses from self-employment' (including royalties) and the 'Value of goods produced for own consumption'. Various alternative approaches to the measurement of income from self-employment are allowed. The value of goods produced for own consumption is currently not included in the main income aggregates.

#### Private pension plans

Regular pensions from private plans — other than those covered within the 'Current transfers' item — refer to pensions and annuities received in the form of interest or dividend income from individual private insurance plans, i.e. fully organised schemes where contributions are at the discretion of the contributor independently of their employers or government.

#### Current transfers received

Current transfers received include social benefits and regular inter-household cash transfers received. Social benefits are broken down into family and children-related allowances, housing allowances, unemployment benefits, old-age benefits, survivors' benefits, sickness benefits, disability benefits, education-related allowances and 'other benefits not elsewhere classified'.

#### Other sources of income received

Three sources of income are covered under this item: 'Income from rental of a property or land', 'Interest, dividends, profits from capital investment in unincorporated business', and 'Income received by people aged under 16'.

<sup>(20)</sup> See Handbook on Household Income Statistics, 2011. Available at: [http://www.unece.org/fileadmin/DAM/stats/groups/cgh/Canberra\\_Handbook\\_2011\\_WEB.pdf](http://www.unece.org/fileadmin/DAM/stats/groups/cgh/Canberra_Handbook_2011_WEB.pdf) (Accessed: 10 March 2016).



### Current transfers paid

Current transfers paid are broken down into ‘Tax on income and social insurance contributions’, ‘Regular taxes on wealth’ and ‘Regular inter-household cash transfers paid’. The ‘Employers’ social insurance contributions’ variable is not included in the computation of the main income aggregates, even though it would be crucial for cross-country comparisons related to labour cost.

### Imputed rent

The imputed rent has been computed since 2007 for all households that do not report that they pay full rent (i.e. households that own the dwelling they live in (owner-occupiers) or households that enjoy subsidised rents). Yet, the value of imputed rent is not included in the main income aggregates. Its inclusion would have a significant impact on all income-based indicators but a methodology for achieving comparing results for all countries is not yet available <sup>(21)</sup>. (For a discussion on the distributional impact of imputed rent in EU-SILC and the lack of cross-country comparability of this component, see Chapter 7 of this volume.)

### Imputation

The EU-SILC framework requires full imputation for income components. The level of imputation of income components is reported in microdata by means of a set of detailed flags. This requirement helps to make the information delivered by the instrument more homogeneous and complete. Imputation is performed by Member States.

### Income reference period

In all but two countries, Ireland and the United Kingdom, the income reference period is the previous calendar year. So, for a survey conducted in year  $N$  the income information that is collected refers to the household income received between 1 January  $N-1$  and 31 December  $N-1$  (put differently, the ‘survey year’ is  $N$  and the ‘income year’ is  $N-1$ ). Ireland and the

UK use a sliding reference period. In Ireland, it refers to the 12 months prior to the interview date. In the UK, it is centred on the interview date. In addition, the respondents are asked to provide figures which relate most commonly to their current (and usual) incomes, i.e. which could relate to the last week, 2 weeks, or month. These figures are then annualised.

The more distant in time the fieldwork period is from the income reference period, the higher the risk of inconsistency between income-related variables and other socioeconomic variables (including socio-demographic variables). It is therefore essential to limit as much as possible the lag between the income reference period and the fieldwork.

## 2.3.3 Sample requirements

### Sampling design

EU-SILC data are to be collected from nationally representative probability samples of the population residing in private households within the country, irrespective of language, nationality or legal residence status. All private households and all persons aged 16 and above within the household are eligible for the operation. Representative probability samples must be achieved both for households and for individual persons in the target population. The sampling frame and methods of sample selection should ensure that every individual and household in the target population is assigned a known probability of selection that is not zero.

### Sample size

The Framework Regulation and its updates define the minimum effective sample sizes to be achieved. The ‘effective’ sample size is the size that would be required if the survey were based on simple random sampling (design effect in relation to the EU ‘at-risk-of-poverty rate’ indicator is 1.0). The actual sample sizes have to be larger to the extent that the design effect exceeds 1.0 because of complex sampling designs and in order to compensate for all kinds of non-response. The sample sizes for the longitudinal component refer, for any 2 consecutive years, to the number of households or individuals aged 16 and over that are successfully interviewed in both years. Table 2.1 gives the min-

<sup>(21)</sup> The position of the Indicators Sub-Group of the EU Social Protection Committee is that the imputed rent could be included in a small number of income poverty indicators which would be listed in the EU social inclusion portfolio (see below) as secondary indicators or context information.

imum effective sample sizes required for each EU Member State (plus Iceland, Norway and Switzerland) in terms of households and individuals aged 16 or over.

### 2.3.4 Tracing rules

In order to ensure the best quality output, minimum requirements for implementation have been defined within the legal basis in addition to the definition of the minimum sample size. These rules concern, for instance, the use of proxy interviews, the use of substitutions, fieldwork duration, non-response procedures, and tracing (or 'following') rules.

In each country, the longitudinal component of EU-SILC consists of one or more panels or subsamples (four subsamples in the recommended 4-year rotational design). For each panel/ subsample, the initial households representing the target population at the time of its selection are followed for a minimum period of 4 years on the basis of specific tracing rules. The objective of the tracing rules is to reflect any changes in the target population drawn in the initial sample and to follow up individuals over time. (See Chapter 27 of this volume for more details on the EU-SILC tracing rules.)

In order to study changes over time at the individual level, all sample persons (members of the panel/ subsample at the time of their selection) should be followed up over time, despite the fact that they may move to a new location during the life of the panel/subsample. However, in the EU-SILC implementation some restrictions are applied owing to cost and other practical reasons. Only those persons staying in one private household or moving from one to another in the national territory are followed up. Sample persons moving to a collective household or to an institution, moving to national territories not covered in the survey, or moving abroad (to a private household, collective household or institution, within or outside the EU), would normally not be traced. The only exception would be the continued tracing of those moving temporarily (for an actual or intended duration of less than 6 months) to a collective household or institution within the national territory covered, as they are still considered as household members.

## 2.4 Information on quality

### 2.4.1 Some comparability issues

The flexibility of the EU-SILC instrument may be seen as both its main strength and its main weakness. While flexibility should allow embedding EU-SILC into the national systems of social surveys, the lack of harmonisation can affect comparability across countries. This section addresses some of these comparability issues.

#### Different sampling designs

Almost all countries have used the integrated design proposed by Eurostat.

The EU-SILC framework encourages the use of existing sources and/or administrative data. However, in practice, not all EU-SILC variables can be obtained from registers and administrative data. Hence, it is possible to establish two groups of countries on the basis of the data sources used in EU-SILC:

- The 'register' countries (see also Chapter 28 of this volume):
  - 'Old' register countries (Denmark, Finland, Iceland, the Netherlands, Norway, Slovenia, Sweden): In these countries, most income components and some items of demographic information are obtained through administrative registers. Other personal variables are obtained by means of interview from a sample of persons according to the 'selected respondent model' (see below as well as Chapter 27 of this volume for more details), where only one member of the household answers to the detailed questionnaire while the income information is derived from register for all the family members.

**Table 2.1:** Minimum effective sample size for the cross-sectional and longitudinal components

Countries	Households		Persons aged 16 or over to be interviewed	
	Cross-sectional	Longitudinal	Cross-sectional	Longitudinal
Belgium	4 750	3 500	8 750	6 500
Bulgaria	4 500	3 500	10 000	7 500
Czech Republic	4 750	3 500	10 000	7 500
Denmark	4 250	3 250	7 250	5 500
Germany	8 250	6 000	14 500	10 500
Estonia	3 500	2 750	7 750	5 750
Ireland	3 750	2 750	8 000	6 000
Greece	4 750	3 500	10 000	7 250
Spain	6 500	5 000	16 000	12 250
France	7 250	5 500	13 500	10 250
Croatia	4 250	3 250	9 250	7 000
Italy	7 250	5 500	15 500	11 750
Cyprus	3 250	2 500	7 500	5 500
Latvia	3 750	2 750	7 650	5 600
Lithuania	4 000	3 000	9 000	6 750
Luxembourg	3 250	2 500	6 500	5 000
Hungary	4 750	3 500	10 250	7 750
Malta	3 000	2 250	7 000	5 250
Netherlands	5 000	3 750	8 750	6 500
Austria	4 500	3 250	8 750	6 250
Poland	6 000	4 500	15 000	11 250
Portugal	4 500	3 250	10 500	7 500
Romania	5 250	4 000	12 750	9 500
Slovenia	3 750	2 750	9 000	6 750
Slovakia	4 250	3 250	11 000	8 250
Finland	4 000	3 000	6 750	5 000
Sweden	4 500	3 500	7 500	5 750
United Kingdom	7 500	5 750	13 750	10 500
<b>Total EU</b>	<b>135 000</b>	<b>101 500</b>	<b>282 150</b>	<b>210 850</b>
Iceland	2 250	1 700	3 750	2 800
Norway	3 750	2 750	6 250	4 650
Switzerland	4 250	3 250	7 750	5 800
<b>Total</b>	<b>141 000</b>	<b>105 950</b>	<b>290 650</b>	<b>217 100</b>

Source: Regulations (EC) Nos 1553/2005 and 1791/2006 of the European Parliament and of the Council.

- ‘New’ register countries: More and more countries are moving towards retrieving income information from registers, but without adopting the selected respondent model. This is *inter alia* the case of Spain, France, Italy and Austria.
- The other countries: In the ‘non-register’ countries, the full information is obtained by means of a survey of households and interviews with household members.

All the national sampling designs ensure strict cross-sectional representativeness and enable a significant number of individuals to be followed over a period of at least 4 years. In line with the legal requirements, all samples are probabilistic <sup>(22)</sup> — with updated sampling frames and stochastic algorithms used to select statistical units. The sampling designs used in 2013 by countries were the following:

- sampling of dwellings or addresses: Czech Republic, Spain, France, Croatia, Latvia, Hungary, the Netherlands, Austria, Poland, Portugal, Romania and the United Kingdom;
- sampling of households: Belgium, Bulgaria, Cyprus, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Slovakia and Switzerland;
- sampling of individuals: Denmark, Estonia, Finland, Iceland, Lithuania, Norway, Slovenia and Sweden (all these countries are ‘register’ countries except for Lithuania).

In all cases, unbiased estimates can be produced on firm theoretical grounds. In almost all countries, the coverage bias is under control with frequent updates of this frame.

Countries have designed their samples so as to achieve a good trade-off between reporting needs at sub-national level and the cost effectiveness of the data collection. Significant increases of the sample size, driven by sub-national reporting requirements, were recorded in Spain and Italy and are planned in Portugal and other countries.

<sup>(22)</sup> Germany used quota sample by derogation until 2008.

## Differences in the method of data collection

In most countries (exceptions: the register countries that apply the ‘selected respondent’ model), all members aged 16 or over in selected households are asked to fill in a personal questionnaire. In the ‘selected respondent’ countries, only one respondent per household receives a personal questionnaire. These two different rules have different impacts on the tracing of individuals over time (longitudinal dimensions) depending on whether only one or all household members are interviewed over time. The selected respondent model needs some adaptation in order to avoid bias in the follow up of children. The two different rules lead to different weighting schemes. In particular when the selected respondent type is used, the weights of the household and of the selected respondent are obviously different.

In 2013, the most frequent mode of data collection was CAPI (computer assisted personal interview), used as a prevalent mode in 14 countries (Belgium, Estonia, Ireland, Spain, France, Croatia, Italy, Cyprus, Latvia, Luxembourg, Malta, Austria, Portugal and the United Kingdom). It was followed by PAPI (paper and pencil interview), used as a prevalent mode in eight countries (Bulgaria, Czech Republic, Greece, Lithuania, Hungary, Poland, Romania, Slovakia) and then CATI (computer assisted telephone interview), used in seven countries (Finland, Iceland, the Netherlands, Norway, Slovenia, Sweden and Switzerland). Self-administered paper questionnaire, used in some countries as a residual mode, is used as a prevalent mode in Denmark and Germany. Some countries are also testing web questionnaires and mixed modes.

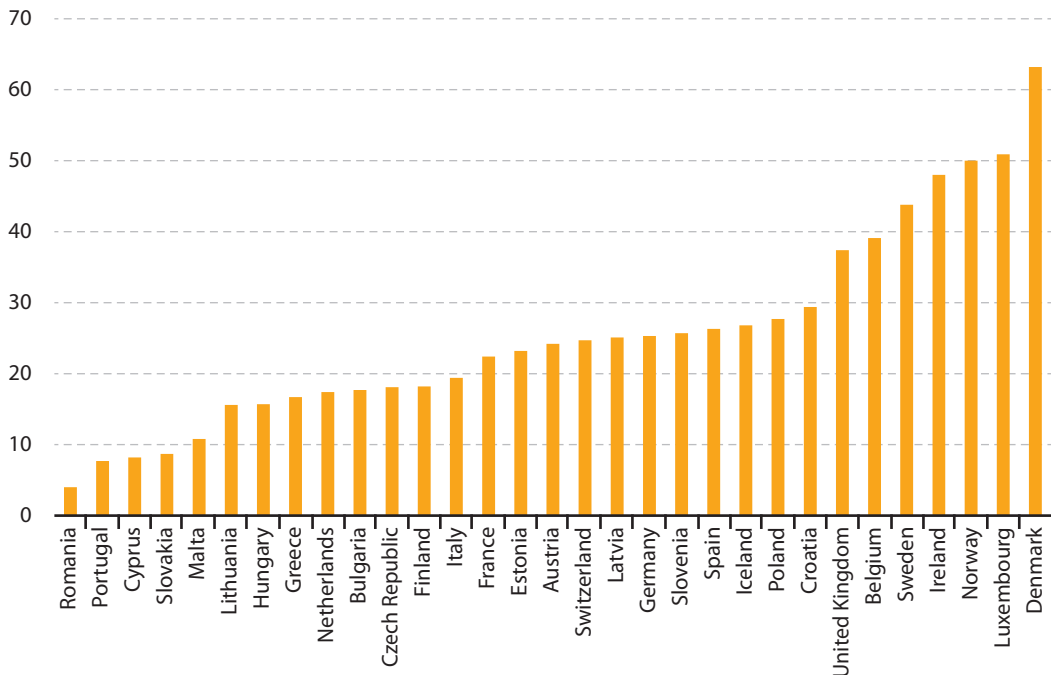
## Different non-response rates

Non-response is measured in EU-SILC at three stages: address contact, household interview and personal interview. Figure 2.1 presents the overall non-response rates for individuals for the whole sample broken down by country.

Total non-response of the selected households and individuals had to be less than 40 %, which was seen as a challenge for a non-mandatory survey. The overall non-response rate in the personal interview for

**Figure 2.1: Overall personal non-response rates in EU-SILC, 2013**

(%)



Source: EU-SILC Production Database

the whole sample was equal or below 10 % in 2013 in four countries: Romania (5 %), Portugal (6 %), Cyprus (6 %) and Slovakia (9 %). At the other extreme, non-response rates exceeded 30 % in seven countries and even 50 % in Luxembourg (51 %) and Denmark (63 %) where the introduction of web interview could in future improve the response rate.

The creation of models using external variables in order to correct non-response is highly desirable. Most of the countries apply either a standard post-stratification, based on homogeneous response groups, or a more sophisticated logistic regression model.

## 2.4.2 Quality reports

Adopted in 2005, the European Statistics Code of Practice sets common standards for the independence, integrity and accountability of the national and EU statistical authorities. The EU statistical authorities have undertaken to adopt a compre-

hensive approach to high quality statistics which builds upon a common definition of quality in statistics. In this approach, the following dimensions are addressed:

- relevance: European Statistics must meet the needs of users;
- accuracy and reliability: European Statistics must accurately and reliably portray reality;
- timeliness and punctuality: European Statistics must be disseminated in a timely and punctual manner;
- coherence and comparability: European Statistics should be consistent internally, over time and comparable between regions and countries; it should be possible to combine and make joint use of related data from different sources;
- accessibility and clarity: European Statistics should be presented in a clear and

understandable form, disseminated in a suitable and convenient manner, and should be available and accessible on an impartial basis with supporting metadata and guidance.

This European definition of quality is monitored in EU-SILC with annual 'Quality reports' which are prepared by both the countries and (for the EU level) Eurostat and which are managed through an integrated IT system.

The national Quality reports provide a useful insight into national implementation practice as well as substantive information from which to draw preliminary conclusions regarding the quality of the instrument. This material is complemented by the information that Eurostat collects through its frequent contacts with national statistical authorities, in particular as regards data validation, which is an integrated process with tools shared with Member States. The purpose of the EU Quality reports is to summarise the information contained in the national Quality reports. Their objective is to evaluate the quality of the instrument from a European perspective, i.e. by establishing cross-country comparisons of some of its key quality characteristics. The EU Quality reports and most of the national Quality reports are publicly available <sup>(23)</sup>.

## 2.5 Data and indicators

### 2.5.1 Data access

EU-SILC data are disseminated either as aggregated data or as microdata sets. Individual EU-SILC records are considered as confidential data within the meaning of Article 23 of Council Regulation 223/2009 (Statistical Law) because they allow indirect identification of statistical units (individuals and households). In this context, they should be used only for statistical purposes or for scientific research.

Aggregated results relate to indicators and statistics on income distribution and monetary poverty, living conditions, material deprivation and childcare arrangements. They are presented as pre-defined

tables or as multidimensional datasets and may be extracted in a variety of formats <sup>(24)</sup>.

Commission Regulation (EU) No 557/2013 granted the European Commission permission to release anonymised microdata to researchers. Anonymised microdata are defined as individual statistical records which have been modified in order to control, in accordance with best practices, the risk of identification of the statistical units to which they relate. Both EU and national rules are applied for anonymisation, and are described in full with each release. They concern variable suppression, global recoding or the randomisation of some variables.

Twice a year Eurostat releases anonymised microdata to researchers (encrypted CD-ROM with documentation). Each CD-ROM contains data from the latest available operation, as well as revisions from any previous datasets. A detailed description of the full procedure for accessing microdata is provided on the Eurostat website <sup>(25)</sup>.

### 2.5.2 Indicators computation

In order to monitor progress towards the Europe 2020 strategy, an analytical tool has been put in place: the 'Joint Assessment framework' (JAF). The JAF underpins evidence-based policy-making in the social domain. In particular, it is used as an analytical tool in the dialogue between the Commission and the Member States to support the identification of key challenges and help Member States establish their priorities. In each policy area, progress in the implementation of policies and towards the related EU social objectives is assessed quantitatively on the basis of a limited number of commonly agreed indicators. A large number of indicators are computed on the basis of EU-SILC, which has become the second pillar of household social survey statistics at EU level, complementing the EU Labour Force Survey which focuses on labour market information.

The use of commonly agreed indicators (not only in the context of the JAF but also, more widely, to analyse the social situation across the EU and mon-

<sup>(23)</sup> <https://circabc.europa.eu>, EU-SILC interest group quality folder.

<sup>(24)</sup> Data and publications can be accessed at: <http://ec.europa.eu/eurostat/web/income-and-living-conditions/statistics-illustrated>.

<sup>(25)</sup> <http://ec.europa.eu/eurostat/web/microdata/overview>

itor progress towards the commonly agreed EU social objectives) is an essential component of EU cooperation in the social field. The development of EU social indicators is a dynamic process under the responsibility of the EU Social Protection Committee (SPC) and its Indicators Sub-Group. The work of the national delegations of experts, who make up the Group, and the secretariat provided by the European Commission's Directorate-General for 'Employment, Social Affairs and Inclusion' (in close cooperation with Eurostat), has enabled the set of indicators (and breakdowns of these) to be considerably enriched.

EU social indicators are grouped in four portfolios: an 'overarching' portfolio and a portfolio for each of the three main social areas in which Member States cooperate (Poverty and social exclusion; Pensions; Healthcare and long-term care) <sup>(26)</sup>. The indicators are permanently updated and disseminated on the Eurostat website <sup>(27)</sup>.

## 2.6 Way forward

Even though EU-SILC has become the EU reference source for data on income and living conditions, Eurostat and a number of stakeholders are reflecting on ways to further improve the tool and its (potential) uses. This book, and more generally the analysis and activities of the 'Second Network for the analysis of EU-SILC' (Net-SILC2) which prepared it are part of an effort to improve EU-SILC and the level of analysis based on it. At a conference <sup>(28)</sup> which was organised jointly by Eurostat and the Net-SILC2 network, and which was hosted by

Statistics Portugal, a wide-ranging debate on present and future perspectives was held in the context of the future revision of the EU-SILC legal basis. The main objectives of the revision are:

- in the context of the modernisation of social statistics, integration of EU-SILC with other data collections, implementation of the standardisation of variables and modules, wider use of administrative data sources and improved statistical frames;
- increase the responsiveness of the instrument to new policy needs, currently and for the future;
- deliver EU-SILC data faster;
- maintain the stability of the main indicators, with adapted frequency and keeping a cross-cutting approach;
- maintain and if possible slightly decrease the current burden and cost.
- allow sufficient regional breakdown;
- ensure adequate accuracy and quality of measurements;
- adapt to multi-modes and multi-sources data collections;
- ensure a general consistency of the different element of the tool (e.g. frequency of non-annual modules and length of the longitudinal component).

The planned future developments of EU-SILC itself are presented in Chapter 29 of this volume.

<sup>(26)</sup> More information on the EU social indicators can be found on: <http://ec.europa.eu/social/main.jsp?catId=830&langId=en>.

<sup>(27)</sup> <http://ec.europa.eu/eurostat>

<sup>(28)</sup> 2014 International Conference on Comparative EU statistics on Income and Living Conditions, Lisbon, 16-17 October 2014, <http://ine.pt/scripts/eu-silc2014/conference.html>.





# Income measurement and distribution





# 3

## Monitoring the evolution of income poverty and real incomes over time

Anthony B. Atkinson, Anne-Catherine Guio and Eric Marlier <sup>(29)</sup>

### 3.1 Introduction

For many years, there has been a sharp separation between, on the one hand, the macroeconomic evaluation of economic policy and, on the other hand, the analysis of the impact of policy on the living standards of households. On one side are the national accounts, where performance is judged by eagerly watched figures for Gross Domestic Product (GDP). Recovery in the short-term and growth in the medium-term have been assessed in these aggregate terms. In the EU, these are the matters on which the European Commission's 'Directorate-General for Economic and Financial Affairs' and the EU 'Economic and Financial Affairs (ECOFIN)' Council have focused. On the other side are the — more slowly arriving — statistics on households' living conditions, now represented by the EU-SILC instrument. These form the basis for the EU social indicators and for judging success in terms of social inclusion across EU countries. These are the matters on which

the European Commission's 'Directorate-General for Employment, Social Affairs and Inclusion' and the EU 'Employment, Social Policy, Health and Consumer Affairs (EPSCO)' Council have focused.

In recent years, however, there have been welcome signs of a more integrated approach. Criticism of GDP as a measure of performance has led to a 'Beyond GDP' agenda that recognises not only the need to extend the boundaries of national accounts but also to relate the national accounts more directly to the everyday concerns of citizens <sup>(30)</sup>. National income has to be reconnected with household incomes and with the distribution of these incomes. The OECD has set out a framework for inclusive growth (OECD, 2014). As it is put in the 'Employment and social developments in Europe 2013', we need indicators of inclusive growth to complement GDP growth (European Commission, 2014). From the side of household statistics, there has come increasing recognition of the need to complement existing (income) poverty indicators by measures of real incomes <sup>(31)</sup>. The Indicators Sub-Group of the Social Protection Committee (SPC) has in 2014 adopted an aggregate indicator of (unadjusted) real gross household disposable income as part of the EU portfolio of social indicators.

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<sup>(30)</sup> These issues were discussed in the report of the Stiglitz-Sen-Fitoussi Commission (2009) and developed in a joint OECD-Eurostat project (see, for example, Fesseau, Wolff and Mattonetti 2013).

<sup>(31)</sup> 'Poverty' here refers systematically to the EU concept of 'at-risk-of-poverty' (AROP) — i.e. a concept of relative income poverty (see definition below).

In our view, this integration is essential. Its importance has been demonstrated clearly by the economic crisis, where there has been a marked divergence between aggregate measures of economic performance and the experience of individual households. Put in broad terms, in the early years of the crisis GDP fell more than household incomes, where these were protected by automatic stabilisers and the initial policy packages. Later on, household incomes then fell as a result of austerity policies, raising questions about who is (will be) benefiting from any return to prosperity. These events have led to a longer-term debate about the way in which the fruits of growth have been shared in the past. In both cases (the crisis and the longer-term) there are important distributional issues. The impact of austerity has differed across the population; the longer-term perspective has raised issues about the failure to reduce significantly the rate of income poverty.

These two approaches — macro and micro — are important in substantive terms. They also raise serious methodological issues. The national accounts are based on aggregate information; the social indicators are derived in large part from household surveys and, in a growing number of countries, register data (Jäntti, Törmälehto and Marlier (2013); see also Chapter 28 of this volume). These two sources need to be reconciled. Measures of the evolution of real incomes can be derived from both national accounts and EU-SILC. We should be able to understand the relation between these two sources. They may differ, for example in the underlying definitions, but we can only have confidence in the two sources if the differences can be explained.

The two themes — examination of the social indicators of income poverty and reconciliation of micro and macro evidence — are the principal focus of this chapter. We start in Section 3.2 with the headline (income) poverty indicators derived from EU-SILC. We then consider the relation with overall incomes, starting first in Section 3.3 with what can be learned within the EU-SILC framework. In Section 3.4, we begin to investigate the bridge to the national accounts. What is the relation between the overall measures of income in the two sources? This analysis leads in turn to examination in Section 3.5 of the changes in real income and the new indicator adopted by the SPC Indicators Sub-Group

based on the national accounts. In Section 3.6, we explore the possibility of an EU-SILC based real income indicator incorporating distributional considerations. In the course of the chapter, we make a number of recommendations. These and the main findings are summarised in the concluding Section 3.7.

## 3.2 The headline indicators of income poverty and income inequality in the EU

We begin with some of the EU social indicators available on the Eurostat website <sup>(22)</sup>.

The broad picture is well-known. The pre-crisis period 2005 to 2008 (income years, i.e. survey years 2006-2009) <sup>(23)</sup> was disappointing in terms of (income) poverty reduction. It is true that the EU-SILC-based headline income poverty rate indicator (referred to as 'at-risk-of-poverty' (AROP) rate <sup>(24)</sup>) fell overall in the 'new' Member States <sup>(25)</sup>, but there were new

<sup>(22)</sup> National and EU values of all EU social indicators, including a number of socio-demographic breakdowns can be downloaded from the Eurostat web-database at the following address: <http://ec.europa.eu/eurostat/data/database>.

<sup>(23)</sup> It is important to highlight that in this chapter the years that are referred to are the income years (contrary to the years referred to on the Eurostat web-database which are the survey years). The income year is the year preceding the EU-SILC survey for all countries apart from the UK (total annual household income calculated on the basis of current income) and Ireland (calculation on the basis of a moving income reference period covering part of the year of the interview and part of the year prior to the survey).

<sup>(24)</sup> According to the EU definition, the AROP rate is the share of people living in a household with a total equivalised disposable income (including social transfers) below the AROP threshold, which is set at 60 % of the national median equivalised disposable income (including social transfers). The equivalised disposable income is calculated in three steps: 1) all monetary incomes received from any source by each member of a household are added up (these include income from work, investment and social benefits, plus any other household income; taxes and social contributions that have been paid, are deducted from this sum); 2) in order to reflect differences in a household's size and composition, the total (net) household income is divided by the number of 'equivalent adults', using the so-called OECD-modified (equivalence) scale, which gives a weight to all members of the household (1 to the first adult, 0.5 to the second and each subsequent person aged 14 and over, and 0.3 to each child aged under 14); 3) finally, the resulting figure, the equivalised disposable income, is attributed equally to each member of the household (adults and children).

<sup>(25)</sup> 'New' Member States are those countries that joined the EU in May 2004 or after. Croatia, that joined the EU in July 2013, is not included in our analyses.

Member States where it increased. AROP increased by more than 2 percentage points in Bulgaria and Latvia. It did not fall in the EU-15, with an increase of more than 2 percentage points in Germany, which more than offset the reductions in Ireland and Italy. These differential movements meant that the overall EU-27 percentage showed no change.

From 2008 to 2012 (income years, i.e. survey years 2009-2013), the AROP rate remained broadly stable — it went from 16.4 to 16.6 % for the EU-27 as a whole, after a small peak at 16.8 in 2011 and 2010. The EU-15 figure rose from 16.2 to 16.4 % (16.6 in 2010 and 2011), and that for the euro zone by 0.5 percentage point. There were rises of more than 2 percentage points in Greece, Slovenia and Slovakia. In the opposite direction, there were reductions of more than 2 percentage points in Estonia and Latvia. There were therefore differences in individual country experience, but the overall picture is that of little change.

These figures relate to the income poverty headcount, but what about the intensity of poverty? Between 2005 and 2008, there was in fact a reduction in the relative median poverty gap for the EU-27 as a whole: from 23.4 to 22.2 <sup>(36)</sup>. This was largely the result of a decline in the new Member States, from 27.3 to 25.1. Conversely, there was an overall rise from 2008 to 2012, returning the EU-27 figure to its 2006 level. In this period, the rise was principally due to the rise in EU-15 (from 21.4 to 22.7). Measured this way, too, there has been no overall progress.

## Relative indicators and real incomes

The AROP rate is a relative measure in that it would record the same values if all incomes were doubled or all incomes were halved. There are good long-term reasons for employing such a relative measure. We would not want to judge living conditions in Europe today by the same standards as applicable to Renais-

sance Italy. But in the short and medium term, the relative measure has to be interpreted in relation to the changes in the overall level of living.

In the two periods under consideration (2005 to 2008 and 2008 to 2012 — income years), these issues arise in different ways. Where overall incomes are rising in real terms, as broadly happened in the earlier period, a constant AROP rate is consistent with those below the income poverty threshold still seeing an improvement in their real incomes. This is certainly true for a person at the AROP threshold. Put differently, if we were to anchor the threshold at the 2005 level of purchasing power (i.e. if we updated annually the 2005 threshold on the basis of the annual inflation rate, as is done with the EU indicator of 'at-risk-of-poverty rate anchored at a fixed moment in time'), then the poverty rate might record a decline.

Where, on the other hand, mean incomes are falling, the situation is different. It is now the case that a constant (or even decreasing) AROP rate can be consistent with those below the income poverty threshold suffering a worsening in their living standards. Application of an anchored income poverty indicator can then show a rise in the poverty rate: the Eurostat estimates for EU-15 using an income poverty threshold anchored at 2007 levels show a rise in the poverty rate from 16.4 % in 2007 to 19.2 % in 2012, whereas the AROP figure did not increase between 2007 and 2012 <sup>(37)</sup>.

From this, we can see the importance of setting the headline indicator of income poverty in the context of what is happening to overall incomes. This, in turn, raises the issue of the relation between incomes as measured in the EU-SILC dataset and incomes as measured in the national accounts. When the AROP rate is anchored in the EU-SILC data, to give a measure at a constant level of real income, how does this EU-SILC income threshold relate to average household incomes in the national accounts? It is to this that we turn in the next section.

<sup>(36)</sup> The EU indicator of relative median (income) poverty gap is the difference between the median equivalised income of persons aged 0+ below the AROP threshold and the threshold itself, expressed as a percentage of the AROP threshold. See Eurostat web-database, code *ilc\_li11*.

<sup>(37)</sup> For a short analysis of the anchored poverty rate, see for example the 2014 Social Protection Committee's annual report (SPC, 2015, p. 39).

### 3.3 The AROP social indicator and overall living standards

To introduce the issues involved in building a bridge between EU-SILC-based indicators and the national accounts, we begin with a simple comparison: between the AROP threshold (set at 60 % of median equivalent disposable household income from the EU-SILC data) and the national accounts (NA) figure for adjusted gross household disposable income (GHDl) <sup>(38)</sup> per capita. The former is used for calculating the EU 'at-risk-of-poverty' indicator; the latter is the Eurostat headline household disposable income indicator. Both are measured in Purchasing Power Standards (PPS; see Chapter 1 of this volume) <sup>(39)</sup>. It should be noted that the adjusted GHDl figure includes social transfers in kind. We have taken this figure, as it is that most commonly cited in the macroeconomic debate, but we later argue that it is more appropriate to use the unadjusted GHDl where social transfers in kind are excluded in line with the basis for the EU social indicator adopted in 2014 by the SPC Indicators Sub-Group <sup>(40)</sup>.

The NA figure for GHDl is the sum of employee compensation, operating surplus/mixed income, property income and transfers minus taxes and social contributions paid. It is therefore the analogue of the disposable household income measure in EU-SILC. There are however several major reasons why the AROP threshold should not be equal to 60 % of the NA figure:

- a) the difference between the median (used in the threshold) and the mean (used in the NA);
- b) the use of equivalised income (threshold) rather than a per capita calculation (NA);

- c) differences in the definition of income, such as the inclusion or exclusion of social transfers in kind;
- d) inclusion in the NA of the Non-Profit Institutions serving households (NPISH);
- e) inclusion in the NA of Non-private households;
- f) differences in the accuracy with which different elements of income are measured in the two sources.

Of these, (a) and (d) are likely to cause the threshold to fall below 60 % of the NA total; the effect of (b), on the other hand, operates in the opposite direction. The effects of (c), (e) and (f) can only be identified from a detailed comparison of income components.

Figures 3.1 to 3.3 show the ratio of the AROP threshold to the NA Adjusted GHDl for the income years 2005 to 2012 (NA data for Malta are not available). From these, we can see a number of interesting features, concerning both levels and changes over time. To begin with, we can see from Figure 3.1 that, even for countries that one might expect to be relatively similar there are differences in level. The figure for Belgium in 2012, for example, is around 50 %, whereas those for the Netherlands and Denmark are some 5 percentage points higher. If the NA figure had been used, with the same percentage in all countries, then the threshold would have had to be raised in Belgium (by a factor of 55/50), increasing the recorded poverty. Secondly, the differences are not constant. At the beginning of the period, the Netherlands was closer to Belgium than to Denmark. This means that, relative to the national income figure for household income, the threshold rose in the Netherlands between 2005 and 2012.

The differences and the changes over time become even more marked when we look at the Southern European countries in Figure 3.1. The figures for Southern Europe are all below those for Belgium, and in 2012 those for Greece and Portugal are all below 40 %. The figure for Portugal in 2012 is three-quarters that for Belgium. It may be that such a difference can be explained by the factors listed above, such as the greater inequality of income (so that the median is further below the mean), but this clearly warrants investigation. This is reinforced by the changes over time. In Portugal the series is

<sup>(38)</sup> In national accounts terminology, 'gross' refers to items calculated before the deduction of consumption of fixed capital and 'net' refers to items calculated after this deduction.

<sup>(39)</sup> The Purchasing Power Standards (PPS) are designed to remove differences in purchasing power: i.e. differences in price levels across countries. Since they are applied to both denominator and numerator, the present calculation is not affected.

<sup>(40)</sup> The indicator adopted by the Indicators Sub-Group is the 'growth rate in real gross household disposable income'; we discuss the definition further below.

fairly flat, but in Greece the proportion fell from 41 % in 2009 to 36 % in 2012. In Ireland, there was a fall between 2006 and 2012 from 55 % to 50 %.

Figure 3.2 shows the corresponding figures for the remainder of the EU-15 countries. The range is smaller, but there is still a spread in 2012 between 45 and 56 %. There are also substantial changes over time. The figure for Sweden rose from 50 % in 2005 to 54 % in 2012. In the United Kingdom, the ratio increased until 2008 and then sharply decreased. Figure 3.3 shows the ratios for the new Member States. The differences are even larger and the changes over time more marked. The threshold in Cyprus, Latvia and Slovenia is around twice, as a percentage of the NA figure, the threshold in Romania. There seems to have been in a number of cases, such as Bulgaria, Latvia and Lithuania, where there was a rise in the threshold in the first part of the period, followed by a fall in the later part.

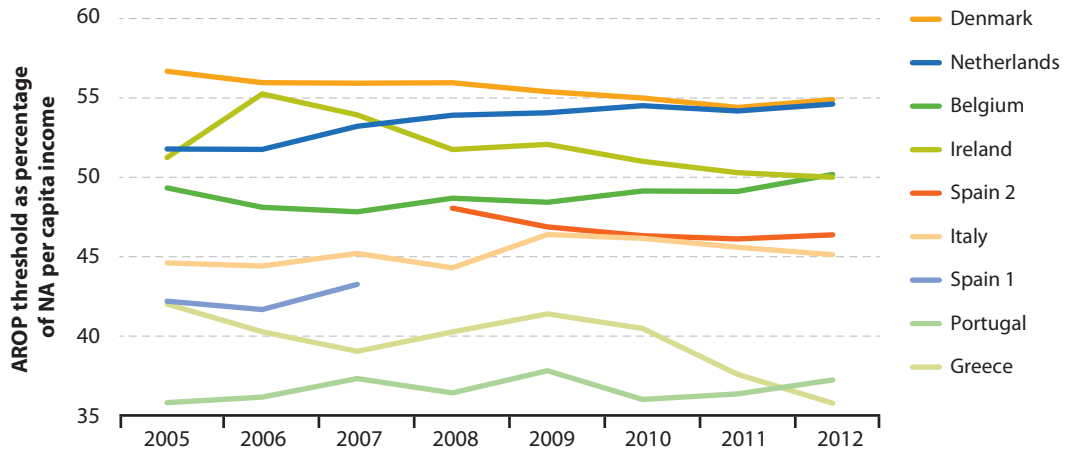
Overall, the difference between the AROP threshold and the NA GHDI per capita figure may be summarised in terms of the (unweighted over EU-27; Malta excluded) country average in 2012, which was 46.2 %, rather than 60 %. In order to understand the reasons for this difference, we take each of the elements (a) to (f) in turn. The first two concern only the EU-SILC data and are discussed in the remainder of this section. The other three concern the relation between EU-SILC and the national accounts, and are the subject of Section 3.4.

The EU-SILC data are essential as a source of distributional data. The national accounts cannot provide any evidence about the median income, nor, evidently, about the rate of income poverty. The EU-SILC data are the basis for the figures we have downloaded from the Eurostat web-database to construct Figures 3.1 to 3.3. In order to take the analysis further, we need to make use of the micro-data which the European Statistical System makes available to researchers for scientific purposes research. <sup>(41)</sup>

<sup>(41)</sup> The conditions for getting access to the EU-SILC Users' Database (UDB) are explained on the Eurostat website (<http://ec.europa.eu/eurostat/web/microdata/overview>). See also Chapter 29 of this volume.

**Figure 3.1: Comparison of AROP threshold with NA Adjusted GHDl per capita, EU-15 Member States, 2005-2012 (income years)**

(%)



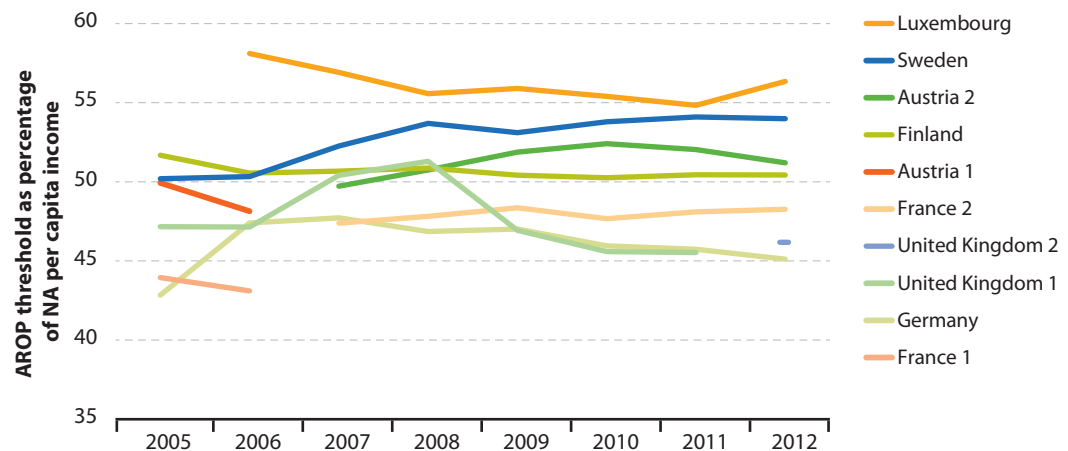
NB: No NA data available for Luxembourg (2005). Break in EU-SILC series in Spain (2008), following the switch to register data.

Reading note: In 2005, the AROP threshold in Belgium was 49.4 % of the NA adjusted GHDl per capita.

Source: AROP threshold from Eurostat web-database, Statistics/Employment and social protection indicators/Social inclusion, variable code tessi014; NA adjusted GHDl from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*, variable tee00113.

**Figure 3.2: Comparison of AROP threshold with NA Adjusted GHDl per capita, EU-15 Member States (continued), 2005-2012 (income years)**

(%)



NB: Breaks in EU-SILC series in France (2007), Austria (2007) and United Kingdom (2012).

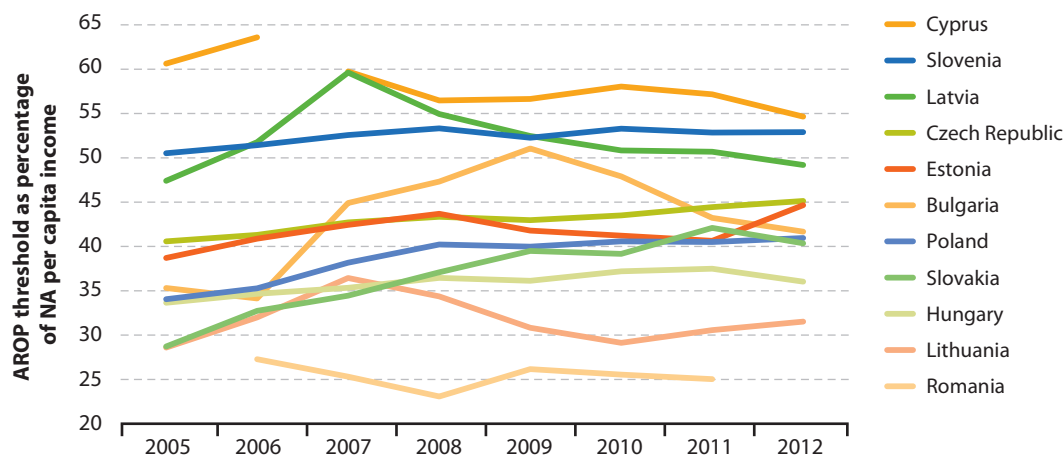
Reading note: In 2005, the AROP threshold in France was 43.9 % of the NA adjusted GHDl per capita.

Source: AROP threshold from Eurostat web-database, Statistics/Employment and social protection indicators/Social inclusion, variable code tessi014; NA adjusted GHDl from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*, variable tee00113.



**Figure 3.3: Comparison of AROP threshold with NA Adjusted GHDI per capita, new Member States, 2005-2012 (income years)**

(%)



NB: 'New' Member States are those countries that joined the EU in May 2004 or after. No NA data available for Malta (whole period) and Romania (2012). Break in EU-SILC series in Cyprus (2007). No EU-SILC data for Romania in 2005. Croatia is not covered in our analyses.  
 Reading note: In 2005, the AROP threshold in Cyprus was 60.6 % of the NA adjusted GHDI per capita.

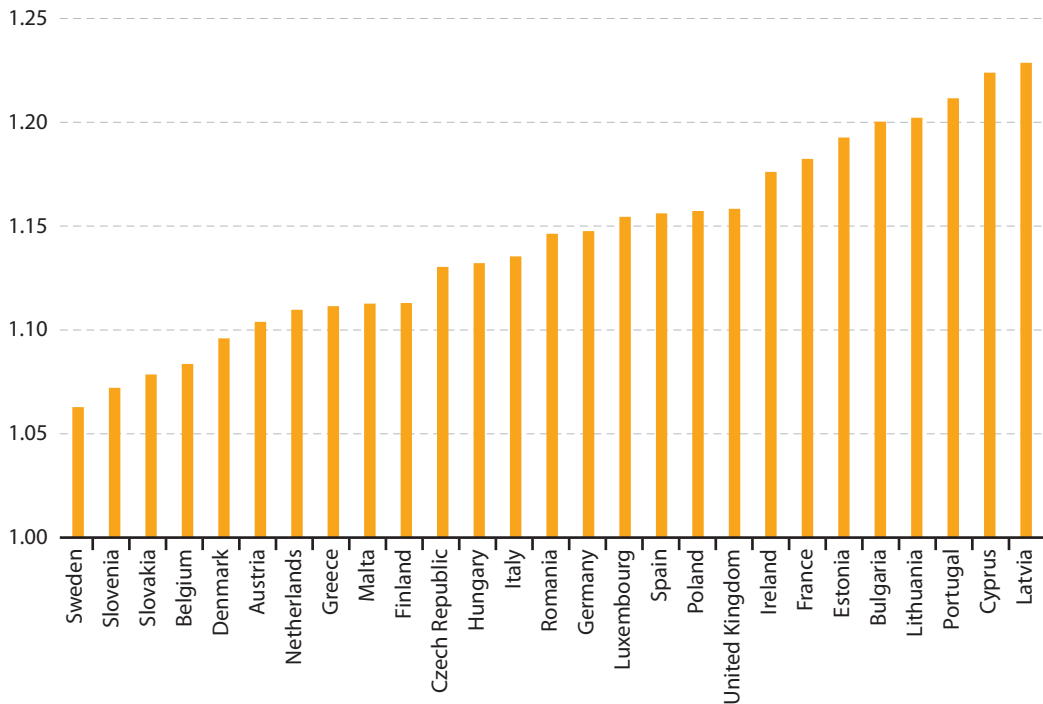
Source: AROP threshold from Eurostat web-database, Statistics/Employment and social protection indicators/Social inclusion, variable code *tessi014*; NA adjusted GHDI from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*, variable *tee00113*.

### Mean and median

The first difference is that between the mean and the median. As is shown for 2012 in Figure 3.4, the mean everywhere exceeds the median. There is quite a wide range: from 1.06 for Sweden to 1.23 for Latvia. This implies that moving to use a percentage of the mean as the basis for the income poverty threshold, in place of the median, would raise the threshold in Latvia, relative to that for Sweden, by 17 %. For the EU as a whole, the ratio is 1.14, so that using the mean rather than the median would raise the figure of 46.2 % in the previous section, for the ratio of the AROP threshold to national income per capita, to 52.7 %. In other words, the 'shortfall' is reduced from 13.8 % to 7.3 %. This is a material contribution to understanding the difference.

The mean/median ratios differ across countries, but do they also vary over the period considered? Only countries which had a break in the series because of a move to registers showed a salient increase in the ratio (Cyprus, France and Spain). In the opposite direction, ratios decreased by more than 0.06 between 2005 and 2012 in Greece, Hungary, Portugal and Slovakia. A decreasing ratio means that if the income poverty threshold had moved in line with the mean rather than with the median, the change in the poverty rate would have been more negative (i.e. if the poverty rate had risen, the increase would have been smaller or turned into a fall, and if it had fallen, the fall would have been higher).

**Figure 3.4: Ratio of mean to median equivalised income, EU-27, income year 2012**  
(Survey year 2013)



*Reading note:* In Sweden, the ratio of the mean equivalised income to the median equivalised income is 1.06.

*Source:* Eurostat calculations.

### Equivalisation

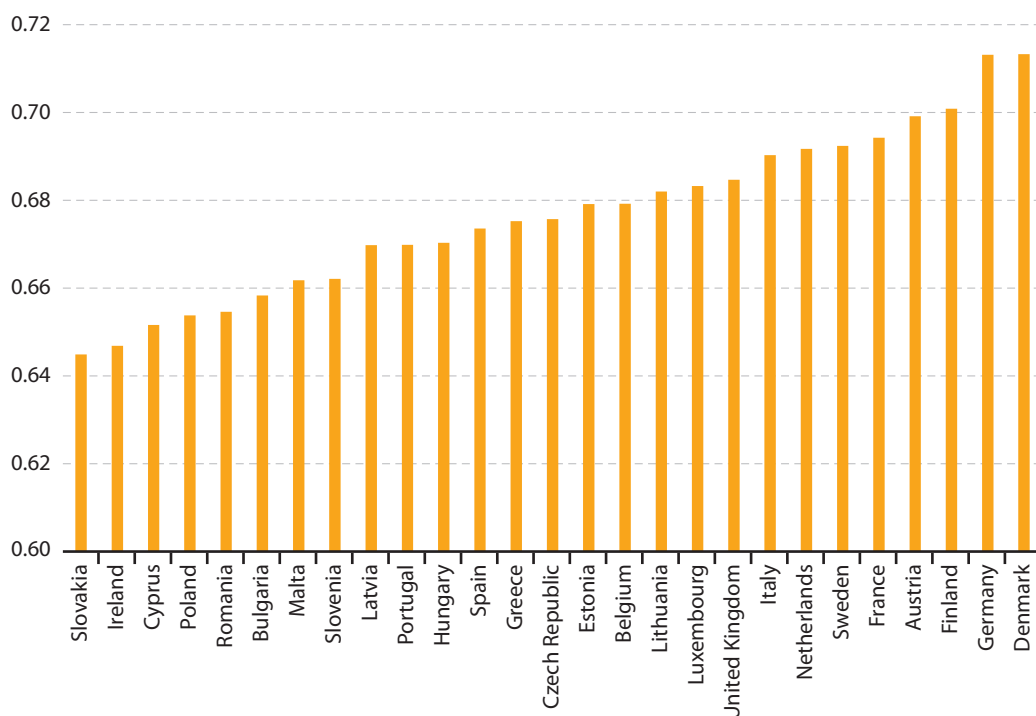
In calculating per capita income, everyone counts as 1, but when an equivalence scale is employed, the needs of those sharing a household are reduced to take account of economies of scale, so that the equivalent income is higher than the per capita income (except in one-person household). As a result, the mean per capita income is only a fraction of the equivalised income, as shown in Figure 3.5 for the income year 2012. For example, in Belgium in income year 2012 the mean per capita income in euros is EUR 15 811, whereas the equivalised figure is EUR 23 279. The mean per capita figure is 0.68 of the equivalised figure.

Across all countries, the country unweighted average across EU-27 in 2012 is 0.68. The ratios of the mean per capita income to mean equivalised income are quite stable across time, but they vary across countries. As is to be expected, they vary according to

the average household size (strong negative correlation). The varying impact may also reflect the differences in household composition documented in other chapters in this book (including Chapters 4, 15 and 18).

In this section, we have identified the major issues that arise in relating the relative social indicators of poverty and inequality to the overall level of income. Using EU-SILC data, we have examined two of these elements: the choice of the median and equivalisation. Each of these affects the comparison across countries, but the variation across time does not seem of particular concern. Of the two elements, that of equivalisation is stronger: the average adjustment factor was 0.68, compared with 1.14 for the mean/median difference. This means that, rather than closing the gap between the AROP and national accounts, there is a larger discrepancy to explain when we compare mean unequivalised income

**Figure 3.5: Ratio of mean per capita to mean equivalised income, income year 2012**  
(Survey year 2013)



*Reading note:* The ratio of the mean income per capita to mean equivalised income in Bulgaria is 0.645.

*Source:* Eurostat calculations.

per capita in EU-SILC with the national accounts. To narrow the gap, we have to consider the other elements, which means confronting the EU-SILC data with the national accounts.

### 3.4 The bridge to national accounts

As a result of the recent important work by the Eurostat and OECD Joint Expert Group <sup>(42)</sup> and the report by Mattonetti (2013) for Eurostat, we now have a much clearer picture of the relation between the national accounts (NA) and the EU-SILC data, and of the

main elements that contribute to the observed difference. In this chapter, we draw heavily on this work. Our focus is however different. Here we focus on the direct implications for the measurement of income poverty as in the EU social indicators. This means that in considering the sources of the difference we need to ask, in concrete terms, how, if at all, should the information collected in the national accounts and that collected through EU-SILC be modified?

In what follows, we consider the most important elements accounting for the difference between EU-SILC and the national accounts. Table 3.1 lists the composition of the national accounts income variables.

<sup>(42)</sup> See: [http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSTAT/WPNA\(2013\)9/RD&docLanguage=En](http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/CSTAT/WPNA(2013)9/RD&docLanguage=En).

### Social transfers in kind

The first important distinction is that between Adjusted GHDI, denoted B7g, and Unadjusted GHDI, denoted B6g. The difference is that Adjusted GHDI includes social transfers in kind (STiK). In the construction of the EU AROP indicator, STiK have not been included and the new NA-based indicator adopted by the SPC Indicators Sub-Group in 2014 takes GHDI before adjustment. Given the substantial magnitude of STiK, the use of Unadjusted GHDI, as is adopted from this juncture, makes a major difference.

### Non-profit institutions serving households (NPISH)

A second definitional issue is that some countries combine the household sector S14 with the NPISH sector, S15 (Non-Profit Institutions Serving Households), which includes bodies such as charities, churches, learned societies, trade unions, political parties and sports clubs. From the Eurostat-OECD report (Mattonetti (2013)), it appears that five of the EU-27 countries covered in that report have a combined sector account (Denmark, Germany, Ireland, Austria and the UK). The failure to make the separation raises particular problems for the *Unadjusted* GHDI, as may be seen from the case of France, where there are separate accounts for S14 Households and S15 NPISH. In terms of gross income before adjustment, the NPISH sector is some 3 % of the household sector: in 2013, EUR 45.5 billion compared with EUR 1 326.3 billion. However, most of the gross income is used to make Social Transfers in Kind to the household sector. This means that moving from GHDI to Adjusted GHDI

adds to household income and subtracts from NPISH, leaving the latter with only EUR 2.1 billion. So in terms of Adjusted GHDI, the inclusion of NPISH would make little difference, but the unadjusted figure would be some 3 % higher.

*Recommendation 1: Given the use of the unadjusted GHDI for the newly agreed EU social indicator, it is important that all Member States provide national accounts data for the household sector S14 excluding the NPISH.*

This should be feasible, since 20 countries from the EU-27 have provided statistics for the S14 sector for unadjusted GHDI, and their data are used in the construction of Figures 3.6 and 3.7, which show the ratio of the EU-SILC mean income per capita to NA Unadjusted GHDI per capita for EU-15 and the new Member States. Both are measured in euros. The missing countries are Denmark, Germany, Ireland, Austria and the UK (already mentioned above) as well as Luxembourg and Malta. There are therefore only nine EU-15 countries.

Since we have now allowed for three definitional differences (mean/median, equivalisation and exclusion of NPISH), there is a straight comparison. The benchmark is 100 %. There is a distinct pattern in Figures 3.6 and 3.7. If we distinguish those countries where the EU-SILC income is 85 % of the NA figure or above, and those where it is below two-thirds, then in EU-15 the former group consists of three register countries (Netherlands, Sweden and Finland), where most income components are obtained from administrative registers. In two countries, the adoption of a register basis caused a jump: France (2007) and

**Table 3.1: Definition of gross disposable household income**

D1	Compensation of employees
+ B2g + B3g	Gross operating surplus/mixed income
+ D4	Property income net of property income paid
+ D7	Other current transfers received, net of transfers paid
+ D62	Social benefits, other than social transfers in kind, net of those paid
D61	Social contributions paid net of those received
D5	Current taxes on income and wealth
= B6g	Gross disposable household income
+ D63	Social transfers in kind
=B7g	Adjusted gross disposable income

Spain (2008). At less than two-thirds are Portugal and Greece, followed at around 70 % by Spain and Italy. Belgium comes in-between.

Among the new Member States, shown in Figure 3.7, the ratio in 2012 is above 75 % in Estonia and Slovenia (a register country). The ratio is below two-thirds in Bulgaria, the Czech Republic, Poland, Hungary, Latvia (except for a peak at 70 % in 2007), Lithuania, Romania and Slovakia.

There remain therefore marked differences between countries, and we explore these further below. At the same time, national ratios remain relatively stable over time, particularly if we consider the later part of the period (from 2008 to 2012). Exceptions are Greece in Figure 3.6 and Bulgaria, Estonia and Lithuania<sup>(43)</sup> in Figure 3.7, but apart from these the EU mean income data have a broadly stable relation with the national accounts mean income. To the extent that the difference can be treated as a (country-specific) fixed effect, this is re-assuring. It does however mean — paradoxically — that if improvements are made in EU-SILC (or in the national accounts) that we can then no longer treat them as differing consistently by a constant proportion. This is illustrated by the case of France and Spain, where the move to a register basis has been associated with a rise of some 10 percentage points.

In order to measure the impact of the sampling error on our estimation, Figure 3.8 provides the 95 % confidence interval of this ratio for 2012 for those countries where both EU-SILC and NA data are available. As shown in this figure, national ratios vary by maximum +/- 0.03.

We now consider some of the elements that can explain the observed differences.

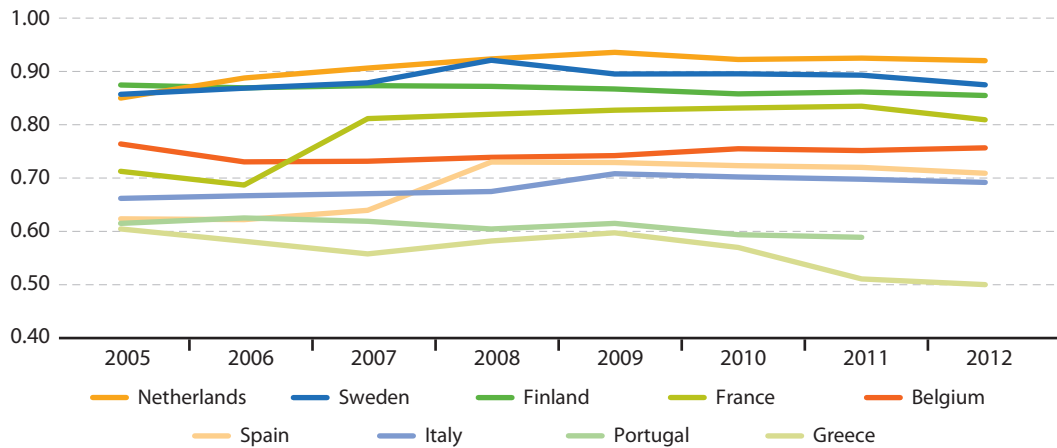
### Non-private households

EU-SILC data cover only private households and therefore exclude those people living in prisons, boarding schools, retirement homes, hospitals and nursing homes, religious institutions, hotels, etc. The Eurostat-OECD Expert Group referred to above carried out an extensive exercise to estimate the share of non-private households in the NA totals (see Figure 4 and Annex 6 in Mattonetti, 2013). Here however our concern is a different one. The EU-SILC-based indicators are expressed as percentage of the EU-SILC population, and the same is true of the per capita comparisons with the national accounts. The problem only arises to the extent that (1) statements are made about aggregate numbers (as in the Europe 2020 social inclusion target; see Chapter 1 of this volume) or (2) the non-private household population differs with regard to the indicator in question. In this latter respect, the Expert Group exercise makes a contribution in that they take account of the different demographic composition of the non-private households and make assumptions about different categories of income. Even if they assume that within age groups the income in many categories is the same as in EU-SILC, it would be interesting to take their analysis further and examine the impact on the AROP and other indicators.

*Recommendation 2: The effect on EU-SILC-based social indicators of the non-coverage of non-private households should be examined, using NA data and other relevant sources (registers, specific surveys).*

<sup>(43)</sup> In Cyprus, it is difficult to interpret the drop in 2007, because of a break in the series in that year.

**Figure 3.6: Ratio between EU-SILC and NA Unadjusted GHDl per capita (S14), EU-15, 2005-2012 (income years)**

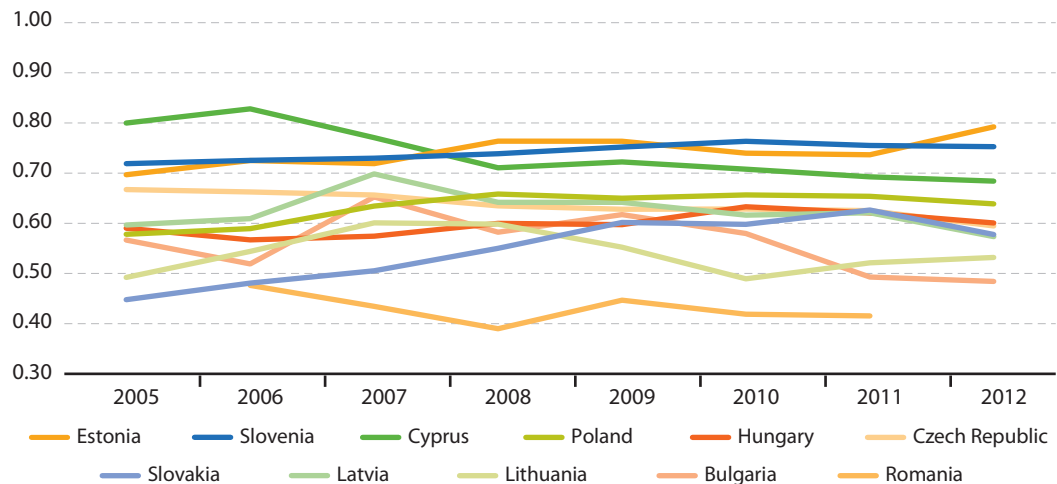


NB: No NA data for Denmark, Germany, Ireland, Luxembourg, Malta, Austria and the UK for the whole period and for Portugal in 2012. Break in EU-SILC series in France (2007) and Spain (2008).

Reading note: In Portugal, the ratio of EU-SILC mean per capita income to the NA unadjusted GHDl per capita for the household sector S14 is 0.60 in 2005.

Source: Eurostat calculations for EU-SILC data and NA unadjusted GHDl from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*.

**Figure 3.7: Ratio between EU-SILC and NA Unadjusted GHDl per capita, new Member States, 2005-2012 (income years)**

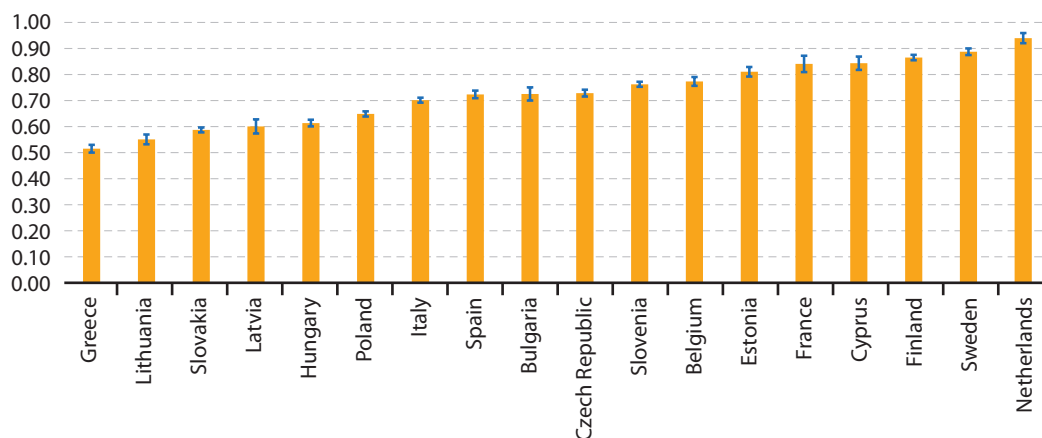


NB: 'New' Member States are those countries that joined the EU in May 2004 or after. No data NA available for Malta (whole period) and Romania (2012). No EU-SILC data for Romania (2005). Break in EU-SILC series in Cyprus (2007). Croatia is not covered in our analyses.

Reading note: In Lithuania, the ratio of EU-SILC mean per capita income to the NA unadjusted GHDl per capita for the household sector S14 is 0.48 in 2005.

Source: Eurostat calculations for EU-SILC data and NA unadjusted GHDl from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*.

**Figure 3.8: Ratio between mean income per capita (EU-SILC) and the NA Unadjusted GDI per capita (S14), 95 % confidence interval, 2012**  
(income year)



NB: No NA data for Denmark, Germany, Ireland, Luxembourg, Malta, Austria, Portugal, Romania and the UK in 2012.

Reading note: In Greece, the ratio of the EU-SILC mean per capita income to the NA unadjusted GDI per capita for the household sector S14 is comprised between 0.515 and 0.530.

Source: Eurostat calculations for EU-SILC data and NA unadjusted GDI from Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*.

### Coverage by income category

From the work of the Eurostat-OECD Expert Group and Mattonetti (2013), we can compare the coverage rate for different income components by country for the year 2008 (see Table 3.2). The pattern follows that found in earlier comparisons of survey data and national accounts (such as Atkinson, Rainwater and Smeeding, 1995, Table 7). Wages and salaries have the highest coverage rate, followed by social benefits in cash, and taxes and social contributions. The lowest coverage rates are for self-employment income and for property income.

These figures are worrying. At the same time, the coverage rate depends on the choice of baseline and we have here a particular focus: the implications for the social indicators. The baseline taken in the exercise is a 'reduced scope' national accounts definition (Mattonetti, Table 2), which omits for example the Financial Intermediation Services Indirectly Measured (FISIM) element of property income and the property income attributed to insurance policy holders. Nevertheless, there are a number of questions concerning the appropriateness of the baseline from the standpoint of the indicators. For example,

the present social indicators are defined on income excluding imputed rent on owner-occupied houses. This is a substantial item in the national accounts. The Expert Group reports that, in the countries analysed, the share of income from owner-occupied dwellings ranges from 6 % of total adjusted disposable income to 13 %. If the baseline were to exclude this item, it seems likely that the comparison of 'operating surplus and mixed income' would be more favourable. A second example is provided by property income paid. If mortgage interest is regarded as an outgoing (part of housing costs), rather than as a subtraction from income, then incomplete coverage of property income paid is not important (business loans appear under self-employment income).

*Recommendation 3: The EU-SILC coverage of income by components exercise should be re-done, with a baseline appropriate for the calculation of the social indicators.*

From such an examination of the coverage, it should be possible to identify those components where there is a significant difference between the EU-SILC variable and the desired coverage. In such cases, there are two possible routes forward. The first is to consider whether there are potential improvements

**Table 3.2: Coverage rate (EU-SILC over NA), EU-27, 2008**

(%)

Wages and salaries	85.9 to 103.5
Social benefits in cash	72.6 to 92.6
Taxes and social contributions	63.8 to 90.2
Operating surplus and mixed income	53.5 to 108.3
Property income received	8.0 to 51.7
Property income paid	15.1 to 55.4

NB: The intervals show the range excluding the bottom four and the top four EU-27 countries.

Source: Mattonetti, 2013, Table 3.

in future EU-SILC practice. One obvious question, suggested by the earlier findings, is whether there is greater scope for the use of register data. The second approach, which can be applied retrospectively, is to examine the sensitivity of conclusions to data deficiencies. Here an obvious question to ask is how far the AROP and other indicators are affected by proportionate adjustments to different income categories. If, for example, operating surplus/mixed income were to be scaled up by  $x\%$ , how much would the poverty rate be changed?

*Recommendation 4: Following the coverage exercise, consideration should be given to the future development of EU-SILC to improve income coverage, and an analysis should be made of the sensitivity of past results to income under-recording.*

This section has sought to compare the EU-SILC data and the national accounts. Such a confrontation might well have led to very negative conclusions. In terms of the level of income, there are indeed worrying features. Even allowing for differences in definition, it seems likely that the EU-SILC data yield income estimates that fall short of the national accounts totals. We have proposed ways in which this could be further explored and possible corrective measures. But the good news is that — speaking broadly, and with certain notable exceptions — these differences appear relatively stable over time. The trends in the two sources seem in general coherent. If for the majority of countries there is broad stability in the ratio of the two series, then this means that when using the EU AROP indicator we can be re-assured that the threshold is in these cases not moving out of line with the picture painted by the national accounts. Such a conclusion is also relevant to the GHDl indicator of income levels adopted in

2014 by the SPC Indicators Sub-Group, to which we turn in the next section.

### 3.5 Changes in real incomes

To this juncture, we have been looking at ratios of the incomes in the EU-SILC and national accounts; we now consider what they show separately about the changes in the level of living. Have the changes in income poverty with which we began been accompanied by rising or falling real levels of income? It is for this reason that the SPC Indicators Sub-Group has adopted a new indicator based on national accounts data on (unadjusted) GHDl per capita: the growth rate in real gross household disposable income.

Crucial to such measures of the growth of real income is the choice of price index. Here it is important to note that only *national* information is required. In particular, there is no need to have recourse to Purchasing Power Standards or to exchange rates (see Annex 3 of Atkinson, Guio and Marlier (2015)). The *Eurostat-OECD Methodological Manual on Purchasing Power Parities* observes that ‘many international comparisons require neither PPPs nor exchange rates. For example, to compare real growth rates of GDP between countries, each country’s own published growth rate can be used’ (Eurostat-OECD, 2012, p. 16). These are of course influenced by exchange rate movements, but only insofar as they feed into domestic prices. For this reason, we start from the amounts in national currency, and deflate by a national price index to obtain the rate of growth in real terms. To underline the fact that the results do not allow a comparison of the *levels* of income across



countries, the series is expressed for each country as an index with 2005 = 100.

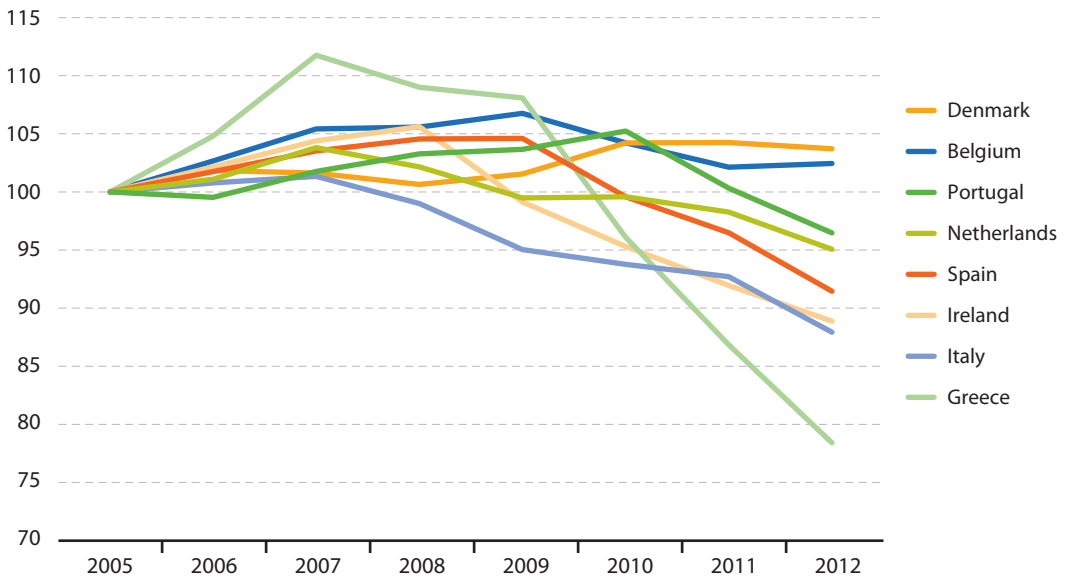
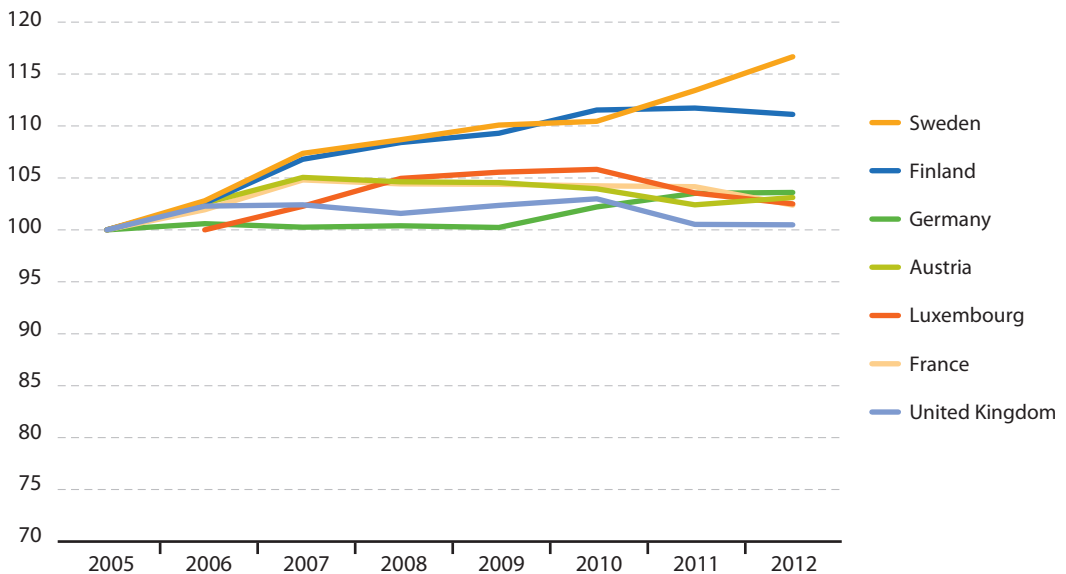
The next question is 'which price index?' The SPC Indicators Sub-Group proposes using the deflator of household final consumption expenditure. This is the natural measure from the national accounts (see, for example, Milusheva and Gal, 2012): 'Final consumption aggregates' (Eurostat code *nama\_fcs\_p*). It does however differ from the standard EU-SILC practice, the Harmonised Index of Consumer Prices (HICP: series *prc\_hicp\_aind*), as used in the AROP rate anchored at a point in time. As we have seen earlier, the national accounts measure is more extensive, including 'individual' government consumption, on items such as education and health. The prices of these items may have moved differently, and the items themselves have acquired a larger significance in the total in the crisis years, as other direct spending by consumers has been curtailed (see Gerstberg-er and Yaneva, 2013, Figure 7).

In our judgment, the HICP index more closely approximates the experience of individual households. The HICP is the index disseminated in the media and it does not include components such as FISIM (financial services indirectly measured) that are not readily explained, even by experts. The choice is however an important one. Over the period 2005 to 2012, in the EU-27, the national accounts index rose by 12.0 %, whereas the HICP increased by 18.4 %. This is a large difference: almost 1 percentage point per year. The difference arises mainly outside the euro area: for the euro area (18) the difference was only 2.7 % over the period as a whole. In 10 out of the 27 EU countries, the difference was 'small' (less than 0.25 % per year). On the other hand, in the second half of the period, from 2008 to 2012, the proportion with small differences fell to a third and there were six countries with large differences (more than 1 % per year). The reasons for these differences warrant further examination.

*Recommendation 5: There should be further investigation of the reasons for the differences in the changes in price level over time indicated by the HICP and by the final consumption expenditure deflator.*

In order to show the difference from the national accounts deflator, Figures 3.9 and 3.10 show the NA-based indicator over the period 2005 to 2012 derived from Unadjusted GHDI per capita expressed in national currency (*nasa\_nf\_tr*) and deflated by the HICP. It should be noted that these figures include NPISH. Data on GHDI are not available for Malta and data for Luxembourg only start in 2006. As is to be expected, the two sub-periods (2005-2008 and 2008-2012) are quite different. All EU-15 countries except Italy saw positive growth in real income between 2005 and 2008, even if in Denmark, Germany and the UK it was less than 2 % over the 3-year period. In the middle came, in increasing order, the Netherlands, Portugal, France, Spain, Austria, Luxembourg, Belgium and Ireland. In all of these countries, the rate of growth was less than 2 % per year. 2 % per annum was only achieved in Finland, Sweden and Greece. The experience of the new Member States from 2005 to 2008 was quite diverse, with the increase in real income per capita ranging from minus 4.2 in Hungary to more than 20 % in Bulgaria, Estonia, Lithuania, Latvia and Romania (plus 58 %).

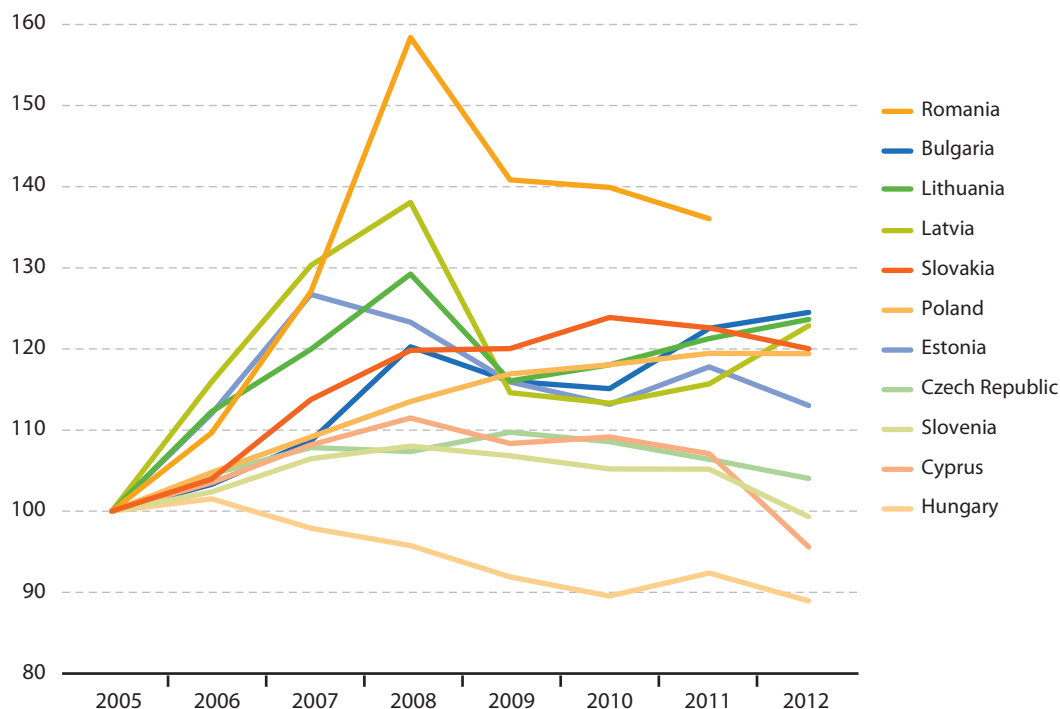
In the post-crisis period from 2008 to 2011, there are the expected large losers in EU-15 countries (Figure 3.9); in increasing order: Spain, Italy, Ireland and Greece, to which, when 2012 is taken into account, we have to add the Netherlands and Portugal. Countries that stand out at the top, with more than a 3 % increase are Finland, Denmark, Germany and Sweden. In the middle with no change (France) or moderate reductions are the UK, Luxembourg, Austria and Belgium. Among the new Member States, the large losers are Latvia, Romania and Lithuania, and, if we add 2012, Estonia, Cyprus, Slovenia and Hungary. Positive growth of real GHDI per capita (between 2 and 6 % for the 3-year period) is recorded in Bulgaria, Slovakia and Poland (but if we add 2012, Slovakia is back to the 2008 situation).

**Figure 3.9a:** Real unadjusted GHDl per capita (Index 2005 = 100) EU-15, 2005-2012**Figure 3.9b:** Real unadjusted GHDl per capita (Index 2005 = 100) EU-15, 2005-2012

NB: No data for Luxembourg before 2006.

Reading note: In 2012, the real unadjusted GHDl per capita in Greece was 78.4 % of its value in 2005.

Source: NA unadjusted GHDl from Eurostat web-database, Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*; HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

**Figure 3.10: Real unadjusted GHDl per capita (Index 2005 = 100), new Member States, 2005-2012**

NB: 'New' Member States are those countries that joined the EU in May 2004 or after. No data for Malta. Croatia is not covered in our analyses.  
 Reading note: In 2012 the real unadjusted GHDl per capita in Hungary was 88.9 % of its value in 2005.

Source: NA unadjusted GHDl from Eurostat web-database, Statistics/National accounts/Annual sector accounts, *nasa\_nf\_tr*; HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

These changes provide the background against which to assess the movements in the AROP indicator in Section 3.2 <sup>(44)</sup>. In the new Member States, from 2005 to 2008, an overall reduction in the AROP rate was achieved at a time when real incomes were rising, often by substantial amounts. Where the AROP rate increased by 3 percentage points, as in Bulgaria and Latvia, this has to be seen in the context of 20 and 38 % increases, respectively, in the level of real income. In the EU-15 in this period, the rise in the AROP rate in Germany happened when real incomes were stagnating.

When we turn to the period 2008 to 2012, we see that the positive growth rate of per capita real incomes in Germany did not translate into a reduction in the AROP rate. The rises in the AROP rate in Greece, where real incomes fell greatly, highlight the severity of the problems faced. In Latvia, in contrast, there was a large fall in real income but the AROP rate fell.

<sup>(44)</sup> For a more detailed discussion of the changes in real GHDl from the national accounts in Germany, Greece, Spain and Portugal, see European Commission (2014, pp. 28-29). It is not clear what price deflator was employed.

### 3.6 An EU-SILC-based real income indicator?

The SPC Indicators Sub-Group has for good reasons begun with an indicator of real income based on the national accounts. NA cannot however provide the distributional information in which the SPC is principally interested. The final question that we consider therefore is whether a social indicator of real incomes could be introduced incorporating two distributional elements: the median in place of the mean, and equivalised income in place of per capita income? Such a measure has indeed already been displayed in the *Employment and social developments in Europe 2013* report of the European Commission (2014, p. 389).

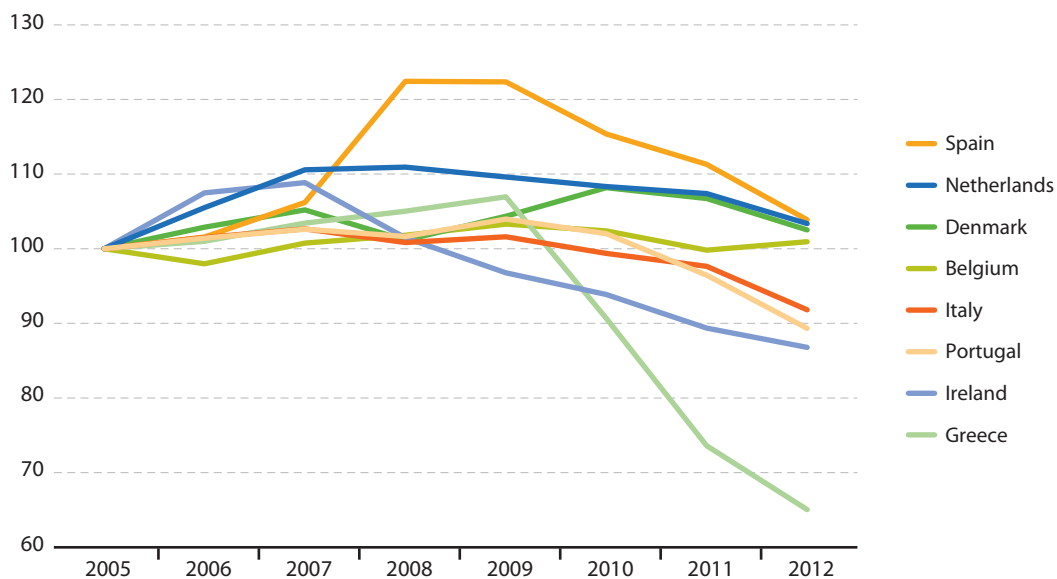
In order to throw light on this question, we present evidence in two steps — in effect reversing the order of the earlier analysis. First, we contrast the levels of change in real mean per capita income derived from EU-SILC with those that we have just been examining using NA data. Figures 3.11 and 3.12 are parallel to Figures 3.9 and 3.10, but are based on EU-SILC data. It may be noted that the 2012 figure for Greece was 78.4 % of the 2005 index in Figure 3.9, using the national accounts data, and is 64 % in Figure 3.11, using EU-SILC data; but the general trend is

close. This is however not true for Bulgaria, Germany, Luxembourg, the Netherlands and Slovakia, where there appear to be discrepancies when we compare both trends (see for details Atkinson, Guio and Marlier (2015), Figure 19).

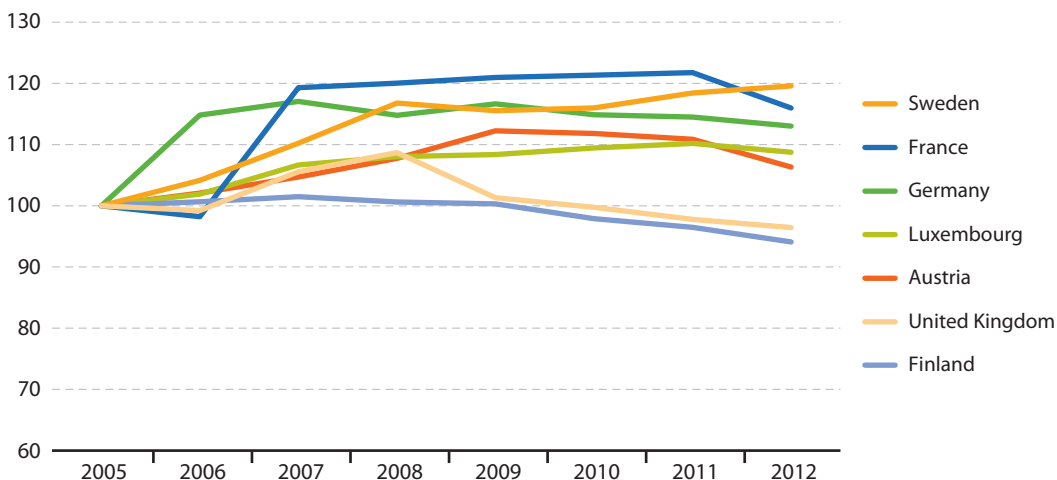
The second step is to replace mean per capita income with median equivalised income, as used in the AROP indicator. The results are shown in Figures 3.13 and 3.14. For Luxembourg and Italy, there was no apparent growth in real median equivalised income in the pre-crisis period, but in Spain, Sweden, France, Germany, the Netherlands and the UK there was strong growth (10 % or more for the period). This was followed by either levelling-off or decline, and six of the fifteen countries in 2012 (Greece, Ireland, Italy, Luxembourg, Portugal and the UK) were below the 2005 level. For the new Member States, shown in Figure 3.14, there was rapid growth in many cases up to 2008; there was a fall in the majority of countries after 2008, but in all cases the 2012 value was ahead of that in 2005 (except in Cyprus and Hungary). For six of the twelve countries shown in Figure 3.14, the increase in real median equivalised income was in excess of 20 % (between 2005 and 2012).

*Recommendation 6: The possibility of developing an EU-SILC-based indicator of the growth of median real household equivalised disposable income should be investigated at the EU level.*

**Figure 3.11a:** Real mean per capita income (EU-SILC; Index 2005 = 100), EU-15, 2005-2012 (income years)



**Figure 3.11b:** Real mean per capita income (EU-SILC; Index 2005 = 100), EU-15, 2005-2012 (income years)



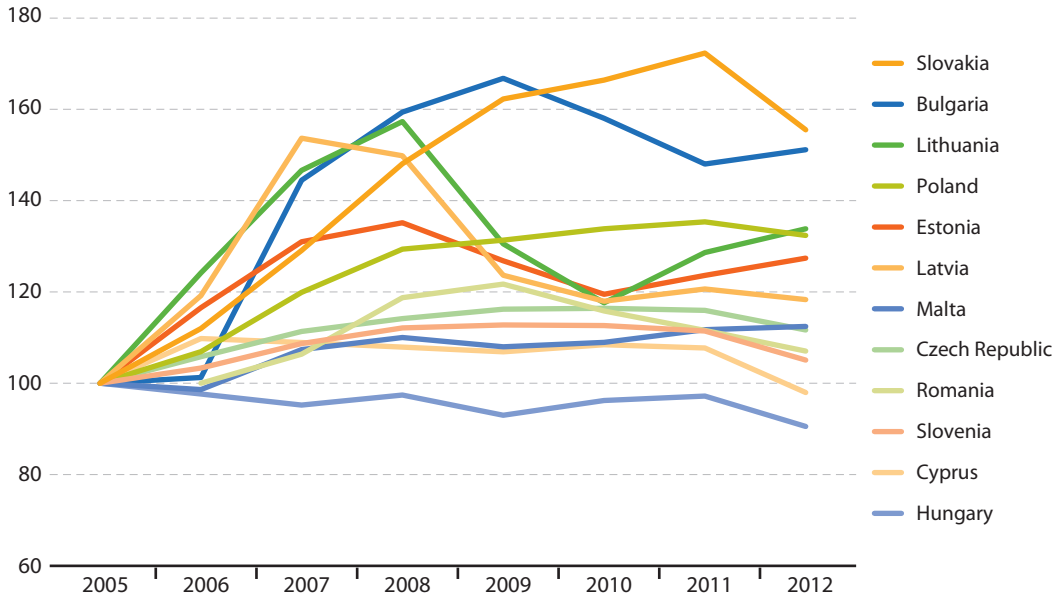
NB: Breaks in EU-SILC series in Spain (2008), France (2007), Austria (2007) and United Kingdom (2012).

Reading note: In 2012, the real mean per capita income in Greece was 64 % of that in 2005.

Source: Mean income per capita from EU-SILC (Eurostat calculations); HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

**Figure 3.12: Real mean per capita income (EU-SILC; Index 2005 = 100), new Member States, 2005-2012**

(income years)

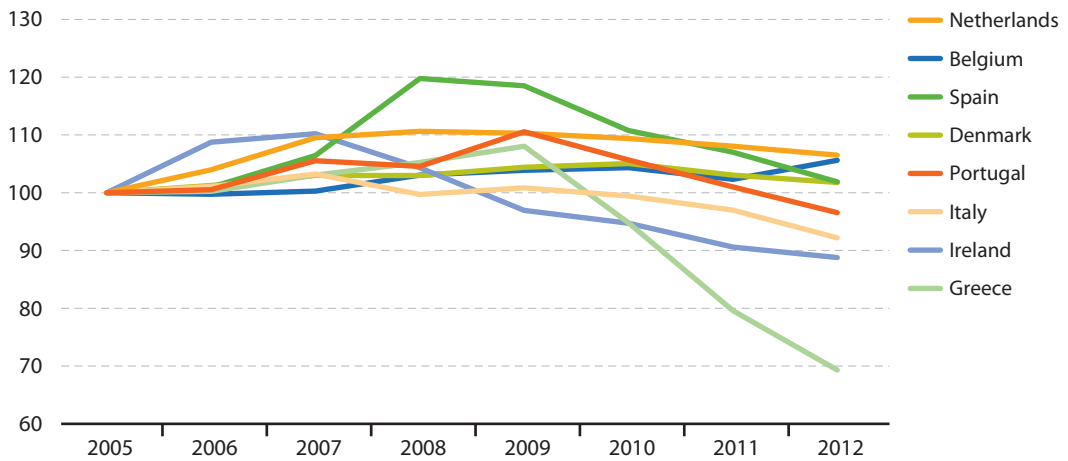


NB: 'New' Member States are those countries that joined the EU in May 2004 or after. Break in EU-SILC series in Cyprus (2007). No EU-SILC data for Romania in 2005 (index 2006 = 100 used instead). Croatia is not covered in our analyses.

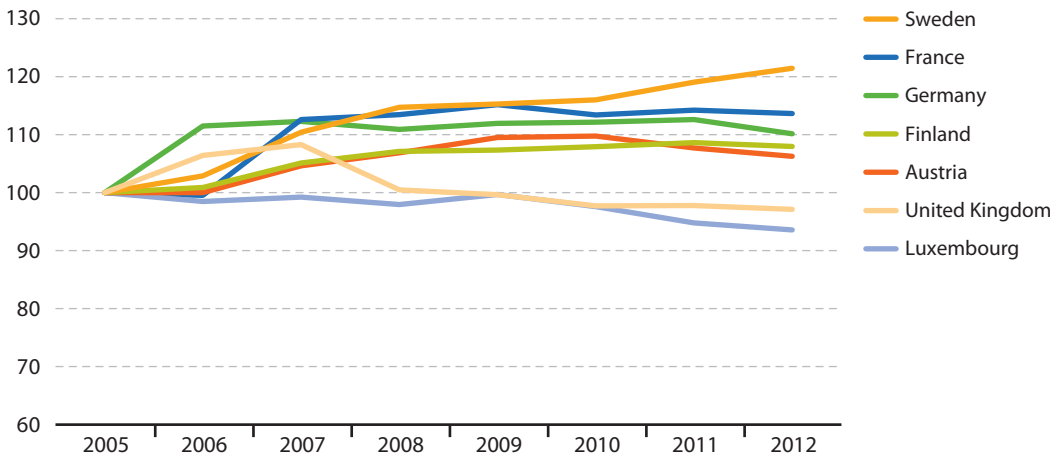
Reading note: In 2012, real mean income per capita in Malta was 112.4 % of that in 2005.

Source: Mean income per capita from EU-SILC (Eurostat calculations); HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

**Figure 3.13a:** Real median equivalised income (EU-SILC; Index 2005 = 100), EU-15, 2005-2012 (income years)



**Figure 3.13b:** Real median equivalised income (EU-SILC; Index 2005 = 100), EU-15, 2005-2012 (income years)



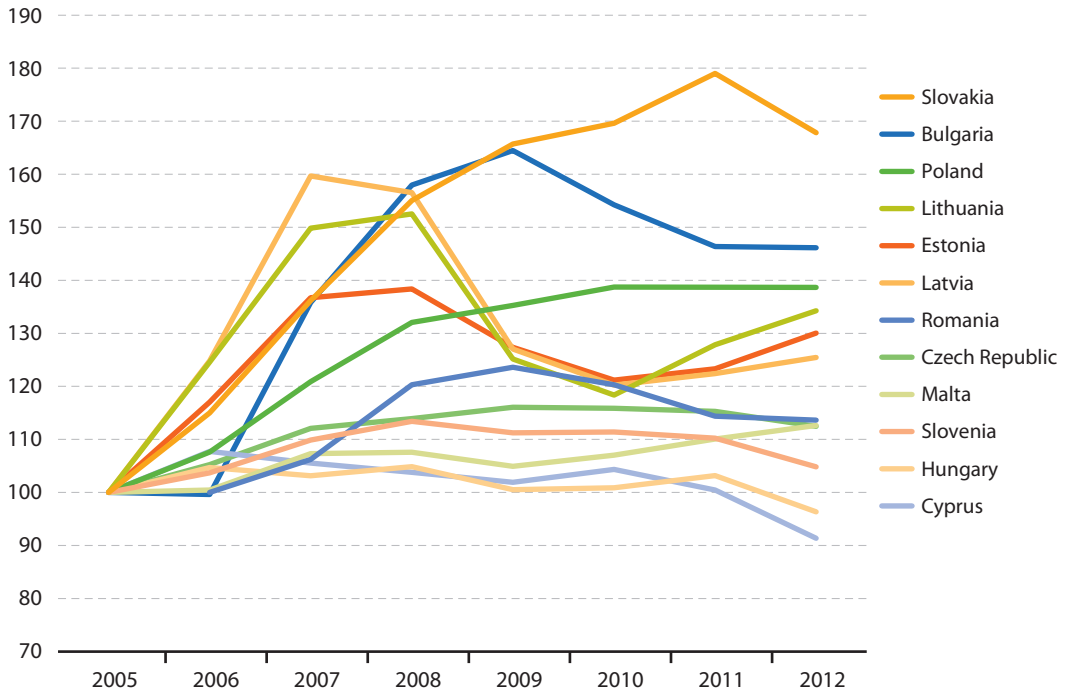
NB: Break in EU-SILC series in Spain (2008), France (2007), Austria (2007) and United Kingdom (2012).

Reading note: In 2012, real median equivalised income in Greece was 69 % of that in 2005.

Source: Median equivalised income from EU-SILC Users' Database (UDB) March 2014; HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

**Figure 3.14: Real median equivalised income (EU-SILC; Index 2005 = 100), new Member States, 2005-2012**

(income years)



NB: 'New' Member States are those countries that joined the EU in May 2004 or after. Break in EU-SILC series in Cyprus (2007). No EU-SILC data for Romania in 2005 (index 2006 = 100 used instead). Croatia is not covered in our analyses.

Reading note: In 2012, real median equivalised income in Hungary was 96.3% of that in 2005.

Source: Median equivalised income from UDB March 2014; HICP from Harmonised Indices of Consumer Prices (series *prc\_hicp\_aind*).

## 3.7 Conclusions

Before coming to the substantive conclusions, we should begin with the unsung hero of our story: the EU-SILC dataset. Without the investment in EU-SILC, and its predecessor the European Community Household Panel (ECHP), it would not have been possible for the EU to embark on the construction of social indicators, and the whole development of the social dimension of Europe would have been much poorer. The EU-SILC data have played a key role in policy formation at EU level and in a number of EU countries. At the same time, the instrument has evident limitations. As its warm supporters, we have been concerned that too much weight might

be placed on what can be achieved using EU-SILC data. It is therefore important that it be subjected to stringent tests. One such test has been the subject of this chapter: a confrontation between the EU-SILC data and the national accounts.

Such a confrontation between two different data sources might well have led to very negative conclusions. In terms of the level of income, there are indeed worrying features. But the good news is that — speaking broadly, and with certain noted exceptions — these differences appear relatively stable over time. The *trends* in the two sources seem in general consistent. To a reassuringly high degree, the two sources tell a coherent story.



But the reassurance does not carry over to the comparisons across countries. We have seen in Section 3.3 that the at-risk-of-poverty threshold varies across countries in relation to national accounts measures of household income per capita. This can in part be explained by differences in the median/mean relationship and in household size, but closer examination (called for in Section 3.4) of the reasons why the EU-SILC data yield income estimates that fall short of the national accounts totals is likely to reveal differences across Member States. We have identified, for example, the differences between countries that employ register information and those that rely more heavily on household surveys.

This calls into question the comparison of income poverty across Member States. In our view, policy-makers have been well-advised to concentrate on the analysis of trends over time within Member States. We believe that the EU-SILC data, viewed in close conjunction with the national accounts, can provide a sound, indeed invaluable, basis for monitoring trends over time. Here our substantive findings have not been encouraging. We see no grounds for disagreeing with one of the Key Messages of the Social Protection Committee in its 2014 annual report, 'the EU is still not making any progress towards achieving its Europe 2020 poverty and social exclusion target of lifting at least 20 million people from poverty and social exclusion by 2020. (...) Furthermore, national targets continue to vary in their ambition and do not add to the EU collective headline target.' (2015, p. 19).

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# 4

## Household structure, income poverty and subjective hardship

Maria Iacovou <sup>(45)</sup>

### 4.1 Introduction

This chapter examines how the risks of income poverty and subjective hardship vary according to household type. Tables showing how the EU's at-risk-of-poverty (AROP; see Chapter 3 of this volume) indicator varies by household type are published by Eurostat <sup>(46)</sup>; this work extends that offering in several ways.

First, we consider a more comprehensive range of household types; in particular, we include households in which parents live with their adult children and extended-family households. Second, we report on a larger range of indicators of disadvantage: in addition to the EU's standard AROP indicator, we consider a lower income poverty threshold which denotes a greater level of disadvantage, and two indicators of subjective hardship. Third, as well as examining the risk of poverty and hardship as they vary between household types, we also examine the *composition* of the population living in poverty and hardship. This opens up an interesting debate relating to the targeting of welfare policy: while lone-parent and single-adult households are at the highest risk of poverty and hardship, they account for a relatively small percentage of individuals living

in poverty and hardship. Couples with children under 18, by contrast, are at a very low risk of poverty and hardship compared to other household types, but account for a very large share of individuals living in poverty and hardship.

There are several reasons why we might expect household type to be related to the risk of poverty and other forms of disadvantage; this relationship is complex, because there are likely to be effects in both directions, with household type influencing the risk of poverty and disadvantage, and individuals' economic resources influencing the choice of household in which they live. This nexus of relationships is discussed in more detail in a longer version of this chapter (Iacovou, 2013).

Both household composition and income sufficiency have been the subject of extensive study in their own right. Incomes and poverty rates, in particular, have received a great deal of attention: a large number of studies have documented the ways in which income levels vary across Europe, with particular attention paid to inequality (Atkinson and Bourguignon, 2000; Atkinson et al., 2010; Fredriksen, 2012, and many more); the incidence of poverty and low income (Förster and Mira d'Ercole, 2005; Lelkes et al., 2008); and the incomes of individuals who are statistically at a higher than average risk of poverty, including most particularly children, young people, the elderly, and lone parents (Bradbury and Jäntti, 1999; Aassve et al., 2007; Rendall and Speare, 1995).

These studies typically find wide disparities in income across Europe, with incomes across Southern and much of Eastern Europe substantially lower than across most of North-Western Europe, and with income dispersions (and hence, relative poverty rates)

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<sup>(46)</sup> See Eurostat's online Data Explorer facility: [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc\\_li03&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_li03&lang=en).

typically lower in the Nordic countries and parts of Eastern Europe, than in many Southern European countries.

A somewhat smaller literature (Iacovou, 2004; Tomassini et al., 2004; Andersson, 2004; Robson and Berthoud, 2003; Iacovou and Skew, 2011; Hantrais et al., 2006; Hoem et al., 2009; Mandic, 2008; Liefbroer and Fokkema, 2008; Saraceno, 2008 and others) deals with household composition. As with incomes, substantial variations may be observed across Europe; household sizes are relatively small in Western and particularly Northern Europe, while they tend to be larger in Southern Europe, and particularly large in parts of Eastern Europe. Large households may arise for many reasons: high fertility, late home-leaving among young adults, and high rates of intergenerational co-residence, for example between older people and their adult children. As well as the body of literature describing patterns of household composition, several studies also investigate the reasons why household composition varies between countries, examining a range of cultural and economic factors.

One aspect of the relationship between household type and economic disadvantage which we do not consider directly in this chapter, is the role of equivalence scales. Efficiencies in the sharing of resources between household members are well researched in the academic literature (Förster, 1994; Atkinson et al., 1995), and are factored into income and poverty calculations in the form of equivalence scales, which adjust household income by a factor relating to the needs of household members, and which typically assess the needs of second and subsequent adults living in a household as some fraction of the needs of the first adult in a household. In line with EU standard practice in income distribution analysis, we use the so-called 'modified OECD' equivalence scale, which assumes that the second and subsequent adults in a households have needs equal to 0.5 of the needs of the first adult, while children below 14 have needs of 0.3 times the needs of the first adult. Different equivalence scales may lead to different estimates of poverty rates, and often to different poverty rankings between countries, regions and groups of people (Burniaux et al. 1998). Thus, it is possible that when we compare the incidence of poverty between household types, differences may arise as an artefact of the particular equivalence

scale used. It is beyond the scope of this chapter to perform the sort of sensitivity analysis which would answer this question definitively. However, alongside our analysis of income poverty, we include analysis of two different self-reports of hardship, which are not sensitive to the particular equivalence scale used in income analysis.

## 4.2 Data and descriptive statistics

Our analysis is based on the 2012 Wave of EU-SILC cross-sectional data (UDB 2012 Version 2, microdata release of August 2014). The use of cross-sectional data is clearly appropriate in this context, but it has one disadvantage, namely that the data on household structures relate to the time of interview while the data on incomes generally relate to an earlier period, the 'income reference period' (see Chapters 2 and 3 of this volume). This causes two problems. Most seriously, where there have been movements in or out of the household, the calculated total income over the past year may not refer to individuals currently living in the household. Even when there have been no movements in or out, the problem remains that household income relates to a 12-month period, whereas household composition and other variables in the data set relate to a moment in time (Debels and Vandecasteele, 2008).

In order to address the first of these problems, many researchers follow a procedure when working with longitudinal data sets, which involves matching incomes collected at time  $t+1$  (but which relate to time  $t$ ) with other data which are collected at time  $t$  and which also refer to the situation at time  $t$  Heuberger (2003). This is not possible when using the EU-SILC cross-sectional files; incomes for households therefore relate to the incomes of current household members measured over a previous time period.

### 4.2.1 Income poverty and subjective hardship

Two income poverty indicators are used in this chapter: the first, which is the standard measure of income poverty used by the EU, is an indicator

based on whether the equivalised income of the household falls below 60 % of the national median. The second is based on a similar methodology (and is also an EU agreed social indicator), but indicates a more severe level of relative poverty, which may be more pressing from a policy perspective: this is whether the household's income falls below 50 % of the national median.

We also use two indicators of subjective hardship, based on the answers of the 'household respondent' <sup>(47)</sup> to two questions. The first is as follows:

*'A household may have different sources of income and more than one household member may contribute to it. Thinking of your household's total income, is your household able to make ends meet, namely, to pay for its usual necessary expenses?'*

This is answered on a scale of 1 (with great difficulty) to 6 (very easily).

The second indicator is based on answers to the following question:

*'In your opinion, what is the very lowest net monthly income that your household would have to have in order to make ends meet, that is to pay its usual necessary expenses? Please answer in relation to the present circumstances of your household, and what you consider as usual necessary expenses (to make ends meet).'*

This question is answered with a monthly amount; we create an indicator of hardship which takes the value 1 if total monthly household income (i.e., annual income divided by 12) is less than 95 % of the stated necessary monthly amount.

These two indicators of hardship have the advantage that they do not depend on assumptions made by the analyst about economies of scale within the household (that, is they do not vary according to which equivalence scale is used). However, they have the shortcoming that the questions on which they are based are asked only of household respondent, and not of other individuals resident in the household. In fact, it is possible that the perceptions of household respondents may differ from the perspectives of other household members; un-

fortunately, EU-SILC does not currently have the data necessary to test this.

In the remainder of the chapter, the word 'poverty' always refers to 'income poverty', while the word 'hardship' always refers to 'subjective hardship'. The word 'disadvantage' is used as a generic term to cover both sets of indicators.

## 4.2.2 Working with clusters of countries

We analyse data for the 28 countries of the EU, examining how incomes differ across 10 different household types. Full country-by-country analysis gives tables containing 280 cells for each of the indicators considered, which is extremely large and arguably too complex for the average human brain to process. Thus, for reasons of space and clarity, we present information only in graphical form, and for clusters of countries rather than for individual countries. This also has the result of increasing cell sizes for uncommon family forms, such as extended families in the Nordic countries, and may also increase the accuracy of estimates. Full country-by-country results in tabular form are available on request from the author.

How should the clusters of countries be defined? One possibility is to use a typological grouping, such as the seminal welfare-regime-based schema proposed by Esping-Andersen (1990 and 1999), or an adaptation of such a schema. There are notable advantages to this approach, namely that it is to a degree at least driven by theory; however, as Berthoud and Iacovou (2004) point out, a typology arrived at for the purposes of understanding (for example) income redistribution may not be the best typology for understanding (for example) the dynamics of the family.

Another possibility is to select a schema empirically. Because this chapter is concerned with household structure, we use household type (discussed below in Section 4.3.1) as the basis for defining a schema, using a purpose-built minimum distance algorithm, and selecting the country grouping which gives the lowest sum of the squared deviations (SSD) from calculated group means. This algorithm yields the grouping presented in Table 4.1.

<sup>(47)</sup> The household respondent is the adult household member who answered the household questionnaire for his/her household.

**Table 4.1: Regional clusters used in the analysis**

<b>Nordic</b>	Denmark, Finland, Sweden
<b>North-Western</b>	Belgium, Germany, France, Ireland, Luxembourg, Netherlands, Austria, UK
<b>Southern</b>	Greece, Spain, Italy, Cyprus, Malta, Portugal
<b>Eastern</b>	Bulgaria, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia.

This reflects a similar typology to one which we might have chosen via an adaptation of welfare regime typology, starting with the fourfold typology proposed by Esping-Andersen (1990 and 1999); incorporating a 'southern' cluster as suggested by Ferrera (1996) and noted by numerous other authors as displaying clear differences from the Northern and Western countries in terms of family forms; including the UK and Ireland which Esping-Andersen categorises as members of the 'liberal' regime type with the 'conservative' countries of North-Western Europe; and assigning the countries which joined the EU in or after 2004 to a separate category, with the exception of Cyprus and Malta, which have clear

geographical and cultural commonalities with the Southern European countries.

## 4.3 Methodology

### 4.3.1 Defining household types

Ten household types are defined, according to the number and ages of people living in a household, and the relationships between them. These household types are listed in the Table 4.2 and follow the typology of Iacovou and Skew (2011).

**Table 4.2: Definitions of household types**

<b>Single person &lt; 65</b>	A single person under age 65
<b>Single person ≥ 65</b>	A single person aged 65 or over
<b>Couple both &lt; 65</b>	A couple (married or cohabiting) both aged under 65
<b>Couple, at least one ≥ 65</b>	A couple (married or cohabiting), one or both of whom is aged 65 or over
<b>Couple + child(ren) under 18</b>	A couple with one or more of their own children, including at least one child aged under 18
<b>Couple + adult child(ren)</b>	A couple living with one or more of their own children, all of whom are aged 18 or over
<b>Lone parent + child(ren) under 18</b>	A single adult plus one or more of his or her own children, including at least one child aged under 18
<b>One parent + adult child(ren)</b>	A household consisting of one parent plus one or more of his or her own children, all of whom are aged 18 or over
<b>Extended family</b>	Non-nuclear households whose members all belong to the same family. Most of these are either three-generation families, or households including a parent and an adult child with a partner or spouse
<b>Other households</b>	Other households, including lodgers, unrelated sharers, etc.

*NB:* that the 'other households' category includes some households where all the members are from the same family, i.e. which properly should be considered as extended families, but for whom this information cannot be recovered from the information available in EU-SILC, which does not provide a full household grid. The distribution of these household types varies greatly between countries and between the regional clusters defined in the previous Section. These regional distributions are shown in Table 4.3.

*Source:* Iacovou and Skew (2011).

**Table 4.3: Distribution of household types by regional cluster, 2012**  
(row percentages)

	Single person aged under 65	Single person aged 65+	Couple both under 65	Couple, 1 or both aged 65+	Couple + child(ren) under 18	Couple + adult child(ren)	Lone parent + child(ren) under 18	One parent + adult child(ren)	Extended family	Other
<b>Households</b>										
Nordic	18.4	11.1	17.7	14.8	24.6	4.5	4.2	2.1	0.3	2.3
North-Western	19.8	13.0	15.3	13.6	20.4	6.7	4.9	3.4	1.0	2.0
Southern	11.7	12.7	9.3	13.2	21.9	14.8	2.6	6.5	3.6	3.7
Eastern	11.2	14.2	11.0	10.3	18.2	13.2	2.5	7.3	9.2	3.0
<b>Total</b>	<b>15.5</b>	<b>13.1</b>	<b>13.0</b>	<b>12.7</b>	<b>20.6</b>	<b>10.0</b>	<b>3.6</b>	<b>5.0</b>	<b>3.8</b>	<b>2.7</b>
<b>Individuals</b>										
Nordic	8.0	4.8	15.2	12.8	42.6	6.3	4.8	2.0	0.6	3.0
North-Western	8.8	5.8	13.6	12.1	35.9	9.9	6.0	3.3	2.0	2.7
Southern	4.7	5.0	7.4	10.4	33.1	19.9	2.8	5.8	6.3	4.6
Eastern	4.3	5.5	8.5	8.0	26.9	17.3	2.6	6.2	17.0	3.7
<b>Total</b>	<b>6.4</b>	<b>5.4</b>	<b>10.8</b>	<b>10.5</b>	<b>33.2</b>	<b>14.0</b>	<b>4.1</b>	<b>4.6</b>	<b>7.4</b>	<b>3.5</b>

*NB:* Estimates are weighted according to the procedure defined in Section 4.3.2. The smallest cell size is 103 (extended family, Nordic countries).  
*Reading note:* 18.4 % of households in the Nordic countries are households consisting of a single person aged under 65.

*Source:* Author's computation, UDB 2012-2.

### 4.3.2 Weighting

All estimates are calculated using weights. The cross-sectional weights provided with EU-SILC are used as a starting point; however, we 'trim' some of the weights which are extremely large. When considering clusters of countries or all-EU averages, several weighting procedures are possible, and none are perfect. Procedures which have been used include (a) adjusting weights so that every country makes a contribution to the mean proportional to its population (the normal procedure for EU social statistics published by Eurostat); (b) adjusting weights so that every country makes an equal contribution to the mean; and (c) avoiding the issue by not adjust-

ing weights at all. Option (a) means that estimated means would be dominated by populous countries such as Germany and France, at the expense of smaller countries such as Malta and Luxembourg, which would make virtually no impression on means at all. Under option (b), by contrast, the influence of smaller countries may be inflated by a factor of several hundred relative to their population. We take a middle way between (a) and (b), by adjusting weights by a factor reflecting the square root of a country's population. This means that larger countries have a larger influence over regional averages than smaller countries, but not by such a huge margin as in (a).

## 4.4 Results

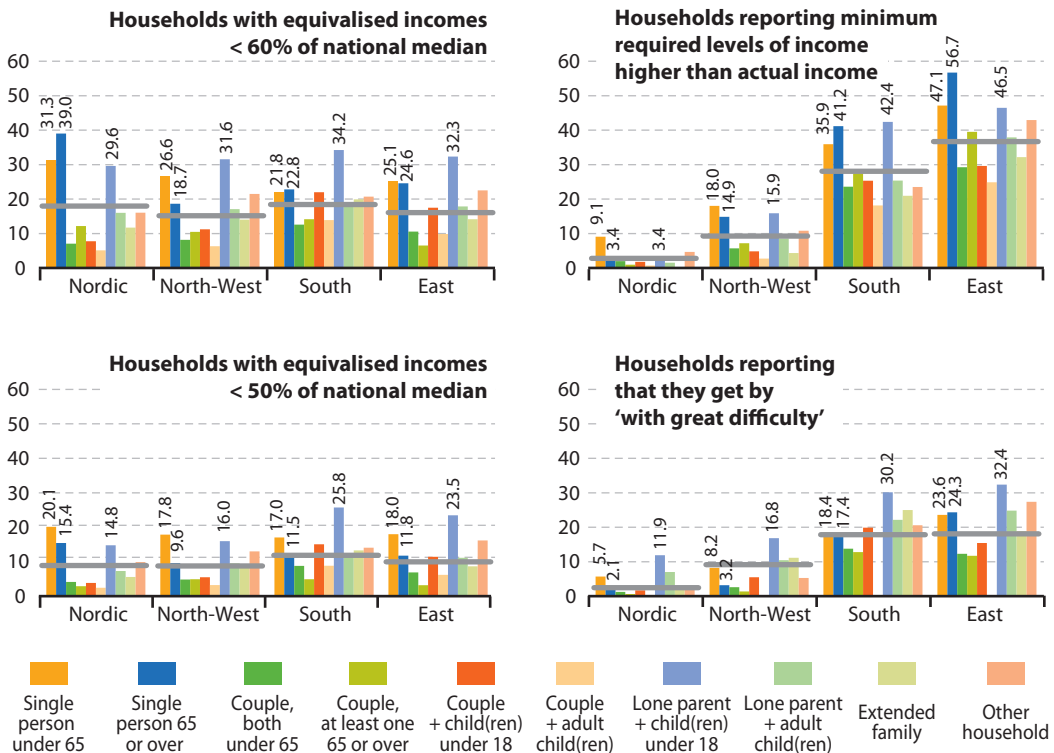
### 4.4.1 Income poverty and subjective hardship by household types, counting households rather than individuals

Figure 4.1 shows how the risks of income poverty and subjective hardship vary by household type, over the four clusters of countries defined in Table 4.1. The average risk of income poverty across all household types in each cluster is shown by horizontal lines on the graph; these aggregate percentages are given in Table 4.4 and discussed in Section 4.4.2.

The top left-hand panel shows the percentage of households defined as income-poor under the 60 % threshold. In all clusters of countries, lone parents are one of the household types with the highest risk of income poverty, with percentages ranging from just under 30 % in the Nordic countries to 34 % in the Southern countries. The other two household types at high risk are those living alone. For single elderly people, the risk of income poverty under the 60 % threshold ranges from 19 % in the North-Western countries to almost 40 % in the Nordic countries; for non-elderly single-adult households, the risk ranges from 22 % in the Southern countries to over 30 % in the Nordic countries. In all countries, couples with children under 18 are at a slightly higher risk of income poverty than non-elderly couples without

**Figure 4.1:** Percentage of households in income poverty or subjective hardship, by household type, 2012

(percentages of households)



*Reading note:* In the Nordic countries, of households composed of a single non-elderly person, 31.3 % of households are income-poor (under the 60 % threshold).

*Source:* Author's computation, UDB 2012-2.



**Table 4.4: Percentages of households and individuals in income poverty or subjective hardship, 2012**

(percentages of households or individuals, as indicated in Column 2)

		Income poverty: 60 % threshold	Income poverty: 50 % threshold	Subjective hardship: income insufficient	Subjective hardship: getting by 'with great difficulty'
Nordic	Households	17.3	8.6	3.4	2.7
	Individuals	13.4	6.6	2.5	2.4
North-Western	Households	15.7	9.0	9.8	5.4
	Individuals	14.2	7.6	7.7	5.7
Southern	Households	18.9	11.9	27.9	18.1
	Individuals	19.4	12.6	25.4	19.1
Eastern	Households	16.7	10.3	37.2	18.3
	Individuals	16.3	10.5	33.4	17.9

*Reading note:* In the Nordic countries, 17.3 % of households, and 13.4 % of individuals, are income-poor according to the 60 % threshold.

*Source:* Author's computation, UDB 2012-2.

children; the difference is very small in the Nordic and North-Western countries, and larger in the Southern and Eastern countries (where couples with children under 18 are slightly more likely than the average household to be poor).

In all clusters of countries, couples with adult children are less likely to be poor than couples with children under 18; indeed, income poverty rates among couples with adult children are similar to, or lower than, income poverty rates among couples with no co-resident children.

Turning now to the lower left-hand panel which shows the risk of more severe income poverty, under the 50 % national median threshold, we see that as expected, the percentages of households at this deeper level of income poverty are lower than when we consider the 60 % threshold. However, the distributions by household type are similar, with one important exception, namely that elderly people are comparatively less vulnerable to this deeper degree of income poverty. In all clusters of countries, single adults under age 65 are at a substantially higher risk of deeper income poverty than single adults over age 65; indeed, in all but the Nordic cluster, elderly singles are no more likely than the average household in the same region to suffer this degree of income poverty. This indicates that pension incomes or social assistance for elderly people, while in many

cases insufficient to keep them out of income poverty under the 60 % threshold, are sufficient to keep them out of income poverty at the 50 % threshold. By contrast, the levels of social assistance payable to younger adults, or low earnings, may not be adequate to keep them out of this deeper level of income poverty. This is evident to a greater or lesser extent in all country groups, and has clear implications for social policy and for considerations of intergenerational equity. It also highlights the fact that higher or lower income poverty thresholds, as well as yielding varying estimates of the percentage of the population who are below the threshold, may also result in 'poor' populations of different compositions.

Both the 50 % and 60 % poverty measures are based on national median incomes, and are by construction relative rather than needs-based measures. Under these measures, poverty rates in the more affluent regions of Northern and North-Western Europe are a little lower than, but not very different to, poverty rates in the less affluent regions of Southern and Eastern Europe. The two measures of subjective hardship, by contrast, incorporate elements of adequacy in relation to both absolute and relative needs (Berthoud, 2012). The fact that these measures incorporate an element of absolute need is reflected in the much larger differences between the more and less affluent regions in Europe.

The first measure defines as ‘in hardship’ those households where the household respondent reports a minimum level of income required to ‘get by’ higher than the actual level of income reported by the household <sup>(48)</sup>. Only 3 % of households in the Nordic countries report this type of hardship; the corresponding figures are 10 % for the North-Western cluster, and 28 % and 37 % for the Southern and Eastern clusters. Despite these differences in the levels of hardship, each region shows a distribution of hardship by household type which is (a) similar to the distribution under the relative income poverty measures, and (b) similar between country clusters. Once again, lone parents and single adults (elderly and non-elderly) are most likely to report hardship, while couples without children, and those living with adult children, are less likely; elderly couples and households in the ‘other’ category also report relatively high levels of hardship under this measure.

The lower right-hand panel reports the percentages of households which report that they get by ‘with great difficulty’. This is also a subjective measure, and in some sense it is an absolute rather than a relative measure of income poverty, although it does also reflect the degree to which people have adapted (or not) to their current level of income. As with the previous measure, we observe higher percentages reporting hardship in the Eastern and (particularly) the Southern countries, where incomes are lower, both in nominal terms and adjusted for purchasing power. Here, the figures are dominated by lone parents in every cluster of countries, with lone parents almost twice as likely to report that they get by ‘with great difficulty’ than single adults, either elderly or non-elderly (except in the Eastern countries, where they are still almost 10 percentage points more likely to report hardship than single adults).

#### 4.4.2 Income poverty and subjective hardship by household types, counting individuals rather than households

The figures discussed in the previous section related to the risk of income poverty or subjective hardship for households of a particular type. In this section we discuss the risk of income poverty or subjective hardship for *individuals* living in households of different types <sup>(49)</sup>. The risks across individuals are presented in Figure 4.2. In the case of single-person households and couple-only households, the figures are identical between Figures 4.1 and 4.2; this is because all households within each type are the same size. However, where household sizes vary, the two figures will be different. In some household types, larger households tend to be at higher risk of income poverty or subjective hardship. Where children are present, they contribute substantially to the needs of a household, but typically contribute only marginally to its income. In the case of families with children under 18, then, because larger households are at greater risk of income poverty, we would expect a higher percentage of individuals to be poor than the corresponding percentage of households.

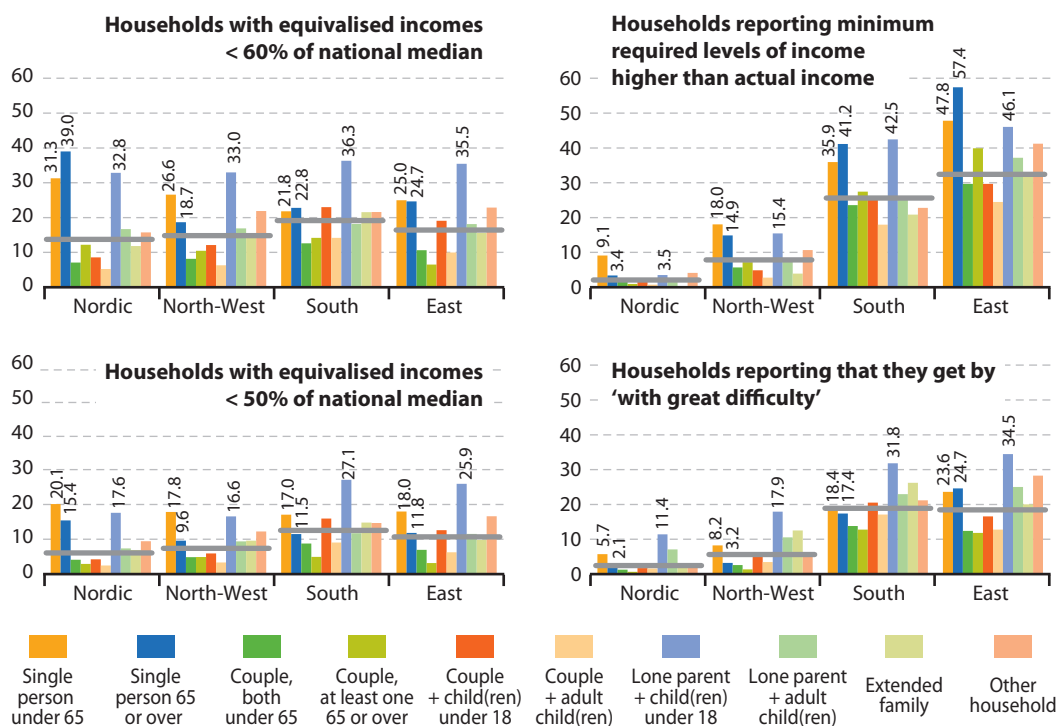
This effect may be reversed for some other household types. For example, where several adults live together, each additional adult would contribute to the estimated needs of the household by only a factor of 0.5, whereas they may bring in the same level of income as the household respondent. Here, we might expect larger households to be at lower risk of income poverty, and for a higher proportion of households rather than individuals to be at risk of income poverty or hardship.

In Figure 4.2, as in Figure 4.1, the aggregate percentages in income poverty or subjective hardship across all household types are shown with horizontal lines. The aggregate percentage of *individuals* in income poverty or hardship is in almost all cases smaller than the percentage of *households* in income poverty or hardship; this is because it is the smallest household types, namely single-person households, and to a lesser extent lone parent households, which

<sup>(48)</sup> Strictly, as discussed in Section 4.2.1, we consider as ‘poor’ those households whose actual incomes are under 95 % of their reported minimum to get by.

<sup>(49)</sup> Equivalised incomes are still calculated on the basis of total household income and not on individual income.

**Figure 4.2: Percentage of individuals in income poverty or subjective hardship, by household type, 2012**  
(percentages of individuals)



*Reading note:* In the Nordic countries, of individuals living in households composed of a lone parent plus children under 18, 32.8% are income-poor (under the 60% threshold).

*Source:* Author's computation, UDB 2012-2.

account for the highest rates of income poverty and hardship; larger households, such as couples with children and extended families, are less vulnerable. Table 4.4 shows that in many cases, the estimated aggregate risks of income poverty and hardship do not vary much according to whether we take the household or the individual as a base; however, in some cases they are sizeable: in the Nordic countries, for example, 17% of households, but only 13% of individuals, are below the 60% income poverty threshold. Figures 4.1 and 4.2 are very similar, in that the rankings between household types are virtually unchanged if we consider individuals rather than households as the unit of analysis. However, on the two indicators of income poverty, we do observe changes in the expected direction for larger households: households with children under 18, whether

headed by a couple or a lone parent, are at a higher risk of income poverty when the individual rather than the household is the unit of analysis. Interestingly, income poverty rates for couples and lone parents with adult children are *also* generally higher when the individual is the unit of analysis, indicating that the beneficial effects on the household finances of adult children who are earning, is outweighed, in aggregate terms, by the effects of adult children whose earnings are either very low or nil.

In addition, the subjective hardship estimates are affected very little by whether we take the individual or the household as the unit of analysis. Thus, although there are some differences between Figures 4.1 and 4.2, we may assert that the estimated risks of income poverty and/or hardship do not differ great-

ly according to whether the individual or the household is the unit of analysis.

How much do these profiles of income poverty and subjective hardship differ between clusters of countries? Income poverty is clearly more concentrated within a few household types in the Nordic countries, with single elderly people being around six times more likely to be poor than non-elderly couples without children; it is less concentrated in the Southern countries, with the risk for lone parents being under three times the risk of income poverty experienced by the least vulnerable household types.

However, if we rank household types by their risk of poverty, these rankings are very similar across all clusters of countries. Comparing rankings across pairs of country clusters yields a Spearman's rank correlation coefficient of over 90 % for the three pairs of country clusters which do not include the Southern countries, and coefficients of around 80 % for the three pairs of country clusters which do include the Southern countries. Thus, although there are differences in poverty and hardship profiles between the clusters of countries, these profiles also exhibit many similarities between country clusters: the three household types at greatest risk of poverty and hardship are (a) lone parents, (b) the single elderly, and (c) other single-person households <sup>(50)</sup>.

### 4.4.3 Composition of the income-poor and subjectively-deprived populations

The analysis in the previous sections revealed large disparities between household types in terms of the risk of income poverty and subjective deprivation. However, the household types at the highest risk of poverty form a minority of the population as a whole. Across the EU, lone parent households with children under 18 account for only around 4 % of households and individuals; the single elderly account for around 13 % of households but only 5 % of individuals, while the single non-elderly account for around 16 % of households but only 6 % of indi-

viduals. Thus, the three highest-risk household types, all together, account for only 32 % of households across Europe, and only 16 % of the total population. The highest-risk household types form a larger percentage of the population in the Nordic and North/Western countries (around 33 % of households and 20 % of individuals) than in the Southern and Eastern countries (around 27 % of households and 12 % of individuals).

In this section, we take as our starting point the sample of households and individuals that are in poverty or hardship, and analyse how the different household types are represented within those populations. We restrict the analysis to one indicator of income poverty (the 60 % threshold) and one indicator of subjective hardship (getting by with great difficulty).

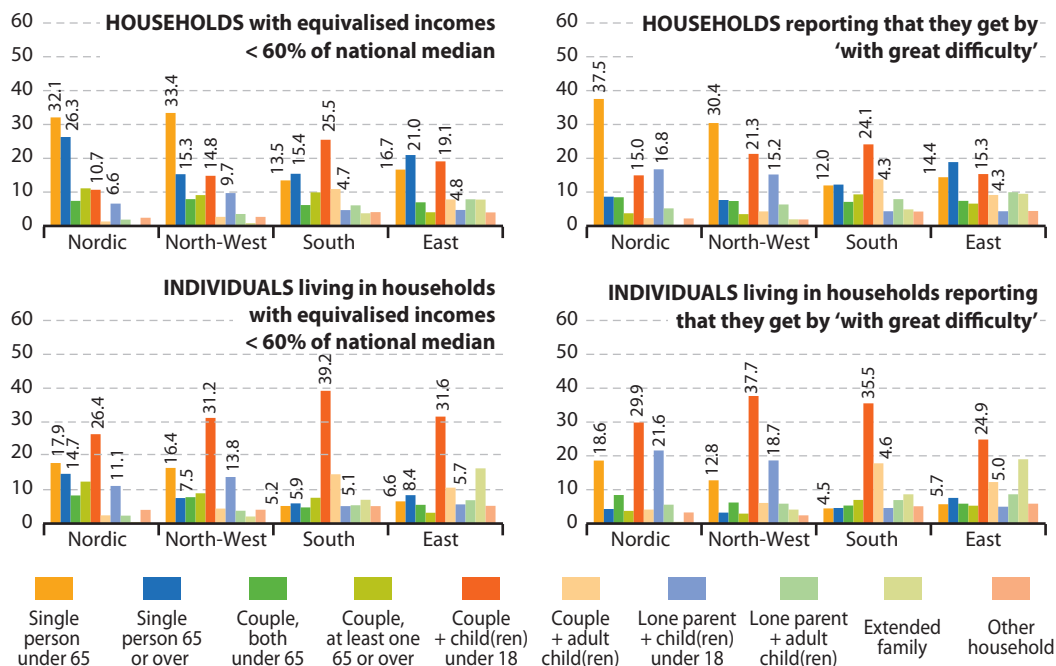
Figure 4.3 presents a breakdown of income-poor households (upper graphs) and subjectively-deprived households (lower graphs) by household type. These results are rather different from those in Figures 4.1 and 4.2. Looking first at the two upper graphs, depicting the population in income poverty, these are no longer dominated by lone-parent families, which, despite being at high risk of poverty and hardship, do not, because of their relatively small numbers, account for a high proportion of poor households. By contrast, we see that couples with children under 18, while at a relatively low risk of poverty, account for a much higher proportion of poor households: this proportion ranges from 11 % in the Nordic countries, to 26 % in the Southern countries if we consider the 60 % relative poverty risk line, and from 15 % in the Nordic and Eastern countries to 24 % in the Southern countries, if we consider the subjective poverty measure.

We also observe the largest differences between clusters of countries which we have so far seen in the course of this analysis, particularly in the case of single-adult households. When we considered the relative risks of different household types, single-adult households were at a higher-than-average risk of poverty and hardship in all country clusters; however, they certainly did not dominate the statistics. In Figure 4.3, however, single adults under age 65 account for over 30 % of poor households in the Nordic and North-Western countries; these figures are much higher than the correspond-

<sup>(50)</sup> We have also performed the same type of analysis for individual countries within country clusters, to confirm that these clusters are a valid means of grouping countries. These results are reported for the 2009 Wave of EU-SILC in Iacovou (2013).

**Figure 4.3: The distribution of household types among the income-poor and those getting by with great difficulty, 2012**

(percentages of households (upper graphs) and individuals (lower graphs))



NB: Percentages in each regional block add up to 100 %.

Reading note: In the Nordic countries, 32.1 % of income-poor households (60 % threshold) consist of a single person aged under 65. In the Southern countries, 35.5 % of individuals living in households getting by with great difficulty consist of a couple plus children under 18.

Source: Author's computation, UDB 2012-2.

ing figures for the Southern and Eastern clusters of countries, where single-adult households are far less numerous.

Looking now at the lower panels of Figure 4.3, which show the composition of the population in poverty or hardship, using *individuals* as the basis for accounting, we note that these are dominated by families with children under 18. Of individuals living in income-poor households, between 26 % (Nordic countries) and 39 % (Southern countries) live in couple-headed families with children under 18. These are much larger than the proportions living in lone-parent families (11 % in the Nordic countries, and only 5 % in the Southern countries). This pattern also holds when we consider individuals living in households reporting hardship: in three of the four

clusters of countries, people living in couple-headed families make a far larger contribution than those living in lone-parent families to the total number of people living in hardship. Taking one- and two-parent families together, families with children make up 37 % of the poor population in the Nordic and Eastern countries, and 44-45 % in the North-West and Southern countries. Not all of these individuals are children, since their parents are also counted as part of this total; nevertheless, these figures highlight the extent of child poverty across Europe.

In the Southern and Eastern clusters of countries, lone parents form a smaller proportion of the pool of people in poverty and/or hardship than in the Northern and North/Western countries, due to their generally smaller numbers; instead, in Southern and

Eastern countries, couples with adult children make a considerable contribution to the pool of poor people. In the Eastern countries, people living in extended-family households also form a large contribution to the numbers of poor. Although, across the Eastern cluster of countries, people in extended-family households are at only an average risk of poverty and hardship, extended-family households are fairly numerous across this region (see Iacovou and Skew, 2011), and are on average larger than any other household type.

## 4.5 Conclusions

The analysis in this chapter has analysed (a) how the risk of income poverty and subjective hardship varies between different household types across the EU, and (b) how the household type composition of the pool of people living in income poverty and subjective hardship varies between the countries and regions of the EU.

When income poverty is considered (that is, when a relative concept is used, according to which a household and all its members are at risk of poverty if it falls below a percentage of national median income (in this chapter: 50 % and 60 %)), poverty rates computed for the total population do vary between regions and between countries within regions; however, these variations tend not to be large, precisely because of the use of a relative measure.

If, instead, we consider subjective hardship, we observe large differences between country clusters in terms of the levels of hardship reported; these reflect real differences in living standards between regions. However, the same household types — lone parents and single-person households — are at an elevated risk of subjective hardship in all country clusters, whether we consider income poverty or subjective hardship.

The household types with the highest risks of income poverty and/or subjective hardship are proportionally much more numerous in the Nordic and North-Western countries than they are in the

Southern and Eastern regions. Thus, while people living in single-person and lone-parent households account for a sizeable fraction of individuals in poverty and hardship in the Nordic, and to a lesser extent the Northern, countries, this is not the case across Eastern and Southern Europe, where the household types at the highest risk of income poverty and subjective hardship account for only a small minority of the population suffering these types of disadvantage. In the Eastern and Southern countries, families with children under 18 constitute by far the largest share of the income-poor or living-in-hardship population; families with adult children and extended-family households also account for a large percentage of the poor or living-in-hardship population.

In this chapter, we have attempted to analyse the relationship between household structure, on the one hand, and income poverty and subjective hardship, on the other hand. We have shown that, to the extent that differences in household composition do affect rates of poverty and hardship, this effect comes not via substantial differences in the relative risks of income poverty or subjective hardship between one household type and another, but primarily via differences in household composition between countries.

These findings raise some interesting issues of policy and methodology. We have already noted the distinction between household types which are at an elevated risk of poverty or hardship on the one hand, and household types making a large contribution to the pool of people living in poverty or hardship, on the other; and the dilemmas this may create in terms of the targeting of social policy. The analysis in this chapter also raises questions about the use of equivalence scales in the calculation of income poverty indicators. These scales were developed with the nuclear family in mind, and are based on assumptions about income sharing within the nuclear family. These assumptions are certainly questionable in the context of the nuclear family, but they are even more questionable in the context of non-nuclear extended families, which are prevalent across large swathes of the new Member States and which account for a sizeable proportion of Europe's poor.

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# 5

## Income poverty, affluence and polarisation viewed from the median

Rolf Aaberge, Anthony B. Atkinson and Henrik Sigstad <sup>(51)</sup>

### 5.1 Introduction

EU-SILC provides a rich source of evidence about the distribution of income in different countries. At the same time, the very richness of the data is a challenge, and it is not surprising that much of the analysis has tended to focus on particular features of the distribution, such as the extent of income poverty or the tendency for the middle of the distribution to be hollowed out. But, as the recent debate about inequality has brought out, it is not enough to look at one single indicator. Our statistics have to be encompassing. This becomes even more important as policymakers become increasingly concerned with linking macroeconomic outcomes with their impact on the well-being of individual citizens. It is not enough to replace GDP per head by just another number. As has been well recognised in the design of the EU social indicators, there is need for contextual information.

The aim of the present chapter is to bring together different features of the distribution — income poverty, affluence and dispersion — in a single framework that allows ready comparisons across countries and across time. We believe that such a unified framework contributes both to the policy debate and to the theoretical understanding of inequality. The former is well illustrated by the recent media and

political interest in inequality generated by the publication of the English translation of Thomas Piketty's *Capital in the Twenty First Century* (Piketty, 2014). Attention in the debate has focused on the top 1 %, and how their share of income is racing away, particularly in Anglo-Saxon countries. But others have asked how this relates to what is happening at the bottom of the income ladder. Do rising top shares have implications for the ambitions of the EU to reduce the number at risk of poverty or social exclusion under the Europe 2020 agenda? Are the countries with rising top incomes also those that are failing to meet the objective of reducing income poverty and social exclusion? When one turns to the academic arena, one finds too a need to bring together separate debates. There are at present largely separate literatures on the measurement of income poverty, (to a limited degree) affluence, and on bi-polarisation <sup>(52)</sup>.

In relation to the EU social indicators, the present chapter may be seen as providing complementary information. Methods developed at Statistics Norway (set out in Aaberge and Atkinson, 2013) are applied to the EU-SILC data for 2012 to show how these tools extend the concept of contextual indicators. One major purpose of this complementary information is to test the robustness of the conclusions drawn to the choice of indicator. As has been recognised from the outset, there is a degree of arbitrariness to the choice of a particular percentage (60 %) of the median as the at-risk-of-poverty threshold. When comparing the progress made by different Member States towards the Europe 2020 targets, we need to know how sensitive the conclusions are to the per-

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<sup>(52)</sup> We refer to this as 'bi-polarisation', to distinguish it from other concepts of polarisation, notably those pioneered by Esteban and Ray (1994, 1999 and 2012) and Duclos, Esteban and Ray (2004).

centage cut-off. Has a country achieved a substantial reduction in income poverty by ‘gaming the system’, concentrating financial help on those nearest to the cut-off? How should the evolution of the income poverty rate be seen in terms of the changes in the income distribution as a whole? For these purposes, the existing contextual EU indicators, the income quintile share ratio and the Gini coefficient (see definitions in Chapter 1 of this volume), while together informative, may not be sufficient. In particular, they do not address two of the issues that have surfaced in recent debate: the ‘squeezing of the middle’ and the ‘racing away’ of the top 1 %.

## 5.2 Poverty, affluence and dispersion in theory

The key elements in the approach adopted here are familiar ones. They are characterised by the keywords: graphics, dominance, and cumulation. All three have a long history, having been embodied in the Lorenz curve introduced in 1905. The Lorenz curve is a graphic device. It is based on cumulating people and incomes from the bottom; and it allows us to see whether one distribution is Lorenz-superior to (dominates) another. Where we depart is in taking the median as a point of reference. In a sense, we are following a trend. As has been widely recognised, with the rise in inequality at the top in a number of countries, notably the United States, the mean has become a less satisfactory indicator of overall progress, and attention is turning to the median. As it was put by the Stiglitz Commission, ‘median consumption (income, wealth) provides a better measure of what is happening to the “typical” individual or household than average consumption (income or wealth)’ (Stiglitz et al., 2009, pp. 13-14 of Executive Summary). In the literature on the ‘middle class’, this group is typically defined in terms of a range around the median. Following the recommendation of the Eurostat Task Force (1998) on social exclusion and poverty statistics, the EU social indicators for income poverty (referred to at EU level as *poverty risk* <sup>(53)</sup>)

are based on an income threshold defined as a percentage of the median, rather than the mean as had previously been employed (see Atkinson et al, 2002, p. 94).

### 5.2.1 The median and poverty measurement

How is the median taken as a point of reference? We start from the fact that, in the countries covered by EU-SILC, poverty is a minority phenomenon. No one would consider poor a person with income (by which we mean equalised disposable income per person in the household) at the median. If we define  $z$  as income relative to the median, then the poverty line is set at  $z^*$ , where  $z^*$  is below 1, and the poverty headcount is  $F(z^*)$ , where  $F()$  is the cumulative distribution. Whereas there may be a range of views about the choice of  $z^*$ , there is general agreement that  $z^*$  should be below some  $z_+$ , where  $z_+ < 1$ .

The distribution of income below the median is illustrated in left hand part of Figure 5.1, which shows  $F(z)$  from 0 to  $\frac{1}{2}$  at  $z = 1$  (the median). For any  $z^*$  we can read off the headcount from the vertical axis, as shown by the dashed lines. The maximum poverty line  $z_+$  demarcates the range of permissible poverty lines. If for two countries the curves do not intersect in the range from 0 to  $z_+$ , then the lower curve dominates and we can conclude that there is a lower rate of income poverty for all permissible poverty lines. The first important point to be noted is that the poverty line is defined in primal space: i.e. income. We define poverty in terms of income below a specified level and the unknown is the percentage of people. An alternative would be to define poverty as people in the bottom  $x$  %, when the unknown would then be the income at the  $x$ -th percentile. This ‘dual’ approach is not one that has been adopted in the EU at-risk-of-poverty indicators, although it is widely used when investigating the distribution of earnings, when the OECD and others report the earnings at the bottom decile (as a proportion of the median). In what follows, though, the distinction between primal and dual approaches runs through the chapter.

<sup>(53)</sup> In this chapter, ‘poverty’ always refers to income poverty.

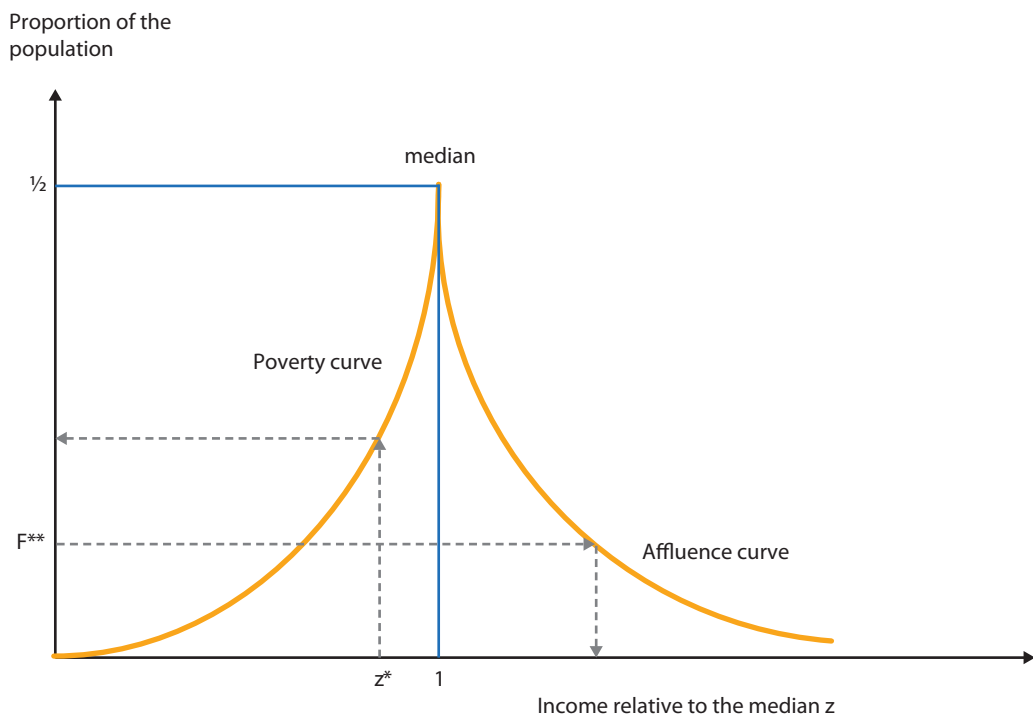
## 5.2.2 Affluence

The left hand part of Figure 5.1 is familiar. Eurostat publishes the dispersion around the at-risk-of-poverty threshold, taking cut-offs of 40, 50, 60 and 70 %. The right hand part of Figure 5.1 is less familiar. This construction, which is due originally to Foster and Wolfson (1992/2010) (we have simply turned their Figure 9 upside down) shows the half of the distribution above the median in the form of  $(1-F(z))$  for  $z \geq 1$ . In effect, this inverts the upper half of the cumulative distribution, showing the proportion of people *above* any given threshold. Concern with 'affluence' is commonly presented in terms of the top 10 % or the top 1 %. In terms of the distinction drawn in the previous paragraph, this approaches the measurement of af-

fluence from the perspective of the dual. In Figure 5.1, as shown by the dashed lines, it means starting from a given percentage on the vertical axis, such as  $F^{**}$ , and reading across to the income required to enter this group. For example, from the World Top Incomes Database <sup>(64)</sup> one can see that, in France in 2009, to appear in the top 1 % of gross incomes it was necessary to have an income 4.8 times the mean.

There are however good reasons for considering a primal approach to measuring affluence. Not only does this parallel the approach adopted in the measurement of poverty, but defining a cut-off above which people can be classified as 'rich' allows the proportion of rich people to vary. There will always be a top 1 %, but a society concerned about the dis-

**Figure 5.1: Poverty and affluence curves**



*Reading note:* The left hand ('poverty') curve shows the proportion of the population with income less than or equal to a poverty defined relative to the median; the right hand ('affluence') curve shows the proportion of the population with income equal to or above an affluence threshold defined relative to the median.

<sup>(64)</sup> <http://topincomes.g-mond.parisschoolofeconomics.eu>

tance between the top and the bottom may seek to reduce the number of people with incomes above the 'affluence' cut-off<sup>(65)</sup>. Such an approach to defining affluence has been adopted by Peichl, Schaefer and Scheicher (2010, p. 608), who take the richness line to be twice the median, describing it as 'arbitrary but common practice', whereas Brzezinski (2010) also considers lines equal to three and four times the median.

Again, we may apply a dominance test to the affluence curve, 1-F. Suppose that we are agreed that the affluence threshold  $z^{**}$  is no lower than  $z$ . Where the curve for one country lies everywhere below that for another country for all  $z \geq z$ , then the affluence score is lower for all cut-offs. This is important, since, as the examples above suggest, there is less agreement about the appropriate threshold. It may for example be agreed that a person cannot be rich unless they have at least twice the median ( $z = 2$ ), but people disagree whether  $z^{**}$  should be 2, 3, 4 or higher.

### 5.2.3 Intersection and cumulation

Application of the principle of dominance only allows us to make definite comparisons in cases where the relevant curves do not intersect. The ranking can only be extended by attaching a weighting. In the inequality measurement literature, this has proceeded by cumulation, based on the assumption that a higher weight is attached to those who appear earlier in the sum (or integral). This allows us to move from first-degree dominance (of the cumulative distribution) to second-degree dominance (of the Lorenz curve). The crucial question then concerns the starting point for the cumulation. When measuring poverty, it is natural to cumulate from the lowest income, attaching most weight to the poorest. This is the procedure embodied in the Lorenz curve, and the basis for Lorenz dominance is that it ranks distributions in the same way as all social welfare functions where the marginal valuation of income falls (or does not increase) with income. It follows that, if the poverty curve for country A starts out above that for country B, then it can never dominate.

In contrast, when measuring affluence we may wish to attach most weight to transfers affecting those at

<sup>(65)</sup> Reasons why societies may be concerned with the top of the distribution are discussed in Atkinson (2007).

the top of the income scale<sup>(66)</sup>. This means cumulating downwards, as proposed in Aaberge (2009). In terms of Figure 5.1, it means integrating from the right. If the affluence curve for country A ends above that for country B, then it can never dominate.

### 5.2.4 Specific measures

In order to make a complete ranking, and attach numerical values, further assumptions have to be made so as to yield a specific indicator. Table 5.1 shows the different indicators employed here, where, as already signalled, we consider both primal and dual approaches. In arriving at specific indicators, the first key assumption is an independence axiom, which ensures linearity of the indicator in the relevant variable ( $F$  in the case of the first line in Table 5.1). The axiom takes a different form in the primal and dual cases. The second assumption is that the remaining part of the indicator should be a power function, leaving the choice of the parameter  $k$  that determines how rapidly the weights fall away. The effect of weighting may be seen in the case of the first indicator, which is the integral of poverty headcounts measured at each value of  $z$  ( $z$  is equal to  $x/M$ ) from 0 to 1, weighted by the gap from the median ( $1-z$ ) to the power of  $(k-1)$ . This primal indicator of poverty may therefore be viewed as corresponding to the Foster-Greer-Thorbecke (FGT) poverty measure; the dual indicator shown in the second line of Table 5.1 corresponds to the Sen (1976) poverty measure<sup>(67)</sup>. Where  $k=1$ , the two indicators are equal, but for  $k$  greater than 1 the two indicators diverge. In both cases, the weights vary between  $k$  (at  $z=0$ ,  $F=0$ ) and 0 (at  $z=1$ ,  $F=1/2$ ), but the pattern of weighting is different. With the primal indicator, with  $k=2$ , a person with zero income has a weight of 2, but a person with an income equal to half the median has half the weight. With the dual indicator, half weight would be reached when we are at the lower quartile, which is typically further up the distribution. If this is the case, then it ex-

<sup>(66)</sup> It should be noted that, in contrast to Peichl, Schaefer and Scheicher (2010), we are assuming that the principle of transfers applies.

<sup>(67)</sup> See Aaberge and Atkinson (2013). By replacing the median  $M$  with a poverty threshold  $T$  less than  $M$ ,  $\Psi_k$  coincides with the FGT poverty measure of power  $k$  and  $\Pi_k$  coincides with a modified version of the Sen poverty measure.

**Table 5.1: Summary indicators**

Poverty		
$\Psi_k$	$k \int_0^1 (1-z)^{k-1} F(Mz) dz$	Primal: weight = income gap from median
$\Pi_k$	$k \int_0^1 (1-2F(Mz))^{k-1} (1-z) dF(Mz)$	Dual: weight = note that the rank of the bottom half of distribution (note that the rank of the median = 0)
Affluence		
$\Lambda_k$	$k \int_1^5 (z-1)^{k-1} (1-F(Mz)) dz$	Primal: weight = income minus median
$\Gamma_k$	$k \int_1^5 (2F(Mz)-1)^{k-1} (z-1) dF(Mz)$	Dual: weight = rank from top down in top half of distribution (median = 0)

*NB:* (1)  $x$  denotes income;  $M$  denotes the median;  $k$  is a parameter;  $F$  denotes the cumulative distribution;  $t$  denotes rank. (2) The formulae for the affluence indices apply only to values of  $k$  for which the integral converges.

plains why primal measures may be more sensitive to outliers than dual measures.

### 5.3 Poverty and affluence in EU-SILC

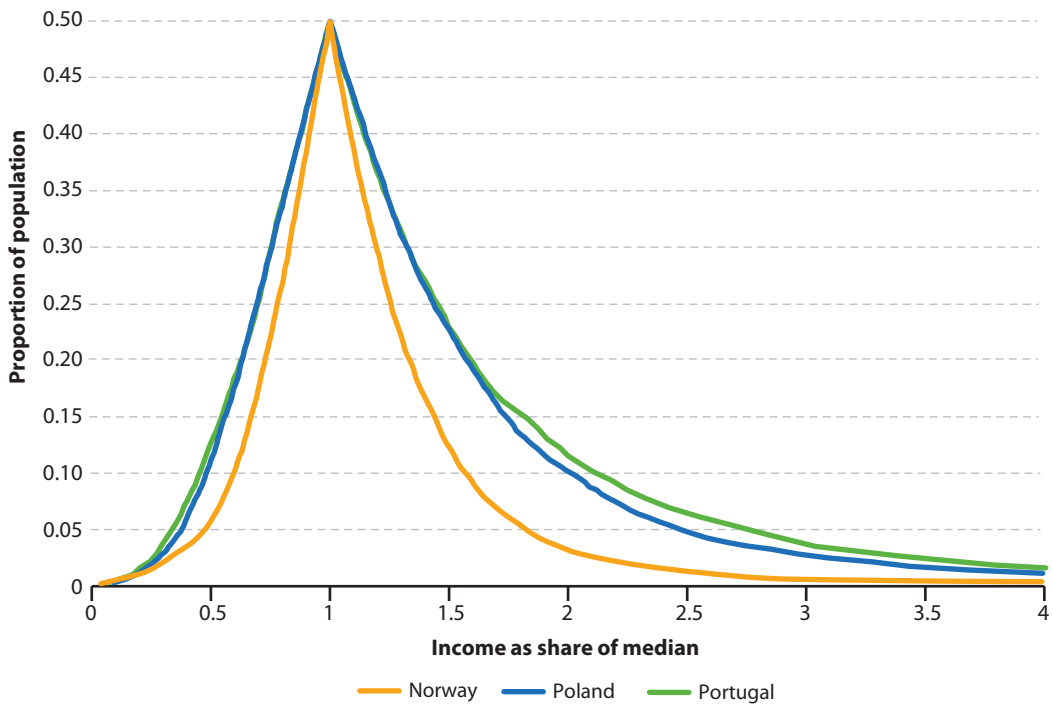
The approach described above has been implemented using the EU-SILC data for 2012. These data refer in general to the income year 2011 (exceptions are Ireland and the UK; see Chapter 2 of this volume). Negative incomes have been set to zero. All households with missing income data and those consisting only of students have been excluded. The fact that we use 1 year as the analytical period instead of a life-cycle perspective means that we are unable to capture the full economic value of being a student. Students partly live on loans justified by higher expected income in the future. Students' low cash income is temporary and thus will not be considered to be associated with poverty. This practice is consistent with the (national) official poverty statistics in several countries.

#### 5.3.1 Dominance

We begin with Figure 5.2, which illustrates well three considerations. It shows the poverty and affluence curves for Norway, Poland and Portugal. In each case, the poverty curves are for the full range  $z$  from 0 to 1, and the affluence curves from  $z=1$  to  $z=5$ . The curves meet at  $(1, 1/2)$ . The first two considerations are meth-

odological. First, there is considerable 'noise' at the tails of the distribution. The same occurs (but is less obvious in Figure 5.2) as the median is approached. From the standpoint of considering dominance, this suggests that the dominance condition should be applied to a restricted range. On a primal approach, we should limit the range of  $z$  over which dominance is tested.

The second point concerns the statistical criterion for ranking. As may be seen from Figure 5.2, the poverty curves for Poland and Portugal are virtually indistinguishable over much of the range and we would not expect a statistical test, taking account of the sampling error, to reject the hypothesis that the poverty curves coincide (over a restricted range). However, as argued in Atkinson, Marlier, Montaigne and Reinstadler (2010), sampling error is not the only consideration when considering the policy significance of differences in poverty rates. When examining changes over time, Atkinson et al. (2010) took a two percentage points difference as salient, and the same practice is followed here. A country is said to dominate another where the poverty/affluence curve is at least two percentage points lower at some point and is nowhere more than two percentage points higher. No ranking can be made where the differences are everywhere less than two percentage points ('identical'), or where both countries are at some point at least two percentage points lower ('intersecting'). (Alternatively the dominance condition could be stated in terms of differences measured horizontally.)

**Figure 5.2: Poverty and affluence curves for Norway, Poland and Portugal, 2012**

*Reading note:* The curves show that over most of the income range both poverty and affluence are lower in Norway than in Poland and Portugal.  
*Source:* Authors' computation, UDB August 2014.

The third point is substantive. It may be seen by eye from Figure 5.2 that the curves for Norway dominate over most of the range in both directions. Fewer people proportionately in Norway are below any poverty threshold; and fewer people are above any affluence threshold. The poverty curve for Poland is slightly below that for Portugal. Also, the affluence curve for Poland lies clearly inside that for Portugal for much of the income range. We have therefore a clear picture of the differences between the distributions in the three countries, which can be summarised as follows, where the Table 5.2 should be read horizontally.

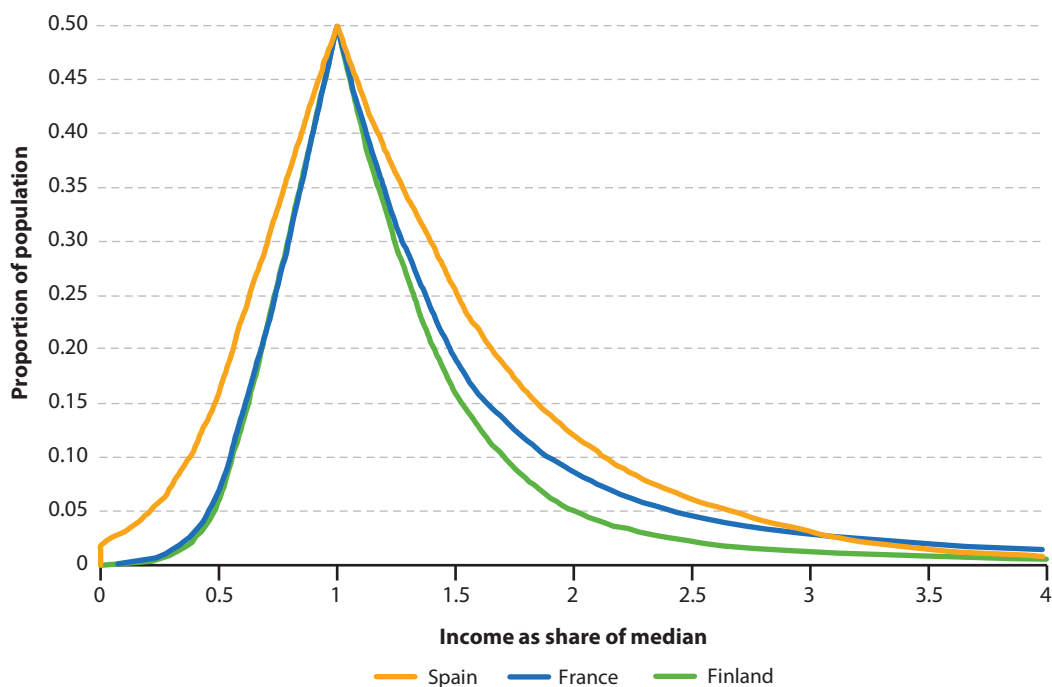
A selection of results for other countries is shown in Figures 5.3 to 5.5, where in each case we compare three countries. Figure 5.3 compares Finland, France and Spain. As would be expected from the published Eurostat figures, the poverty curve for Spain is well outside those for the other two countries at 60 % of

the median, and this is true throughout the range of  $z$ . The poverty curves for Finland and France, on the other hand, seem indistinguishable. In contrast, the affluence curve for Finland lies inside those for the other two countries for most of the range. On the other hand, the affluence curves for France and Spain intersect, suggesting that there are more rich households in France for cut-offs above 3 times the median. Figure 5.4 compares Austria, Bulgaria and Germany. In this case, Bulgaria clearly lies outside on both sides of the median. Above the median, Austria and Germany appear to be indistinguishable, but below the median the poverty curves intersect. At low levels of the poverty cut-off, Germany has a lower poverty rate, so that it cannot be dominated by Austria. However, the poverty curves intersect well before we reach 50 % of the median, leading to Austria performing better on the AROP indicator. Figure 5.5 compares Slovakia and the UK. Slovakia clearly performs better in terms of the affluence curve.

**Table 5.2: Ranking of Norway, Poland and Portugal, 2012**

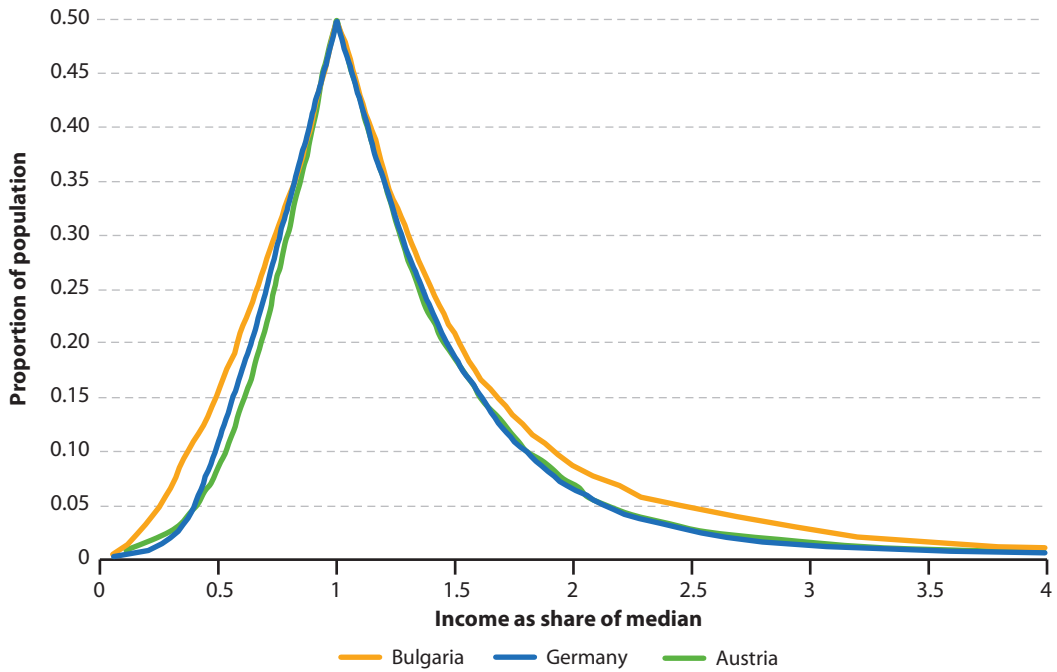
	Poland	Portugal
Norway	Dominant on poverty	Dominant on poverty
	Dominant on affluence	Dominant on affluence
Poland	Dominant on poverty	Dominant on poverty
	Dominant on affluence	Dominant on affluence

Reading note: Dominant on X means less X.

**Figure 5.3: Poverty and affluence curves for Spain, France and Finland, 2012**

Reading note: The curves show that over the entire income range poverty is higher in Spain than in Finland and France and that affluence is higher over most of the income range.

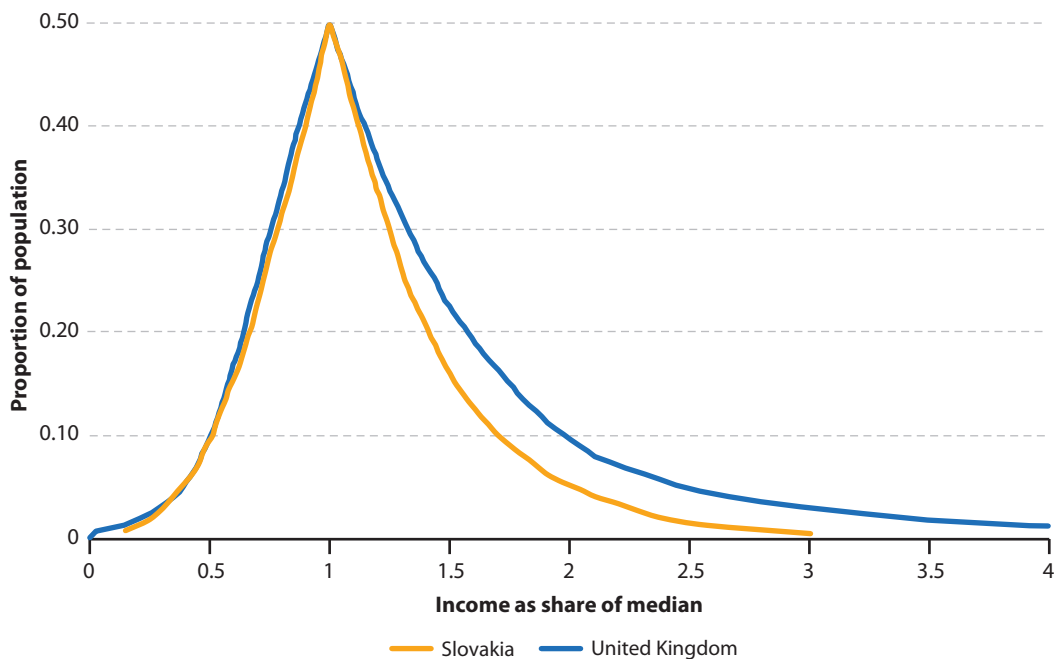
Source: Authors' computation, UDB August 2014.

**Figure 5.4:** Poverty and affluence curves for Bulgaria, Germany and Austria, 2012

*Reading note:* The curves show that over most of the income range both poverty and affluence are higher in Bulgaria than in Austria and Germany.

*Source:* Authors' computation, UDB August 2014.



**Figure 5.5: Poverty and affluence curves for Slovakia and the UK, 2012**

*Reading note:* The curves show that over most of the income range both poverty and affluence are lower in Slovakia than in the United Kingdom.  
*Source:* Authors' computation, UDB August 2014.

As the above examples show, in some cases we have clear rankings, but not in others. Table 5.3 summarises the rankings obtained applying the criteria described above for 29 countries, where dominance is defined over the ranges  $0 \leq z \leq 0.75$  (poverty) and  $1.5 \leq z \leq 5$  (affluence)<sup>(58)</sup>. The 29 countries are 26 of the 28 EU Member States (no data were available for Belgium and Ireland) plus Iceland, Norway and Switzerland. The first conclusion is that the application of these dominance criteria yields a clear ranking in the great majority of cases: for the 406 possible comparisons for each of poverty and affluence, there

are simply 50 question marks for the poverty curves, and only 26 in the case of the affluence curves. In the case of Norway, for example, there is a clear dominance with regard to the poverty curve over all countries apart from Finland, Iceland, Luxembourg, Malta and the Netherlands. The second conclusion is that there are a surprising number of cases (57 in all) where there is a clear ranking but it is in opposite directions for poverty and affluence. The UK, for example, has less poverty, but more affluence, than Italy and Estonia.

<sup>(58)</sup> It should be noted that sample sizes may be small at high values of  $z$ .

**Table 5.3: Dominance of affluence (upper row) and poverty curves (lower row), 2012**

	NO	NL	CZ	SI	FI	FR	CY	SE	AT	CH	LU	HU	MT	DK	SK	DE	UK	PL	PT	LT	HR	IT	EE	BG	LV	ES	RO	EL	
Iceland	-	+	+	-	+	+	+	-	+	+	+	+	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Norway																													
	?	+	+	?	+	+	+	+	+	?	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Netherlands			-	-	?	+	+	-	+	+	+	+	+	-	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+
			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Czech Republic					-	+	+	-	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+
				+	?	+	+	+	+	?	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Slovenia					+	+	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
					?	+	+	+	+	?	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Finland						+	+	-	+	+	+	+	+	-	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+
						+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
France								+	-	-	-	-	-	-	-	-	+	+	+	+	?	+	+	+	+	+	?	+	
								+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cyprus									-	-	-	-	-	-	-	+	+	+	+	?	-	+	?	+	+	+	+	-	
Sweden										+	+	+	+	+	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+
										+	?	?	?	?	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Austria										?	+	-	-	-	-	?	+	+	+	+	+	+	+	+	+	+	+	+	+
											+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Switzerland											+	?	-	-	-	?	+	+	+	+	+	+	+	+	+	+	+	+	+
											?	+	?	?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Luxembourg											-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+
																?	+	+	+	+	+	+	+	+	+	+	+	+	+
Hungary															-	-	-	?	+	+	+	+	+	+	+	+	+	+	+
Malta																													
Denmark																													
Slovakia																													
Germany																													
United Kingdom																													
Poland																													
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Lithuania																													
Croatia																													
Italy																													
Estonia																													
Bulgaria																													
Latvia																													
Spain																													
Romania																													

Reading note: The first row compares Iceland with other countries. The entry in the second column of the first row compares Iceland and Norway; the minus sign in the upper part means that affluence is higher in Iceland; the plus sign in the lower row means that poverty is lower in Iceland.

Source: Authors' computation, UDB August 2014.

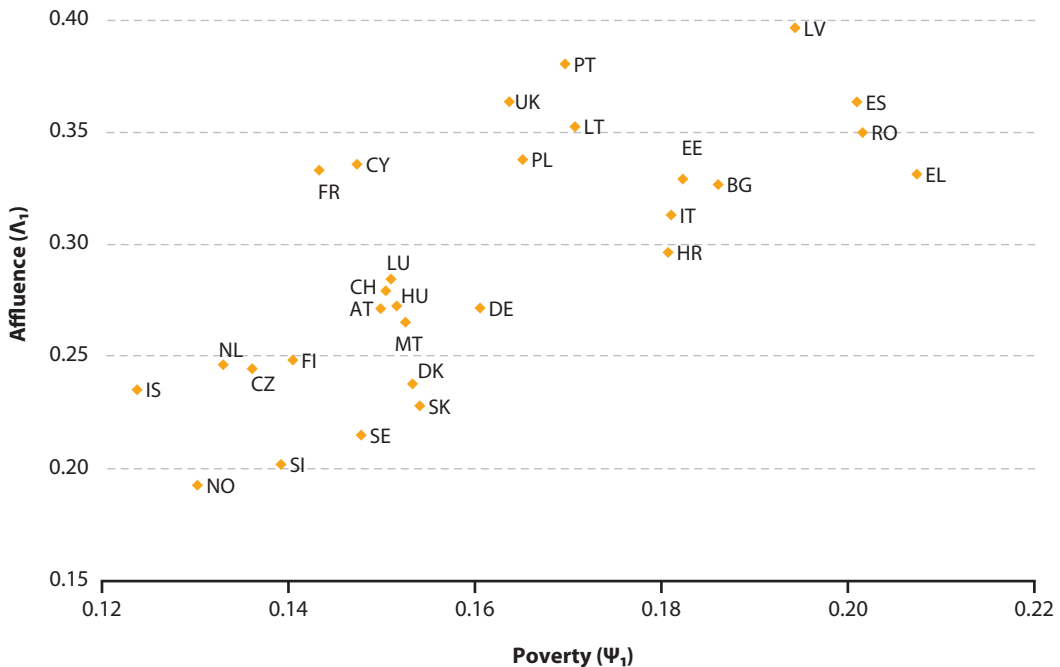
### 5.3.2 Summary measures

The indices described in Section 5.2 (Table 5.1) may be used to summarise the performance of different countries in the poverty and affluence dimensions. Figure 5.6 shows the ranking of the 29 countries using values of  $k=1$ , which is the gap measure (where the primal and dual coincide). Many countries are ranked similarly for poverty and affluence. These include Norway and Slovenia, with low scores (high rankings), Austria, Germany and Switzerland in the middle, and Romania and Spain with high scores (low rankings). But there are countries that perform better on poverty than on affluence. Portugal and the UK, for example, have high affluence scores but do better in terms of their poverty ranking. France

and Cyprus are much better performers in terms of poverty than of affluence.

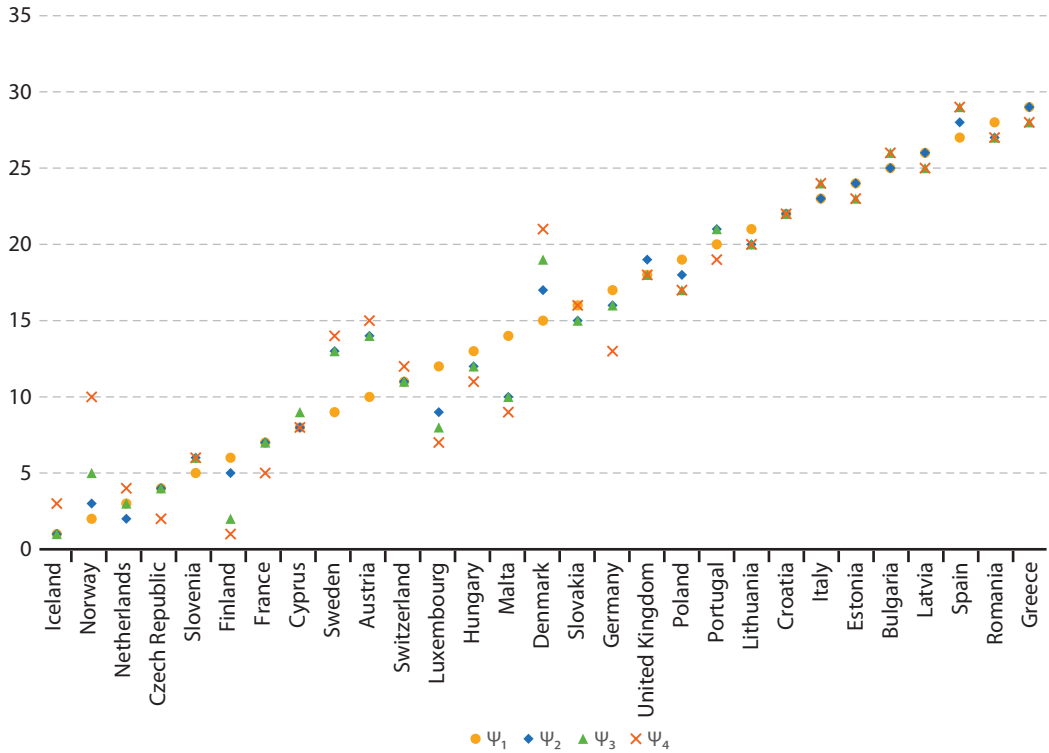
How sensitive are these rankings to the choice of index? Figures 5.7a and 5.7b show the primal and dual indices for poverty starting from  $k=1$ , but then considering the higher values of  $k=2$ ,  $k=3$  and  $k=4$ . As may be seen, there are some changes in rankings, and there is some indication that the dual measures are less sensitive to the choice of  $k$ . Figure 5.8a and 5.8b show that the primal measures of affluence are much more affected. (In considering these results, one has to ask how far they are influenced by the use of different data sources. It is possible that the register countries have more extensive coverage of higher incomes.)

**Figure 5.6: Comparing measures of affluence and poverty, 2012**



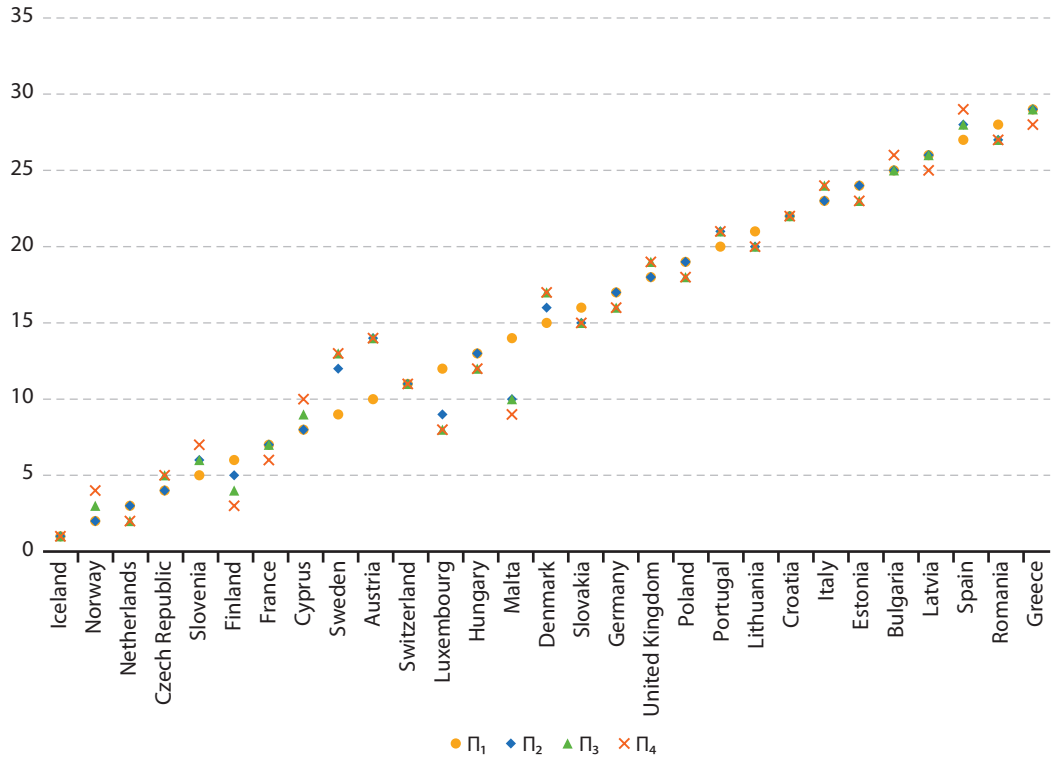
*Reading note:* Iceland is ranked first with the poverty measure, whereas Norway is ranked first with the affluence measure.

*Source:* Authors' computation, UDB August 2014; no data for BE and IE.

**Figure 5.7a: Ranking by primal measures of poverty, 2012**

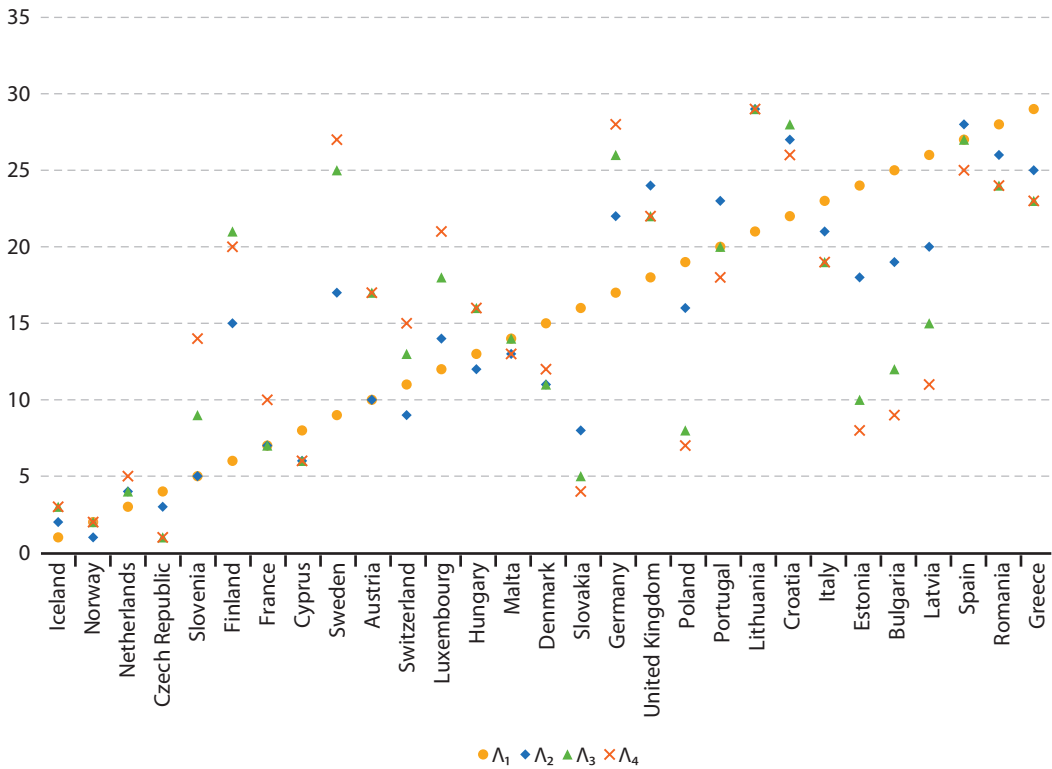
Reading note: Iceland is ranked first with the primal poverty measures  $\Psi_1$ ,  $\Psi_2$  and  $\Psi_3$ , whereas Finland is ranked first with  $\Psi_4$ .

Source: Authors' computation, UDB August 2014.

**Figure 5.7b: Ranking by dual measures of poverty, 2012**

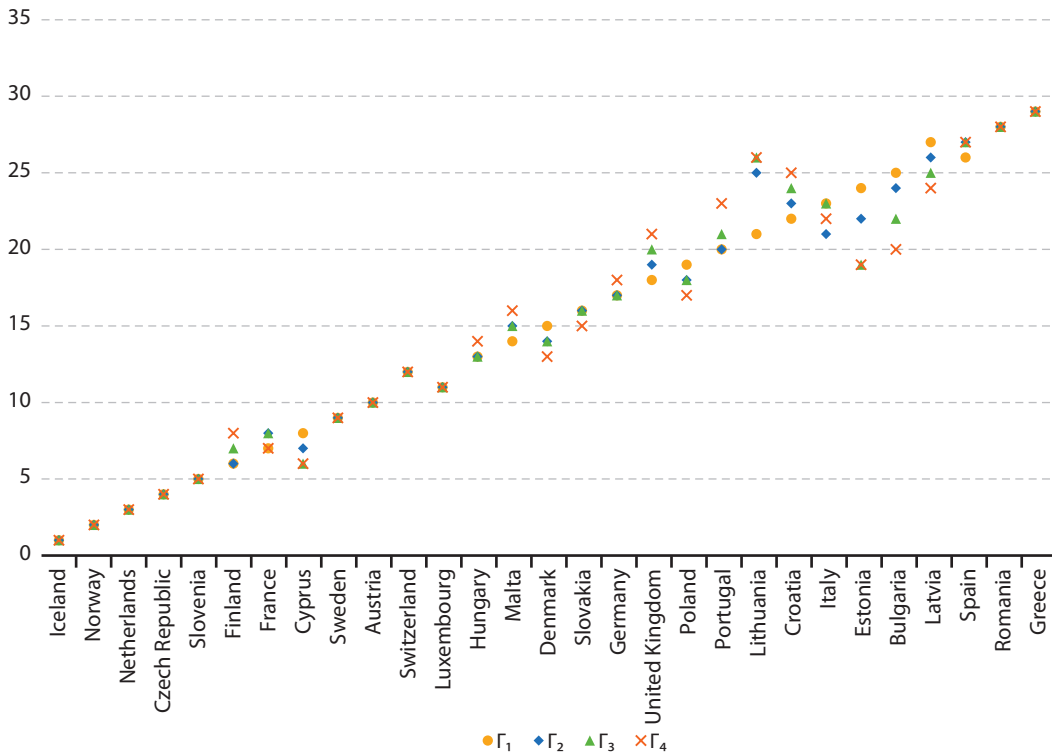
Reading note: Iceland is ranked first with all four dual poverty measures.

Source: Authors' computation, UDB August 2014.

**Figure 5.8a: Ranking by primal measures of affluence; k=1 to 4, 2012**

*Reading note:* Iceland is ranked first with the affluence measure  $\Lambda_1$ , Norway is ranked first with the affluence measure  $\Lambda_2$  and the Czech Republic is ranked first with the affluence measures  $\Lambda_3$  and  $\Lambda_4$ .

*Source:* Authors' computation, UDB August 2014.

**Figure 5.8b: Ranking by dual measures of affluence, 2012**

Reading note: Iceland is ranked first on all four of the values of the dual affluence measure.

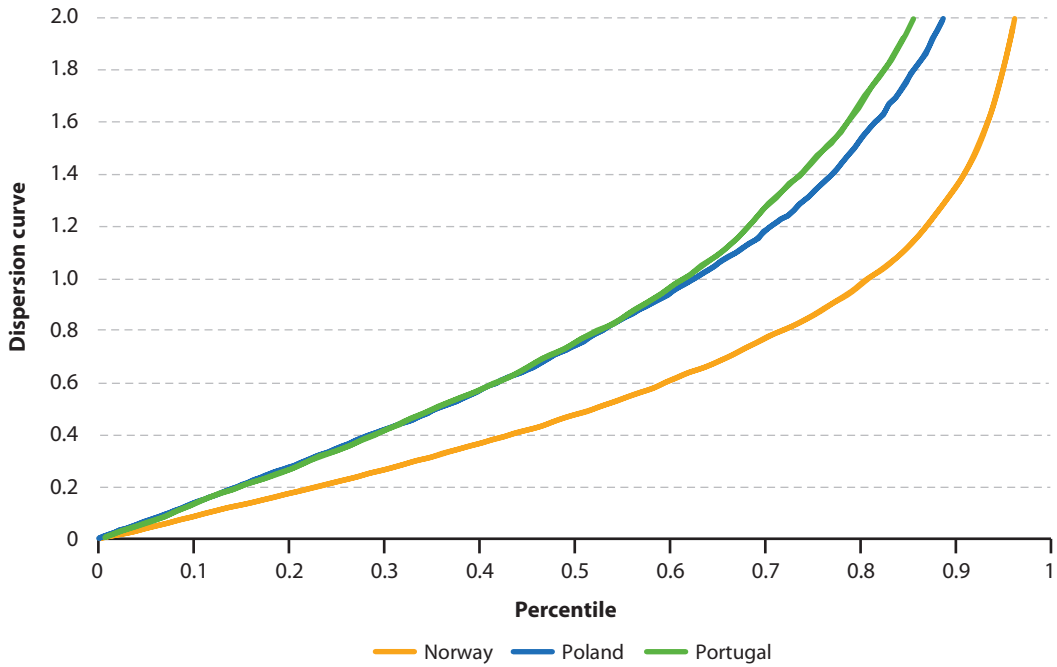
Source: Authors' computation, UDB August 2014.

## 5.4 Dispersion, bi-polarisation and tail-heaviness

In this section, we bring together the two curves shown earlier in Figure 5.1. We focus on a special case of the general notion of dispersion given by Bickel and Lehmann (1979, p. 34). We define dispersion in terms of the distance between the affluence and poverty curves. The distance in terms of income (defined relative to the median) between percentiles equidistant from the median, indexed by  $t$ , where  $t$  runs from 0 (at the median) to 0.5, gives a measure of the spread of the income distribution.

Since this dispersion curve is defined in terms of the percentiles, we refer to it as a dual measure. For formal definitions of dispersion, bi-polarisation and tail-heaviness curves and associated summary measures we refer to Aaberge and Atkinson (2013).

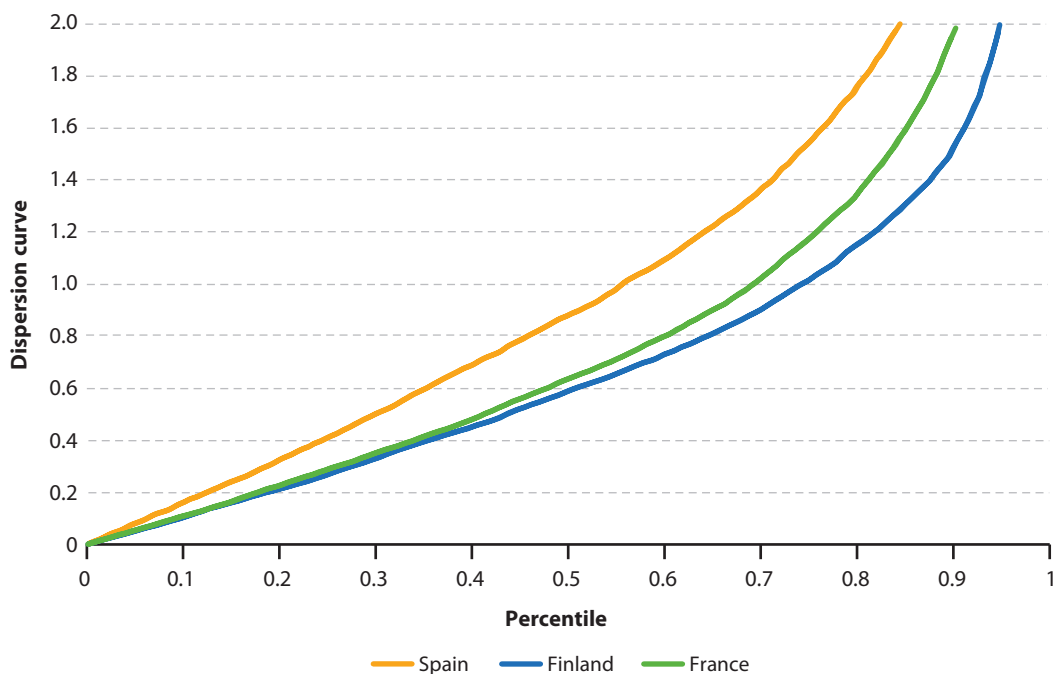
The dispersion curve combines what we have learned separately from the poverty and affluence curves, so that it is not surprising that they confirm what we have already found. In Figure 5.9a, the dispersion curves show that Norway is less dispersed than Poland, and Poland in turn is less dispersed than Portugal. In Figure 5.9b, Finland is the least dispersed, and Spain the most dispersed, with the dispersion curve for France moving from one towards the other.

**Figure 5.9a:** Dispersion curves for Norway, Poland and Portugal, 2012

*Reading note:* The curves show that over the entire income range dispersion is lower in Norway than in Poland and Portugal.

*Source:* Authors' computation, UDB August 2014.



**Figure 5.9b:** Dispersion curves for Spain, France and Finland, 2012

*Reading note:* The curves show that over the entire income range dispersion is higher in Spain than in Finland and France.

*Source:* Authors' computation, UDB August 2014.

Suppose however that we wish to go further and to cumulate the distance measure. As noted in Section 5.2, the cumulation can be from the bottom or from the median. Cumulating from the bottom is equivalent to cumulating from the tails, and this is in the same direction as for the separate poverty and affluence measures. As discussed in Aaberge and Atkinson (2013), this is related to the concept of tail-heaviness (Doksum, 1969, p. 1169): the measures of tail-heaviness are the sum of the measures of poverty and affluence. Put differently, we can see the measures of poverty and affluence as decomposing total tail-heaviness. In Norway in 2012 for example total tail heaviness, with  $k=1$  (when the primal and dual measures coincide), was 0.32 and this was made up of 0.13 from poverty and 0.19 from affluence (figures rounded). The Czech Republic has a similar score for poverty but 0.49 for affluence.

Table 5.4 shows the decomposition for the 29 countries for  $k=1$ , ranked in order of tail-heaviness. The

results provide valuable diagnostic information. For 10 of the 29, the tail-heaviness score exceeds 1. Of these, three countries (Spain, Latvia and Romania) have both a relatively high poverty score (in excess of 0.17) and a high affluence score (in excess of 0.33). Three (Bulgaria, Estonia and Greece) have a relatively high poverty score; the remaining four (Lithuania, Poland, Portugal and the UK) are tail-heavy on account of their relatively high affluence score. At the same time, it is clear that countries are in general ranked very similarly for poverty and affluence. It is not the case that countries can score well on poverty while be quite 'relaxed' about high levels of affluence.

The tail-heaviness measure cumulates from the tails. Cumulating from the median, on the other hand, yields the measures of bi-polarisation (Foster and Wolfson, 1992/2010), which give more weight to differences close to the median. Where the dispersion curves intersect, these tell a different story about the relative ranking of different countries. Figure 5.10

provides an illustration. It shows the dual measures, with  $k=2$ , of tail-heaviness and bi-polarisation. While for many countries their rankings remain the same, there are a number of countries with similar scores

for tail-heaviness that score quite differently on bi-polarisation. This is the case with France and Italy, and with Bulgaria and Lithuania.

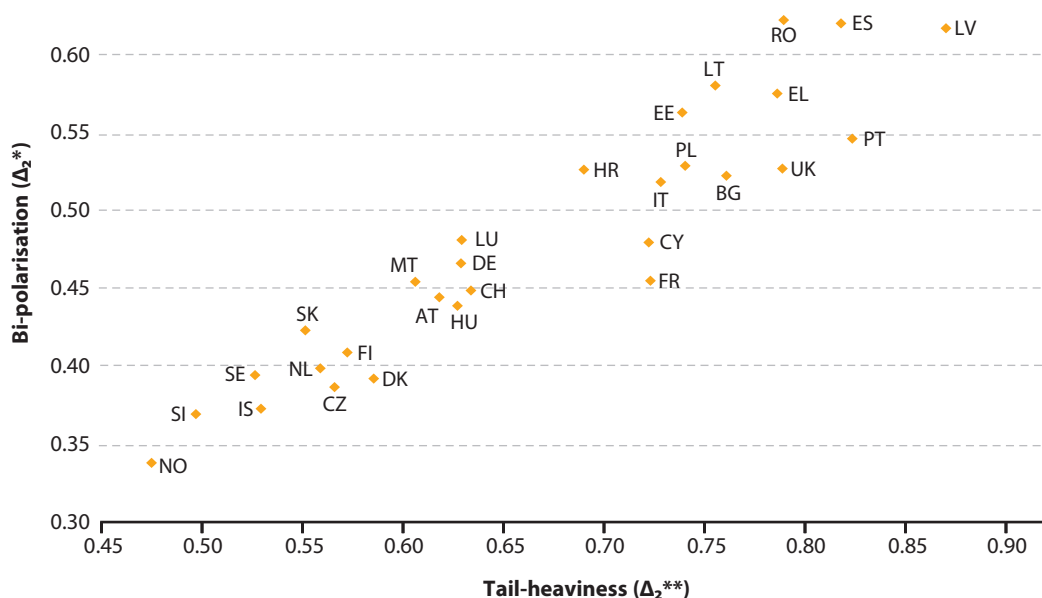
**Table 5.4: Decomposition of tail-heaviness with respect to poverty and affluence, 2012**

Country	Poverty (psi1)	Affluence (lambda1)	Tail-heaviness
Norway	0.13	0.19	0.32
Slovenia	0.14	0.20	0.34
Iceland	0.12	0.24	0.36
Sweden	0.15	0.22	0.36
Czech Republic	0.13	0.25	0.38
Netherlands	0.14	0.24	0.38
Slovakia	0.15	0.23	0.38
Denmark	0.14	0.25	0.39
Finland	0.15	0.24	0.39
Malta	0.15	0.27	0.42
Austria	0.15	0.27	0.42
Hungary	0.15	0.27	0.42
Switzerland	0.15	0.28	0.43
Germany	0.16	0.27	0.43
Luxembourg	0.15	0.28	0.44
France	0.14	0.33	0.48
Bosnia	0.18	0.30	0.48
Cyprus	0.15	0.34	0.48
Italy	0.18	0.31	0.49
Poland	0.17	0.34	0.50
Estonia	0.19	0.33	0.51
Lithuania	0.17	0.35	0.52
United Kingdom	0.16	0.36	0.53
Greece	0.21	0.33	0.54
Portugal	0.17	0.38	0.55
Romania	0.20	0.35	0.55
Spain	0.20	0.36	0.56
Latvia	0.19	0.40	0.59

*NB:* Countries ranked by tail-heaviness

*Reading note:* The poverty and affluence measures are defined in Table 5.1, with  $k=1$ . Tail-heaviness is the sum of these two measures. For Latvia, the poverty measure is 0.19 and the affluence measure is 0.40, giving a tail-heaviness measure of 0.59.

*Source:* Authors' computation, UDB August 2014.

**Figure 5.10: Comparing measures of bi-polarisation and tail-heaviness, 2012**

*Reading note:* Norway is ranked first with the tail-heaviness measure  $\Delta_{2**}$ , as well as with the bi-polarisation measure  $\Delta_{2*}$ , and Slovenia is ranked second with both measures.

*Source:* Authors' computation, UDB August 2014.

## 5.5 Conclusions

The chapter has brought together different features of the income distribution — poverty, affluence and dispersion — in a single framework that allows one to see the relation between different concepts. The framework helps us see, for example, the difference between primal and dual measures (Foster-Greer-Thorbecke versus Sen poverty measures) and between tail-heaviness and bi-polarisation. It has shown how the at-risk-of-poverty measures embodied in the EU social indicators can be related to the wider distribution of income, allowing the full range of the EU-SILC income data to be exploited. We have focused on cross-country comparisons that allow one to identify the sources of differing performance across countries without reducing the analysis to a single indicator. As we have seen, some countries perform better at the bottom and some at the top of the income distribution, but in general

the two move closely together. The different parts of the income distribution story cannot be separated.

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# 6

## High incomes and affluence: evidence from EU-SILC

Veli-Matti Törmälehto <sup>(59)</sup>

### 6.1 Introduction

This chapter describes the top tails of the income distributions in Europe, based on EU-SILC data. Using the most recent cross-sectional data available at the time of writing, the chapter explores issues related to measurement of the right tail in sample surveys, reviews measures of income-based affluence, and briefly addresses non-income dimensions of affluence.

Top incomes have raised considerable debate recently, based on new estimates derived from tax data (Atkinson, Piketty and Saez, 2011; Piketty, 2014; OECD, 2014). From a data point of view, it is interesting to see whether a set of household surveys with a reasonable degree of comparability could offer something to the debate. Sample surveys often are considered to have low accuracy in the top tail, but this need not always be the case, in particular with register-based measurement of incomes coupled with appropriate sampling designs and reweighting schemes. Consequently, with an increasing number of countries relying on register-based income data, the EU-SILC evidence on those with high incomes deserves to be examined.

The chapter is structured as follows. The first part deals with measurement issues, and begins with a description of the data and concepts. To assess

sensitivity of the results, a semi-parametric approach with different under-estimation scenarios is used. We also compare results for selected countries with the World Top Incomes Database (Atkinson and Piketty, 2007, 2010), which includes top income share estimates derived from tax data. The second part goes through a range of income-based affluence measures, i.e. measures of 'richness' proposed in the literature. The third part briefly turns to non-income evidence of high economic well-being. This is important given the weaknesses of the relative income approach when comparing countries with very different income levels. It turns out that non-income EU-SILC data to identify the affluent are quite limited. We also find that in a number of countries those in the upper tail of the distribution report having difficulties in making ends meet.

### 6.2 Definitions and data source

#### 6.2.1 The data and definitions

Our data derive from the 2012 EU-SILC UDB (version August 2014). A key issue is whether income data, and in particular property incomes (dividends, rents, etc.), are based on registers. This appears to be the case in the Nordic countries, the Netherlands, Slovenia, France, and Switzerland while register data on earnings and transfers are used in Austria, and on transfers in Latvia. Registers as a part of mixed methods are used in some other countries (e.g. Italy).

The income distribution refers to the distribution of the standard modified-OECD equivalent household disposable income allocated equally to household

<sup>(59)</sup> Statistics Finland. The author wishes to thank Rolf Aaberge, Anthony B. Atkinson, Anne-Catherine Guio and Eric Marlier for valuable comments and suggestions. All errors remain strictly at the author's responsibility. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the author. Email address for correspondence: [veli-matti.tormalehto@stat.fi](mailto:veli-matti.tormalehto@stat.fi).

members. Incomes are normalised to median, and individual is the unit of analysis. The identification of the well-off depends on the unit of analysis and the income definition. The issue of units and income definitions is elaborated further later when comparing EU-SILC top income shares to the World Top Incomes Database.

It should be noted that capital gains are not included in EU-SILC, although they can be considered as income and are very volatile and highly concentrated to the top. Capital gains are typically measured from registers, which means that what is measured are taxable realised capital gains. Even then, these tend to affect top income shares significantly, but are not likely to much affect headcount measures or rank-based measures. What is taxable in a country is very important, and serious comparability issues may arise with register-based measurement<sup>(60)</sup>.

Top coding or other censoring or truncation of top incomes in the micro data would be a problem for the analyses. In general, we consider the UDB data as not top-coded, at least in the sense of top-coding typically applied in this context. Regarding outliers, the data validation routines of the National Statistical Institutes may have improved over the years so that very extreme values or highly erroneous or implausible values were not present (Törmälehto, 2017; Van Kerm, 2007).

This chapter is mostly concerned with non-sampling errors and uncertainty relating to e.g. richness lines, but standard errors of top 5 % income shares for selected countries are reported when comparing results to the World Top Incomes Database. The variance estimation method used was the rescaling bootstrap method (Rao, Wu and Yue, 1992), while the lack of design variables was partially circumvented using the pseudo-design variables created by Goedemé (2013).

<sup>(60)</sup> For instance, in the height of the internet bubble in 2000 capital gains added more than 5 percentage points to the Gini coefficient in Sweden, whilst in Finland the increase was around 2 percentage points and around 1 percentage point in Norway (Törmälehto, 2006). This was partly due to more extensive definition of capital gains in Sweden.

## 6.2.2 Household surveys and top end of the distribution

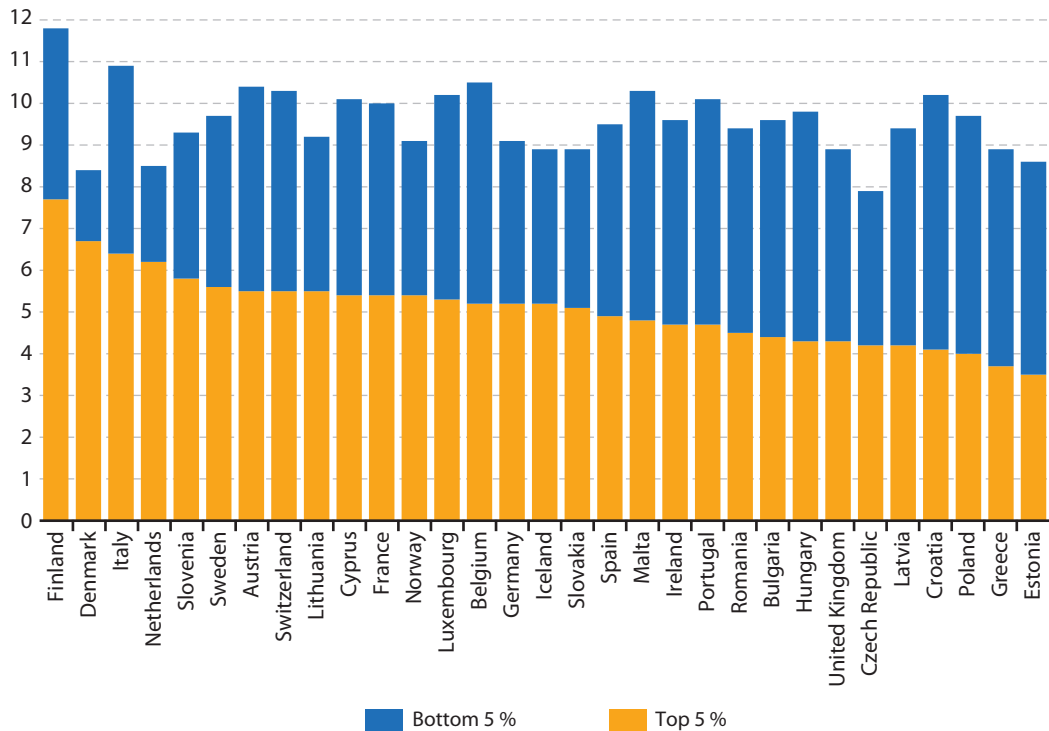
Household sample surveys are often expected to perform poorly in the tails of the distributions. Estimating characteristics of rare domains (sub-populations), such as top 1 %, may require specific sampling methods. It may be that dual frames and/or highly stratified samples would be needed to adequately reach the very well-off (e.g. Kennickell, 2007). Understandably, such oversampling designs generally are not used in EU-SILC. Regarding non-sampling errors, a working hypothesis is that unit non-response is correlated with income level, and that those in the top of the distribution have lower response rates. This differential unit non-response may cause bias which is not easily compensated by weighting and calibration (see Vermeulen, 2014).

Some insight on sample representation can be gained by looking at the allocation of sample observations in the tails of the (estimated) income distribution (Figure 6.1). One would expect to have similar shares in the sample and in the (estimated) population if the sample was drawn randomly from the population. A disproportionate sample allocation may result from sampling design (e.g. stratification) and/or from differential unit non-response. As shown in Figure 6.1, there is more than 5 % of the sample in the top 5 % in about half of the countries, and these countries generally have less than 5 % of the sample in the bottom 5 %. Somewhat worrying for the aims of EU-SILC on poverty measurement is that there is close to or less than 5 % of the sample in the bottom 5 % of the income distribution in many countries.

Absolute sample sizes in the tails are important as well. There is significant variation across countries, resulting from actual thickness of the tails, the sampling designs and country sizes. Törmälehto (2017) suggests that if all countries are included in the analysis, a practical upper limit for affluence threshold in EU-SILC could be 250 % of median. Beyond that, sample sizes can get quite small. In some EU-SILC 2012 countries, sample size was below 50 households already with the 300 % of median threshold.

Whilst sampling bias is difficult to measure, *sampling variance* of an estimate can be quantified by estimat-

**Figure 6.1: Sample allocation in the tails: unweighted proportion of people in the sample belonging to the weighted top/bottom 5 % of the population, Income year 2011/Survey year 2012 (% of persons in the sample)**



*Reading note:* EU-SILC net sample size in Denmark was 13 352 persons in EU-SILC 2012. Of these, 6.7 % (901 persons) were in the weighted top 5 % of the population, while 1.7 % (224 persons) of the unweighted sample were in the weighted bottom 5 %.

*Source:* Author's computation, UDB August 2014.

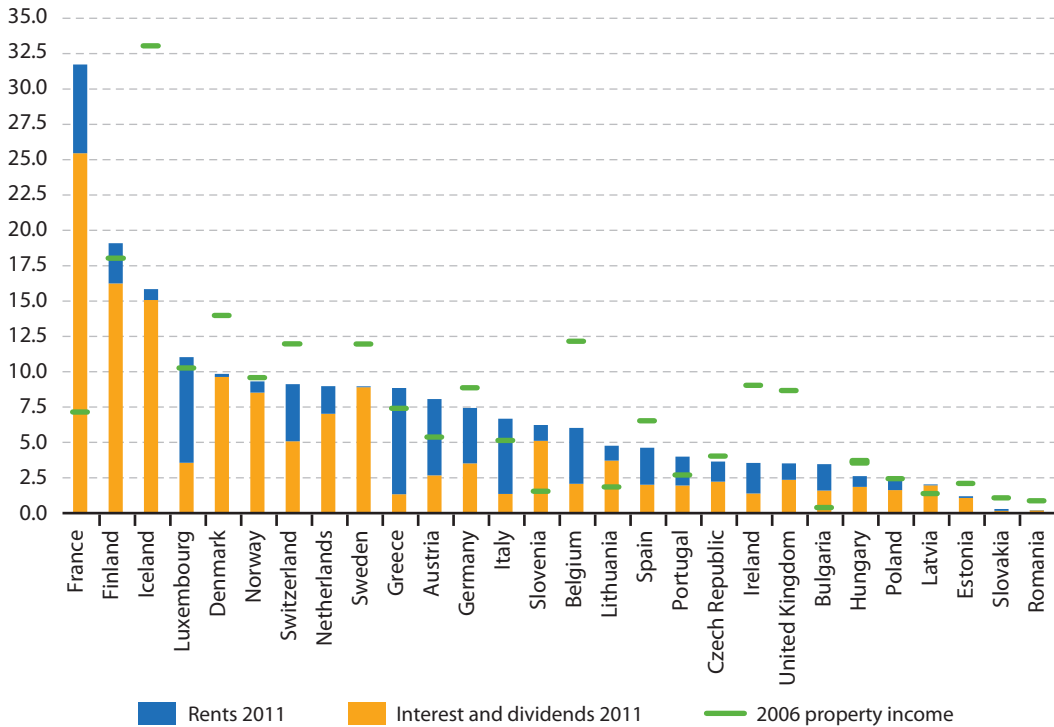
ing it from an observed sample. Since the sample sizes in the tails are small and the distributions skewed, some of the indicators (e.g. top income shares) could have low precision and wide confidence intervals. Some confidence intervals of the top 5 % shares are reported later alongside the comparison to the World Top Income Database. However, rules of thumb are likely to be needed, since variance estimation for many different indicators and affluence lines is in practise not feasible. In our estimations, the estimated relative standard errors of top 5 % income shares tended to be around 2-3 % and no higher than 3.6 %, implying that safety margin of around 7 % could be used as a rule of thumb to control for sampling error. That is, if the top 5 % income share is 15 %, it could be assumed that the 95 % confidence interval is not likely to be wider than +/-1 percentage

point. With income share of 20 %, the margin would be no higher than 1.5 percentage points. Moving up the distribution, more margin would be needed, in relative terms, because sample size decreases.

A distinct problem is *measurement error*. The observed household income in EU-SILC contains measurement error, which may be positively correlated with (true) income level. The measurement errors are likely to be more severe in the 'survey' countries which collect income data via interviews, due to higher item non-response or misreporting compared to register data <sup>(61)</sup>. Measurement errors

<sup>(61)</sup> In self-reported tax data, tax evasion and coverage problems may be a problem as well. It is reasonable to assume that in most countries register data contain less measurement error than interview-based data, particularly when the data are reported by a third party to the register authorities.

**Figure 6.2: Property income, top 5 %, Income year 2011/Survey year 2012 and Income year 2006/ Survey year 2007**  
(% of total gross income)



*Reading note:* In the top 5 % of France, the share of interest, dividends and rents was 31.7 % of pre-tax household income (gross income) in 2011. It was 7.1 % in 2006.

*Source:* Author's computation, UDB August 2014.

may be more serious with non-regular and skewed income components, such as dividends. Comparisons with the national accounts aggregates often show more severe under-estimation of property and self-employment income totals (Mattonetti, 2013; Alkemade and Endeweld, 2014; Törmälehto, 2006). This may result in under-estimation of the proportion of income attributable to the top of the distribution.

Registers also can be used in calibration of survey weights to auxiliary data, and consequently *errors in estimation* (bias and variance) in the top tail can be much less severe in the register-based EU-SILC implementations. There is variation among the register countries in their use of auxiliary register data in estimation, and this may explain some of the observed differences.

Given this, Figure 6.2 shows the shares of property (capital) income in the top 5 %. Capital income consists of rents, interest, dividends and profit sharing as a sleeping partner, but excludes capital gains. Register countries have higher shares than survey countries, but apart from France, Finland, and Iceland the differences perhaps are not as large as one would expect. There is very significant variation among the register countries. France stands out as having by far the highest share of capital income in the top 5 %, followed by Finland and Iceland. This can be contrasted with Sweden and Denmark, with lower shares and where capital income consists mostly of interest and dividends<sup>(62)</sup>. Luxembourg and Greece have high share of rental income.

<sup>(62)</sup> Property income in Denmark is not fully comparable to others, because Denmark measures net interest (received-paid).



Figure 6.2 also shows the share of property income in 2006 (EU-SILC 2007). The changes in most cases reflect the effects of financial crisis, but also changes in measurement. A striking example is France, which changed from interviews to register-based incomes in EU-SILC 2008. There is a conspicuous increase in the share of property income: for the top 5 %, it jumped from 7.1 to 32.6 % from 2006 to 2007 (income reference year).

Labour income dominates the upper part of the EU-SILC distribution, and this holds also for the top 1 % in all countries (not reported here). The EU-SILC samples are not sufficient to detect a point where capital incomes would become the main income source, which one would expect to be the case with the truly affluent even in the absence of capital gains. This would often mean going to the very top, such as the richest 0.1 % of the population.

### 6.2.3 Sensitivity to measurement errors in the tail

The 2012 data set does not appear to have serious outlier problems (Törmälehto, 2017). It may be, however, that this results from not measuring the top incomes correctly. Under-estimation of top incomes could be adjusted for, using external benchmark to assess the size of the measurement errors. For instance, Vermeulen (2014) used the Forbes list of extremely wealthy to improve estimates of wealth survey micro data. While similar adjustments could be conceived with the EU-SILC data, there is no Forbes list of very high incomes available. Therefore, we assess the sensitivity to under-estimation by replacing the actually observed top tail with sets of simulated values, which reflect different levels of under-estimation of income in the top 5 %.

The method is based on the often used assumption that the distribution of income (and wealth) in the upper tail follows a Pareto distribution. The (complementary) cumulative Pareto distribution function of income is the following:

$$(1) 1-F(y) = (k/y)^\alpha, \text{ where } \alpha > 1, k > 0$$

where  $k$  is the scale (threshold) parameter above which the power law is assumed to hold, and  $\alpha$  is the shape parameter (Pareto index), which measures the heaviness of the right tail. Lower  $\alpha$  implies fatter up-

per tail, and it is an inequality measure in itself. The parameter can be expressed in terms of the mean and the threshold as:

$$(2) \alpha = \mu / (\mu - k)$$

where  $\mu$  is the sample mean of those above the threshold  $k$ . That is, the empirical estimate of  $\alpha$  is the ratio of mean above threshold to the difference between mean and threshold. For instance, if the threshold is EUR 30 000 and the mean above threshold is EUR 40 000, the empirical Pareto index is 4. Supposing that the mean above threshold is actually EUR 50 000, i.e. under-estimation of 20 %, the Pareto index would be 2.5.

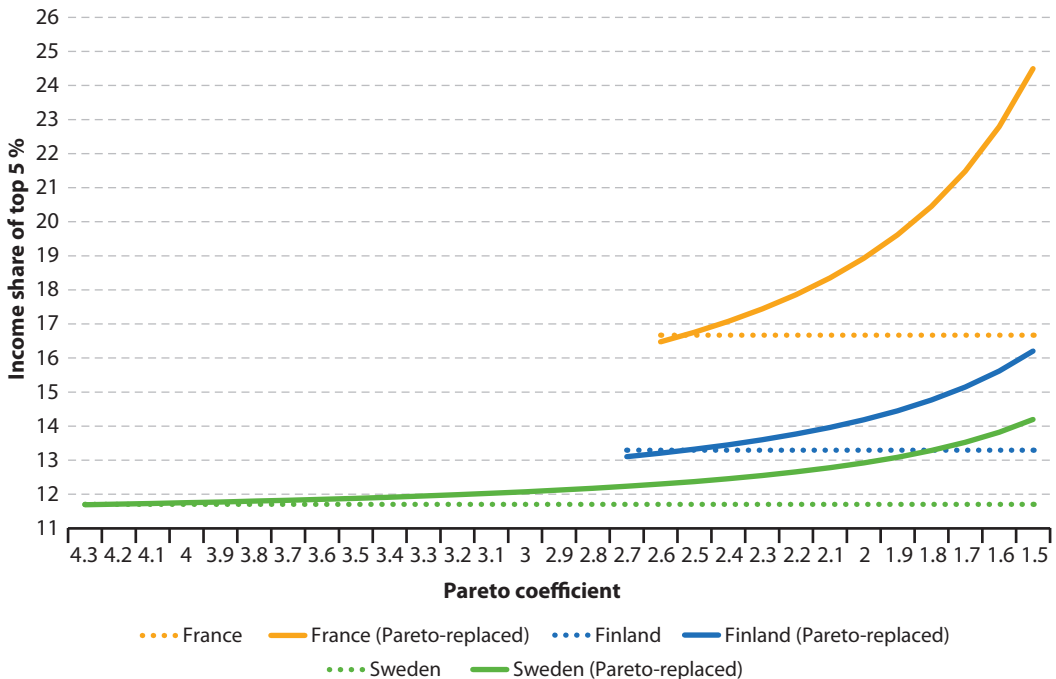
In what follows, the strategy is to fatten the tail by replacing the actually observed incomes above 300 % of median with values drawn from a Pareto distribution. In the absence of external data on incomes exceeding the EU-SILC maximum values, simulations were done over a range of hypothetical Pareto distributions<sup>(63)</sup>. Each reflect a different income distribution in the top tail than is estimated using the actual data values. We report here only results based on draws from heavier-tailed distributions than in the original data.

Figure 6.3 provides a three-country illustration of the procedure. The EU-SILC estimate of top 5 % income share in Sweden is 11.8 %, in Finland 13.3 %, and in France 16.7 %, shown by the dotted lines. The Pareto shape parameters ( $\alpha$ ) estimated from the data are 4.2, 2.8 and 2.6, respectively, with the 300 % threshold<sup>(64)</sup>. Replacing the actual values with simulated values drawn from Pareto distributions with these shape parameters result in income shares equal or close to those obtained from the actual data. Drawing values from distributions with lower Pareto coefficients results in higher top income shares, as we are drawing from heavier-tailed distributions. Even with simulated values based on  $\alpha=1.5$ , corresponding to close to 40 % of under-reporting in this case, the Swedish and Finnish estimates are lower than any of the top shares in France. This suggests that the results are fairly robust to under-estimation of income. In fact, since these three countries measure

<sup>(63)</sup> In the simulations, shape parameters varied from 5 to 1.5 by steps of 0.1.

<sup>(64)</sup> These are (pseudo-)maximum likelihood estimates (see Törmälehto, 2017).

**Figure 6.3:** Top 5 % income shares in Sweden, Finland, and France, income year 2011/survey year 2012, EU-SILC original estimates and estimates from semi-parametric Pareto simulations



*Reading note:* The top 5 % share in Sweden is 11.8 %, as shown by the dotted line. The Pareto index computed from the data is 4.2. The solid line shows the hypothetical top 5 % shares when actual data above 300 % of median are replaced with values drawn from heavier-tailed Pareto distributions. Lower Pareto coefficient implies hypothesis of heavier upper tail than is actually observed, assuming more under-estimation of top incomes. Even with very severe under-estimation (Pareto coefficient of 1.5), the top 5 % share in Sweden remains lower than in France (both actual and simulated values).

*Source:* Author's computation, UDB April 2014.

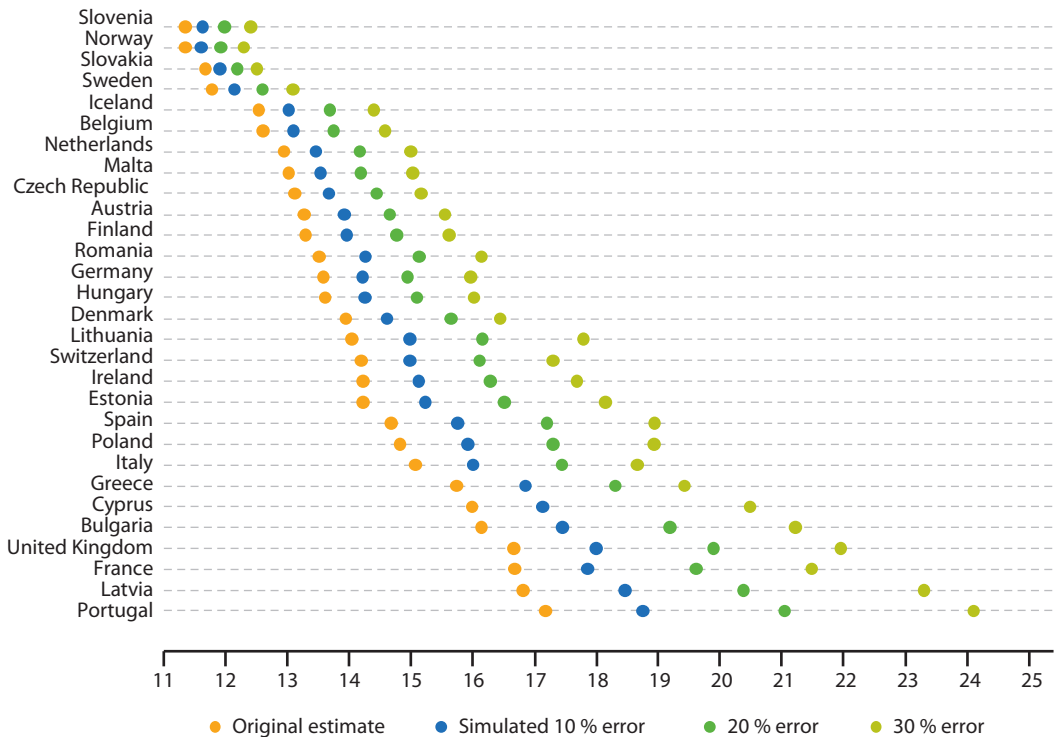
incomes from registers, the under-estimation due to measurement errors should not be large.

Figure 6.4 reports the original top 5 % income shares estimated from the data as well as the income shares based on simulated values corresponding to 10 to 30 % under-estimation of top incomes. The original values range from 11-12 % in Slovenia and Norway to around 17 % in Portugal, Latvia, France, and the UK. The original estimate is always the lowest because the incomes of the top of the distribution where replaced with values drawn from Pareto distributions with lower Pareto coefficient. Three other income shares are shown, based on different Pareto coefficients but corresponding to increase of 10, 20 and 30 % to the mean above the 300 % of median threshold.

The 30 % assumption generally means Pareto coefficients of around 2 or even lower, which seems rather low for equivalent disposable income.

Reading the chart, one could construct different scenarios. For instance, it could be assumed that register countries have no measurement error (first dots) and that survey countries have 10 or 20 % of measurement error (second or third dot). This would imply some re-ranking of the survey and register countries. France is an exception as a register country, and for instance the UK would have higher share assuming that its interview-based incomes are under-estimated. The figure is indicative only, but it seems that the Pareto-replacement could be a viable tool for sensitivity analyses when there is no knowledge of the size of measurement errors.

**Figure 6.4: Top 5 % income shares, original EU-SILC estimates and estimates based on Pareto-replaced values over the 300 % of median threshold, Income year 2011/survey year 2012 (%)**



*Reading note:* In Sweden, the top 5 % share was 11.8 %. The Pareto index computed from the data was 4.2. Assuming that the mean above 300 % of median is under-estimated by 20 % would correspond to Pareto index of 2.3 in Sweden. If the actual values above 300 % of median are replaced with hypothetical values drawn from a Pareto distribution with shape parameter 2.3, the share of top 5 % would be 12.6 %.

*Source:* Author's computation, UDB August 2014.

## 6.2.4 Comparison with the World Top Incomes Database

In general, direct comparison of EU-SILC top incomes to external benchmarks is not feasible, aside from some country-specific register sources and limited comparisons with the World Top Incomes Database (WTID) <sup>(65)</sup>. The WTID provides tax-based estimates of the shares of fixed quantile groups of personal pre-tax incomes in selected countries over a very long period of time. Tax data are used because of the assumption that household surveys do not capture

well the top of the distribution, and because of the fact that surveys do not cover long periods of time.

The WTID income concepts, units, populations and estimation methods differ from EU-SILC, since the latter aims to measure the distribution of economic welfare rather than personal incomes. Therefore, a direct comparison is not meaningful. Below, we compare the adjusted top 5 % income shares of EU-SILC to WTID, for income year 2009, by modifying the EU-SILC income concept and using personal rather than household incomes to the extent pos-

<sup>(65)</sup> Alvaredo, F., Atkinson, A.B., Piketty, T. and Saez, E., The World Top Incomes Database, <http://topincomes.g-mond.parisschoolofeconomics.eu/>

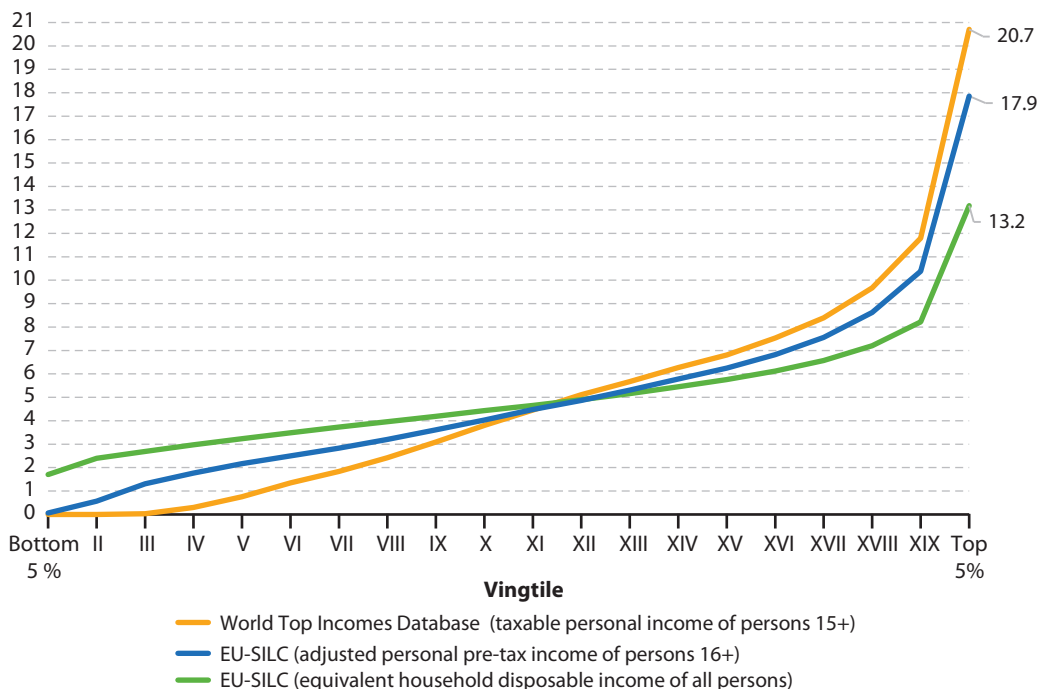
sible. The WTID estimate for Finland 2009 <sup>(66)</sup> is in fact based on tax data records linked to the EU-SILC sample (national micro data), which means that the differences to EU-SILC UDB-based estimates are solely due to different definitions of income and income receiving unit, and sampling and non-sampling errors play no role. Therefore Finland serves as the benchmark in the comparison.

Figure 6.5 illustrates how the WTID estimates differ from EU-SILC estimates because of different definitions in Finland 2009. The WTID estimate for Finland is 20.7 %, which is the share of taxable income of persons over 14 years of age (Jäntti et al., 2010). While the WTID only reports the top shares, the whole dis-

tribution is shown in the figure. Many of those who are over 14 years of age do not have taxable income, implied by the zero income shares in the bottom of the distribution. The concept of taxable incomes in Finland excludes tax-free incomes, which include many social transfers received in the very bottom (e.g. housing allowances) but it also excludes for instance tax-free dividends which accrue to the very top. In contrast, it includes realised capital gains.

EU-SILC income concept captures tax-free incomes but excludes capital gains. The figure also shows adjusted personal incomes from EU-SILC, defined as the share of all personal *pre-tax* incomes plus household pre-tax property income divided by the

**Figure 6.5: Income shares in vingtiles, Finland 2009: World Top Incomes Database, adjusted EU-SILC and standard EU-SILC definitions and units**  
(% of income)



*Reading note:* The top 5 % income share in Finland is 20.7 % in the World Top Incomes Database (IDS series, data retrieved August 2014). The shares in the bottom 15 % were 0 %. Incomes based on the EU-SILC definitions are more equally distributed.

*Source:* Author's computation from the Finnish Income Distribution Statistics 2009 micro data (WTID) and UDB August 2014.

<sup>(66)</sup> This corresponds to Top income shares – IDS series in the WTID database (IDS stands for Income Distribution Statistics, under which the results from EU-SILC are published in Finland).

**Table 6.1: Comparison of the World Top Incomes Database top 5 % pre-tax income shares with EU-SILC estimates (Income year 2009/Survey year 2010)**

	Finland	France	Italy	Netherlands	Norway	Spain	Sweden	Switzerland
WTID 2009* (%)	20.7	21.4	23.2	19.1	18	21.4	18	22.9
Adjusted EU-SILC estimate, pre-tax personal incomes, persons aged 16 and above (%)	17.9	20.2	21.3	19.1	16.9	20.1	16.1	19.7
<b>95 % confidence limit, +/-, percentage points (pp)</b>	0.6	1.0	0.7	0.6	1.0	0.5	0.9	1.1
Difference (pp), WTID — EU-SILC	2.8	1.2	1.9	0	1.1	1.3	1.9	3.2
Original EU-SILC estimate (2009 incomes), equivalent household DPI, person weighted (%)	13.2	15.8	14.5	12.8	12.2	14.5	11.7	15.1
<b>95 % confidence limit, +/- (pp)</b>	0.6	1.0	0.6	0.5	0.8	0.5	0.7	0.9

*Reading note:* In 2009, the top 5 % share of taxable income of persons aged 15 and over was 20.7 % in Finland in the World Top Incomes Database. Using the EU-SILC adjusted pre-tax personal incomes the share was 17.9 % (+/-0.6 pp) and EU-SILC equivalent incomes 13.2 % (+/- 0.6 pp). In Finland, all estimates are based on the same sample survey. In the other countries, the WTID estimates are estimated from different sources (tax data).

*Source:* World Top Incomes Database (retrieved 19.8.2014) and author's computation from UDB August 2014. Estimated 95 % confidence intervals (percentage points) in separated rows.

number of persons aged 16 and over<sup>(67)</sup>. The top 5 % income share of 17.9 is closer to the WTID than the equivalent net household income distribution used in this chapter. The remaining difference is partly due to the better coverage of incomes in the bottom of the distribution.

Table 6.1 then reports top 5 % incomes shares for those EU-SILC countries, which had estimates available in the WTID for year 2009. Except for Finland, the WTID estimates are based on tax data. The cross-country comparability of the WTID depends on the definitions of taxable incomes and target populations as well as the estimation method, which may differ. For instance, the WTID estimate for Finland relates to persons aged 15 and over whilst that for Spain relates to persons aged 20 and over. For the EU-SILC estimates, approximate con-

fidence limits are provided to control for sampling variance based on 1 000 bootstrap replicates and pseudo-design information of Goedemé (2013). Calibration to margins could not be taken into account, which could result in too wide confidence intervals. This, however, depends on the auxiliary variables used in the calibration.

Despite the caveats of the comparison, Table 6.1 provides useful insight to the quality of EU-SILC estimates of top income shares. The results suggest that the EU-SILC estimates are not that incoherent with the WTID. For instance, after the adjustments the top 5 % income shares seem to be at the same level in France and Spain, and lower than in Italy in both sources. Sampling error cannot be ruled out, though. Finland appears to have higher top 5 shares than Norway and Sweden, and Switzerland higher shares than the Nordic countries. The bottom row shows the top 5 % shares based on equivalent person-weighted disposable incomes, i.e. the standard EU-SILC income definition. This gives further evidence on the importance of the income concept,

<sup>(67)</sup> This is the definition closest to the WTID-definition that could be constructed from the EU-SILC UDB for Finland. From EU-SILC, we can only look at personal incomes for people aged 16 years or above. Using 16 years as the age threshold instead of 14 years would in itself decrease the top 5 share of taxable income in Finland from 20.7 % to 20.5 %.

income receiving unit and target populations as potential sources of differences.

## 6.3 Measures of richness and affluence

The measurement of top incomes and ‘richness’ has evolved significantly in recent years, and new measures that go beyond simple headcounts have been introduced (see Medeiros et al., 2014, for a review; see also Chapter 5 of this volume). In this section, we examine how some of these measures would look on the basis of EU-SILC. The measures that are covered are headcounts, transfer-sensitive richness indices, affluence gaps and redistribution-based measures, and also top income shares.

### 6.3.1 The line of richness

To identify the affluent or the rich based on income (or wealth or other resources), a richness line must be specified. The threshold could be fixed to a specific quantile (e.g. 99th percentile) or defined as a distance from a reference level of income (e.g. twice the median), as discussed earlier and mostly used in this chapter. Some methods define threshold on the basis of distributional effect, such as eradication of income poverty (Medeiros, 2006). It is also possible to leave the question of affluence threshold open, by ordering income distributions by a given index for all or a subset of different affluence lines (Chapter 5 of this volume; Bose, Chakravarty and d’Ambrosio, 2014; Aaberge and Atkinson, 2013).

The aim in our work is, in general, to seek affluence orderings of the distributions i.e. all measures have been evaluated over a range of income thresholds (see Törmälehto, 2017). Whether those above, say, 250 % of median are affluent or have very high economic well-being, cannot be determined only on the basis of the rank in the distribution. For this, the level of income, other resources such as wealth, and non-income information such as subjective experiences are needed.

When the affluence threshold is determined relative to the distance from the median income, the size of the affluent group can be measured. This ‘income

space’ approach also relates to income poverty as well as to certain definitions of middle-income households such as those with incomes between 75 and 125 % of median (Atkinson and Brandolini, 2013). Common affluence thresholds are two or three times the median. An alternative would be to choose ‘people space’ and use quantiles of income (deciles, percentiles) as richness lines. This would fix the population shares of the affluent and put focus on their resources (e.g. income shares of top 1 %). Averaging across countries, the 95th percentile corresponds roughly to 200-250 % of median, ranging from 182 % in Norway to 288 % in Portugal. The top 1 % threshold corresponds to more than three times the median, ranging from 269 % in Norway to 480 % in Portugal.

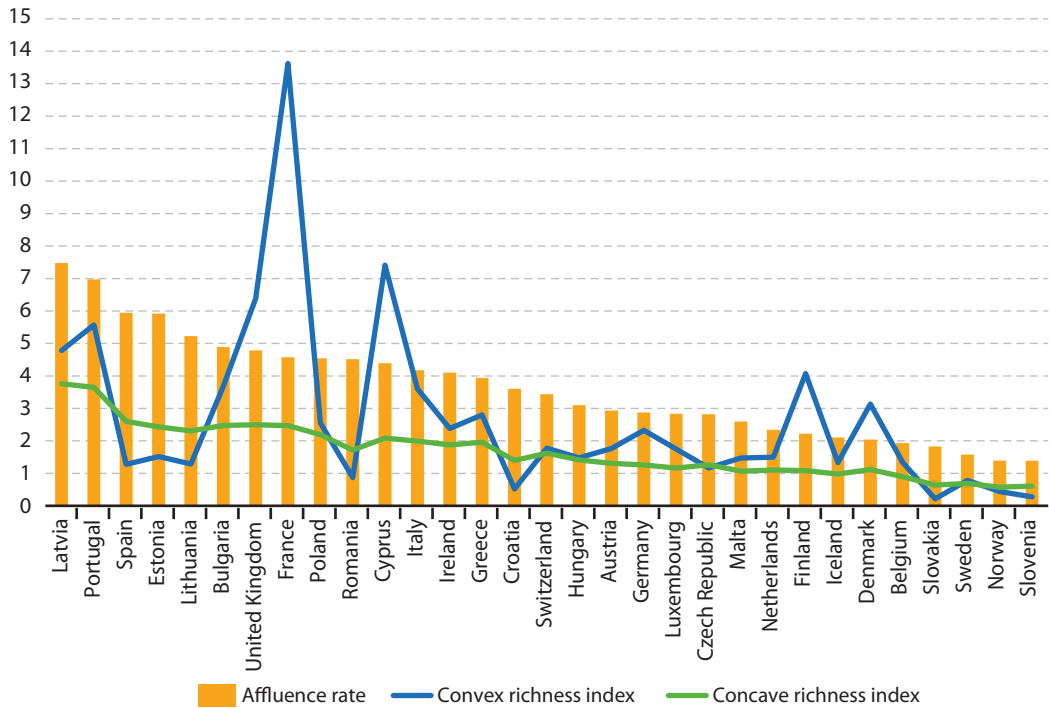
### 6.3.2 Headcount and transfer-sensitive measures based on multiplier thresholds

The simplest measure of richness is the share of population exceeding a high income threshold. Headcount measures are based on empirical complementary cumulative distribution functions, which should be robust to rank-preserving measurement errors or other non-sampling errors, and extreme outliers. The headcount measure is insensitive to the incomes of the affluent. To account for this, Peichl, Schaefer and Scheicher (2010) have proposed a class of transfer-sensitive indices which react also to income distribution among the rich (see also Sen, 1988).

Figure 6.6 shows the headcount rates and two variants of transfer-sensitive indices using the 2.5 times the median threshold. Latvia and Portugal have the highest share of relatively high income households and Nordic countries and Slovenia the lowest shares. Affluence headcount indicator has the same drawback as relative income poverty, i.e. that it does not capture the large differences in average living standards in Europe.

The transfer-sensitive indices would rank the countries somewhat differently. There are two versions of the transfers-sensitive indices, concave and convex, with important underlying normative differences. The convex version is transfer sensitive in a sense that it decreases when a rank-preserv-

**Figure 6.6:** Headcount affluence rates and transfer-sensitive convex and concave richness indices (Peichl et al.), Income year 2011/Survey year 2012. Income threshold 2.5 times the median of equivalent disposable income. Countries sorted by the headcount share of affluent (%)



*Reading note:* In Latvia, 7.5 % of population had more than 2.5 times the median income. Measured with transfer-sensitive indices, richness would be highest in France and Cyprus with the convex index ( $\alpha=2$ ), which increases with more unequal distribution of income among the rich. With the concave index ( $\beta=3$ ), richness would be highest in Latvia and Portugal. The concave index is clearly less sensitive to outliers, and it decreases with more inequality among the rich.

*Source:* Author's computation, UDB August 2014.

ing progressive transfer between two rich persons takes place, e.g. when a billionaire gives money to a millionaire. The convex version is quite sensitive to thickness of the tail, as indicated by the high value of this index in France. The concave version of the transfer-sensitive richness index increases with more equal distribution among the rich, i.e. with more homogeneity in the top. The interpretation of what is 'affluence' is therefore quite different with the concave index. It also is inconsistent with a key element of distributional analysis, the Pigou-Dalton principle of transfers. For a proper description of the indices, we refer to Peichl, Schaefer and Scheicher (2010). The intuitive interpretation of the indices is not straightforward and the choice

of parameters is not easy to communicate. Despite their attractive theoretical properties, headcount measures or top income shares see much more attractive from a practical point of view.

### 6.3.3 Top income shares

The headcount affluence rate does not tell about the resources available to the well-off group. Therefore, the income shares of those above a selected quantile (90th, 95th, 99th) are often used as an indicator of relative richness, or even income inequality (Piketty, 2014). The top 1 %, for instance, can be considered as a small elite group with fixed size, assumed to have

economic and political power beyond its 1 % population share because income and other resources are concentrated to this group. The top income shares are often highly correlated with inequality measures based on the whole distributions, such as Gini coefficients.

Eurostat publishes in their web-database quite detailed results from EU-SILC, including income shares of each of the top 5 percentiles. Table 6.2 reports the shares of income accruing to those in the top 5 % <sup>(68)</sup>. The dominance approach here reflects uncertainty about the proper high incomes cut-off (top 5 %, top 1 %). The 95th quantile is in most countries above twice the median.

Over the range from top 5 to top 1 %, Slovenia and Slovakia never have higher top income shares than other countries. Reading from the bottom of the table, dominance holds until Finland (cells where dominance holds are highlighted), after which we find crossings of the piecewise Lorenz-curves in this range up to Denmark. Register countries have differences. Among them, there is (point-estimate based) affluence-dominance of France, Denmark, Finland, Netherlands, Iceland, Sweden and Norway. France appears to have a much thicker tail than the 'old' register countries, and it also affluence-dominates Switzerland. Slovenia is tied with Norway, and comparison between Denmark and Switzerland is inconclusive.

The potential bias of these estimates was already discussed earlier. Even if unbiased, they are not likely to be precise because they are based on small numbers of observations. Regarding sample sizes, the top 1 % typically has fewer than one hundred households in the sample. The UK estimate is, for instance, based on 79 households and the French estimate on 123 households in the sample. Consequently, it may be better to use top 5 % rather than top 1 % as the fixed quantile definition.

<sup>(68)</sup> The table on top income shares is based on the Eurostat web-database (code *ilc\_di010*). The results for some countries differ somewhat from our own estimates from the UDB used elsewhere in this chapter.

### 6.3.4 Affluence gaps and redistribution-based measures

The headcount measures, transfer-sensitive measures and income shares ignore the levels of income among the group of affluent. Thus, the low overall relative income inequality is behind the low share of the affluent and their incomes in Norway, but this tells nothing about how rich or well-off those in the top are. One absolute measure of affluence is average affluence gap, which is the right tail counterpart of mean poverty risk gap, i.e. the average shortfall from the at-risk-of-poverty line. In general, affluence gap builds on the concept of excess over threshold, which can be quantified with mean excess functions.

Empirical mean excess function (or mean residual life function) can be defined as the average of excess incomes above a certain threshold. The denominator can be the total population instead of those exceeding a threshold, resulting in excesses or affluence gaps per capita. Figure 6.7 shows the average per capita affluence gaps for all countries based on five thresholds, ranking the countries by the 2.5 times the median threshold. France, the UK and Cyprus have the highest per capita excess income, followed by Switzerland, Portugal, Luxembourg and Italy. Eastern Europe has the lowest per capita excesses, but otherwise there is no clear pattern, not even among the register countries. Since the average affluence gap is an absolute measure, the values are expressed in purchasing power standards (PPS; see Chapters 1 and 3 of this volume), taking into account differences in consumer price levels between the countries.

Affluence gaps are also used in a variant of richness measures, which are based on the idea of redistribution of funds from the rich to non-rich so that the rich do not fall below the richness line. That is, the redistribution is financed by reducing the excesses above a richness threshold. From a policy perspective, this could take place by raising top marginal tax rates or progressive capital income taxes. Medeiros (2006) proposed that the affluence threshold could be defined as the value where the sum of excesses would be sufficient to get all poor at the poverty risk line, i.e. when the sum of excess incomes (affluence gaps) would be equal to the sum of poverty risk gaps (for an application, see Brzezinski, 2010). Hypothetically, if the value of



**Table 6.2: Income shares (% of total equivalent disposable income) over the 95th to 99th quantiles, Income year 2011/Survey year 2012**  
(%)

Country	Top 5 %	p96	p97	p98	Top 1 %	Country	Top 5 %	p96	p97	p98	Top 1 %
Portugal	17.3	14.9	12.3	9.3	5.8	Hungary	13.7	11.7	9.6	7.1	4.4
Latvia	16.9	14.5	11.8	8.8	5.4	Romania	13.6	11.4	9.0	6.5	3.8
UK	16.7	14.5	12.2	9.6	6.3	Germany	13.6	11.6	9.5	7.2	4.6
France	16.7	14.6	12.2	9.5	6.2	Luxembourg	13.4	11.4	9.3	7.0	4.5
Bulgaria	16.1	13.9	11.4	8.6	5.5	Austria	13.4	11.3	9.2	6.9	4.2
Cyprus	16.1	13.9	11.7	9.3	6.4	Finland	13.3	11.5	9.5	7.3	4.7
Greece	15.8	13.6	11.3	8.8	5.7	Malta	13.3	11.4	9.3	7.1	4.3
Italy	15.1	12.9	10.6	8.0	5.0	Czech Republic	13.2	11.2	9.1	6.8	4.2
Poland	14.8	12.7	10.4	7.8	4.7	Netherlands	12.9	11.0	9.0	6.8	4.2
Spain	14.7	12.3	9.8	7.1	4.2	Iceland	12.6	10.7	8.7	6.6	4.0
Estonia	14.3	12.1	9.7	7.1	4.2	Sweden	11.8	10.0	8.1	6.0	3.6
Lithuania	14.3	11.9	9.7	7.0	4.1	Norway	11.4	9.6	7.8	5.7	3.4
Switzerland	14.2	12.1	9.9	7.5	4.7	Slovenia	11.4	9.6	7.7	5.6	3.3
Denmark	14.0	12.1	10.2	7.9	5.3	Slovakia	11.4	9.6	7.7	5.6	3.3

NB: Countries ranked according to their top 5 % income shares. UK 2012.

Reading note: Sweden affluence-dominates Norway as it has higher income shares than Norway for all percentiles. Finland has lower share of top 5 % but higher share of top 1 % than Spain, so dominance cannot be established.

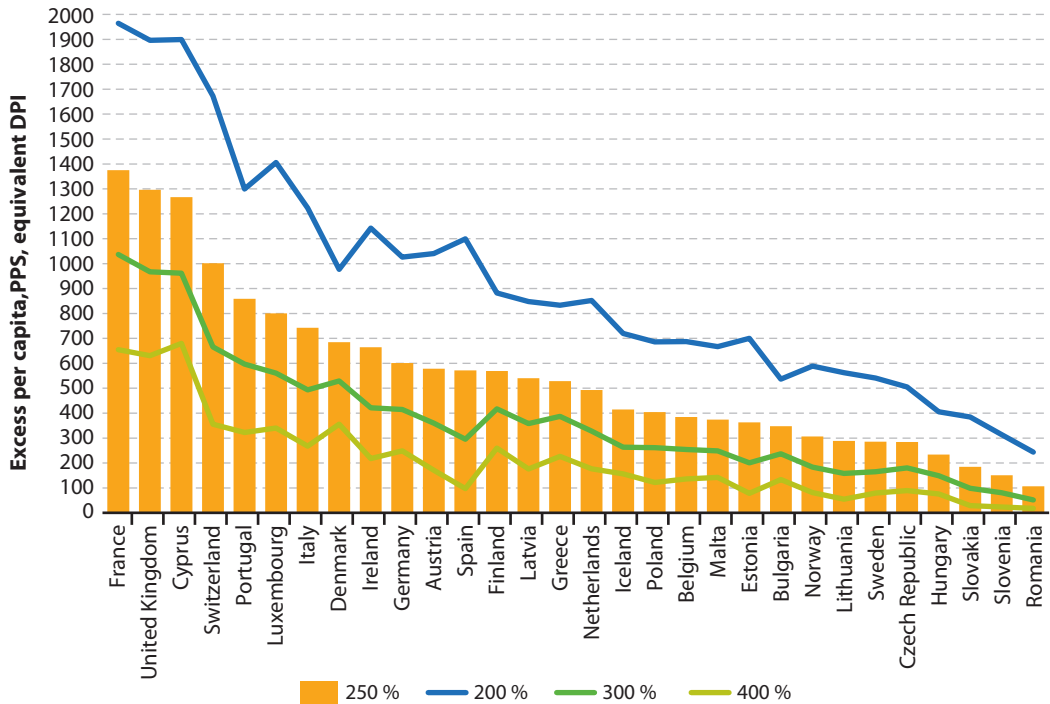
Source: Eurostat web-database, code *ilc\_di010*, retrieved August 2014.

affluence gap is transferred to the bottom of the distribution, poverty risk could be eradicated, ignoring all higher order effects.

At country level, this method would yield quite different affluence lines, as reported in Table 6.3, based

on the 60 % at risk of poverty threshold. Let us note however, that in all countries the lines are above 200 % of median, with the minimum of 205 % in Sweden. The affluence lines are in fact measures of richness reflecting the thickness of the tails, and are above 600 % in Cyprus and France.

**Figure 6.7: Excess income per capita (average affluence gaps), selected high income thresholds, Income year 2011/Survey year 2012**  
(Purchasing Power Standards (PPS))



Reading note: In France, the sum of excess incomes above 250 % of median divided by total population was 1 375 PPS.

Source: Author's computation, UDB August 2014.

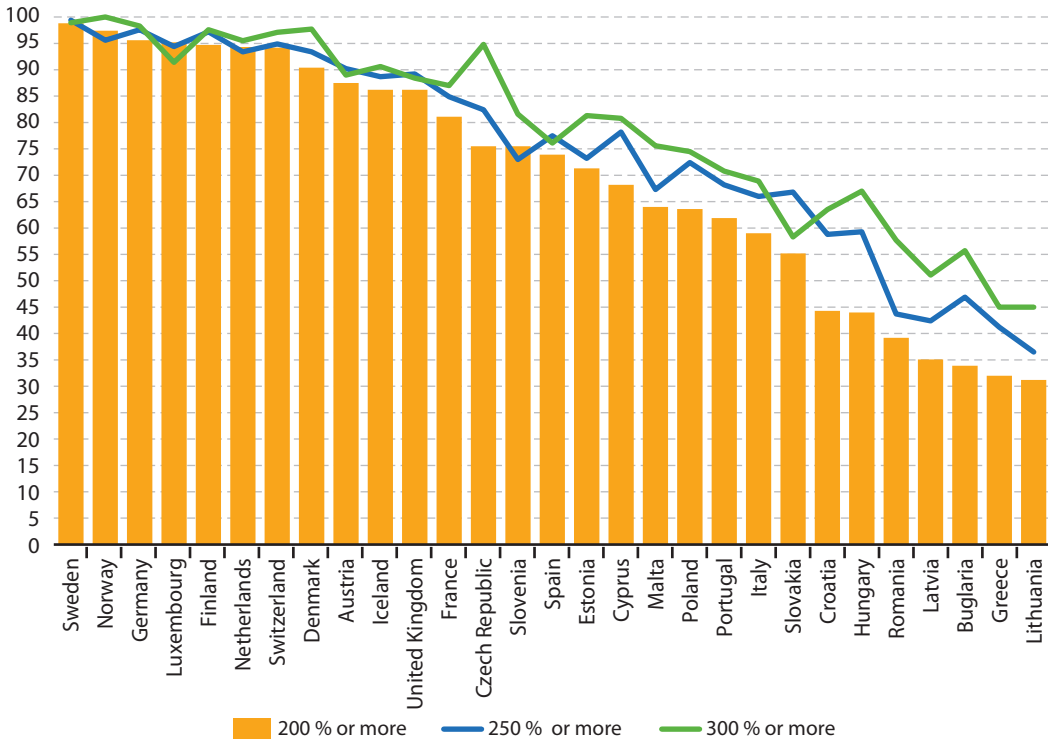
**Table 6.3: Redistribution-based affluence lines of Medeiros, % of median, 60 % poverty risk line, Income year 2011/Survey year 2012**  
(%)

Cyprus	637	Luxembourg	303	Malta	278	Belgium	238
France	607	Switzerland	302	Estonia	276	Romania	216
UK	450	Netherlands	301	Lithuania	272	Norway	211
Portugal	417	Ireland	301	Italy	272	Slovenia	211
Finland	367	Hungary	298	Austria	261	Slovakia	211
Latvia	352	Bulgaria	290	Denmark	252	Sweden	205
Czech Republic	331	Iceland	285	Greece	251		
Poland	314	Germany	283	Spain	238		

Reading note: In Ireland, all those below 60 % of median would have income of 60 % of median if incomes in excess of 301 % of median would be transferred to them, leaving those above 301 % of median with that income.

Source: Author's computation, UDB August 2014.

**Figure 6.8:** Share of persons who make ends meet easily and have the capacity to face unexpected expenses in households above 200/250/300 percentage points of median, Income year 2011/Survey year 2012 (% of population)



*Reading note:* In Sweden, 99 % of persons above 200 % of median lived in households making ends meet easily and having capacity to finance unexpected expenses without borrowing or asking for help. In Lithuania, the corresponding share was 35 %.

*Source:* Author's computation, UDB August 2014.

## 6.4. High incomes and other dimensions of affluence

The measures of richness based on income do not take into account all available resources (wealth, in particular), and mostly neglect the differences in living standards among the European countries. The relative distance from a national median, even if very high, does not necessarily guarantee high economic well-being. We next complement the evidence on high incomes with other dimensions of affluence that could be possibly identified from EU-SILC data.

While EU-SILC does not contain much information on wealth, it does have a wealth of information on non-monetary shortfalls and subjective economic well-being. Unfortunately, there is not much that can help in distinguishing the very well off. Nevertheless, two questions are quite useful: the first is whether the household has difficulties in making ends meet and the second whether the household can finance an unexpected expense without borrowing or other help. We combine these into one measure by restricting to households who can make ends meet fairly easily, easily or very easily (*HS120*) and have the capacity to finance unexpected expenses of 1/12th of the annual poverty risk line from own resources (*HS060*). The combination of the variables leaves out

usually less than 5 % of those who make ends meet very easily. Törmälehto (2017) provides a more elaborated experiment with more dimensions and multi-dimensional counting approach.

This dichotomous variable aims to combine household's perception of adequacy of income in relation to consumption as well as emergency-funding type of wealth. If a household finds it easy to pay for its usual necessary expenses, the ratio of its income to its necessary expenses should be quite high. This may follow from its resources or consumption preferences. All three categories of 'easily' are included (instead of just 'very easily'), since the responses may reflect some personal and cultural differences. Regarding the second condition, if a household can afford an unexpected required expense without borrowing or asking for help, this indicates having some buffer savings in the form of liquid financial wealth (Morrone et al., 2011).

Figure 6.8 shows the proportion of people who make ends meet easily and have capacity to finance unexpected expenses, of those who are above two, two and a half and three high income thresholds<sup>(69)</sup>. Nearly all of those above the twice the median threshold make ends meet easily in Sweden, and more than 85 % in all the Nordic countries, Luxembourg, the Netherlands, Switzerland, Austria, and the UK. In heavy-tailed France, the ratio is a bit lower, and in Eastern and Southern Europe much lower. In particular, only around one third of the relatively high income households make ends meet easily in Lithuania, Greece, Bulgaria, and Latvia. Differences of this magnitude cannot be explained by the inconsistent reference times of EU-SILC; income data are from the previous year while the subjective variables are from the time of the interviews.

In most countries, the share of subjective material well-being increases with higher income thresholds. The differences among the countries reduce, and the figure brings some support to having 250 or 300 % as the high income threshold instead of 200 % of median. It seems evident that using only relative income to identify the affluent is far from satisfactory. For instance, the comparatively large 17 % share of total income going to the top 5 % in Latvia does not translate to uniformly high subjective economic

well-being of this group. Given the large disparities in average living standards in Europe, affluence may be better measured with absolute measures or multidimensional affluence indicators.

## 6.5 Conclusions

Although sample surveys are not generally regarded as good sources on top incomes, EU-SILC is potentially a useful data source as long as its weaknesses and strengths are recognised. The main drawback is the low number of observations in the top end in many countries, which limits the analysis considerably. In contrast, the top tail is not seriously affected by top-coding or extreme outliers. The representation of the sample, possible unit non-response bias, and likely under-estimation are difficult to examine. This chapter addressed the data quality indirectly, by simulating measurement errors via semi-parametric modelling (Pareto-fitting). The method allows for instance sensitivity analysis of more serious under-estimation in the survey countries. Tentatively, it seems that the estimates of top incomes seem not to be overly sensitive to reasonable assumptions about under-estimation of top incomes.

The split to survey and register countries is important, but the differences between the register countries deserve attention as well. The impact on top incomes in France when changing to register data was very significant and shows up in a sizable increase in property incomes. The analysis of the change to register data in France and its effect on comparability should be further examined. We also find differences among the Nordic register countries. The possible impact of different calibration models should be examined; for instance, Denmark and Finland seem to use much more income data in their re-weighting schemes and seem to have fatter tails than the other Nordics.

Regarding the results, relative measures such as headcount shares and top income shares are highly correlated with overall inequality measures. Somewhat different country rankings emerge with transfer-sensitive measures and average affluence gaps, which take into account the distribution and/or the absolute levels of income in the top tail. For instance, the share of persons above 2.5 times the median is

<sup>(69)</sup> Repeating Figure 6.8 for top 5 and top 1 % does not bring much additional insight.

highest in Latvia, Portugal and Spain while with average affluence gaps France, Switzerland and the UK would be ranked to be the most affluent. However, combining affluence headcounts with the absence of financial deprivation suggest that identifying the affluent only on the basis of income is far from satisfactory.

While the chapter followed the dominance approach, in many cases the threshold need to be fixed. Given the sample size restrictions, the upper limit for affluence threshold should not be higher than 2.5 times the median if all countries are to be analysed. The Pareto-fitting and non-income information also give some support to this choice. Regarding outliers, the recommendation is to take the data as it is, and only in very dubious cases consider altering the data. Simple trimming or top-coding should be avoided, and for instance methodology proposed by Alfons and Templ (2013) used instead.

The measurement of 'richness' based on EU-SILC is best seen as related to measurement of relative income poverty and non-monetary deprivation as well as studies of middle-income households and middle class. The value added that EU-SILC can bring to top incomes debate is more on the size and composition of the economically very well-off group rather than concentration of income to the very rich. Sample surveys do have difficulties in capturing top incomes, and sampling errors of population shares of the affluent are likely to be less worrying than sampling errors of top income shares. In terms of the choice between the 'income space' and the 'people' space, the former would be where EU-SILC-based richness measures have more to add. In other words, the focus could be put on the distances of the 'mildly' affluent from the average individual, the size of the affluent group, and their living conditions.

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# 7

# The distributional impact of imputed rent in EU-SILC 2007-2012

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## 7.1 Introduction

With the introduction of data collection about imputed rents in 2007, EU-SILC took a step towards a more complete measure of economic well-being. The definition of imputed rent in EU-SILC takes into account both the returns to home ownership, i.e. that the main residence is an asset, as well as the in-kind transfers accruing to those whose rent is below the prevailing market rent. On a conceptual level, the inclusion of imputed rents should improve comparability of household economic well-being over time, across countries, and between housing tenures, age groups and other population subgroups.

This chapter is based on previous analysis by the authors using EU-SILC data on imputed rents, which focused largely on issues of data quality (Törmälehto and Sauli, 2010; Sauli and Törmälehto, 2010; Törmälehto and Sauli, 2013). It discusses the concept and measurement of imputed rent as well as issues related to EU-SILC data. It also reviews how adding imputed rents into disposable income would affect average income levels, inequality and the prevalence of people at risk of poverty or social exclusion. Finally, it updates our earlier results with the most recent data available at the moment of finalising the analysis, covering survey years 2007-2012.

<sup>(70)</sup> Both authors are from Statistics Finland. The authors wish to thank Anthony B. Atkinson, Anne-Catherine Guio, Stephen Jenkins, Eric Marlier, Mira Pedro and Philippe van Kerm for valuable comments and suggestions. All errors remain strictly the responsibility of the authors. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [veli-matti.tormalehto@stat.fi](mailto:veli-matti.tormalehto@stat.fi).

## 7.2 Measuring imputed rents

Net imputed rent is an estimate of the value representing the benefit accruing to the household due to not paying full market rent. In terms of target variables, net imputed rent refers to imputed rents (HY030) minus interest repayments on mortgage (HY100). Given that rents are to be imputed to around 80 % of the European households, identification of the potential beneficiaries and sensitivity to the underlying assumptions, models and data are of key importance. The two main approaches in the measurement are the rental equivalence method and the user cost/capital market method, with the rental equivalence being preferred in the Eurostat guidelines (Eurostat, 2013).

### 7.2.1 Conceptual and empirical framework

Conceptually, imputed rents are closely related to measurement of housing expenditure and wealth, because a dwelling is both an investment and consumption good. A household's main residence is typically the largest real asset type in household's portfolio, and a dwelling provides a flow of housing services to the occupant. Moreover, housing costs and affordability of housing are decisive factors in the choice of housing tenure <sup>(71)</sup>. Our conceptual framework is the same as in our previous studies, and builds on the following definition of housing costs (user cost of housing):

<sup>(71)</sup> For a detailed discussion, see Törmälehto and Sauli (2010).

$$(1) R = C + L + T + iD + d + r(V-D) - E(DV)$$

where:

$C$  = operational housing costs (service charges, utilities, maintenance and repairs, insurance);

$L$  = actual rentals paid by tenants;

$T$  = property taxes – tax relief on mortgage interest – direct housing benefits;

$i$  = mortgage interest rate;

$D$  = amount of outstanding housing debt;

$d$  = cost of major repairs / depreciation (of structures);

$r$  = interest rate on the alternative use of funds;

$V$  = current market value of the dwelling;

$E(DV)$  = expected (E) change (D) in the value of dwelling.

So,  $C$  represents operational housing costs;  $T$  represents how taxes and benefits affect housing costs; whereas the other terms refer to the user costs of financial and fixed capital. For tenants,  $L$  includes the other components except the last one (expected change in market value), i.e. owner's costs and, in competitive rental markets, returns to owner's investment.

The opportunity cost of an alternative investment plan,  $r(V - D)$ , is a direct measure of return to home equity. If measurement of income is the only concern, it is sufficient to measure the current market price of a dwelling, interest repayments on mortgage, and assume some rate of return. The first two may not be easy to measure, whilst the last component is purely an assumption about an interest rate. This approach can be labelled as the 'capital market' or 'user cost' method.

In the rental equivalence method, the aim is to estimate what the rent level in competitive rental markets is for a dwelling that has the same characteristics. These estimated rental equivalences are calculated for owner-occupiers and tenants who do not pay full market rent. All relevant housing costs normally paid by the owner are then deducted from the rental equivalent. In principle, the estimated rental equivalent should reflect all relevant housing costs plus some profit for the owner. To derive these, one needs a data source containing rental prices and an

extensive set of covariates to control for differences in characteristics. The disadvantage of the method is that non-subsidised rental markets are very small in most European countries, and rental price models may be sensitive to the models and estimation methods.

In EU-SILC, each country estimates gross imputed rents in its own preferred way, but most have opted for the rental equivalence approach (Törmälehto and Sauli, 2013, p. 14). The EU-SILC guidelines take the rental equivalence method as the reference estimation method for derivation of estimates of imputed rental income. According to the 2013 guidelines, target variable imputed rent (*HY030G*) '...shall be the equivalent market rent that shall be paid for a similar dwelling as that occupied, less any rent actually paid (in the case where the accommodation is rented at a lower price than the market price), less any minor repairs or refurbishment expenditure [...]. Costs for heating, water, electricity, etc. are excluded. Repair leading to improvements of fixing major problems of the dwelling are also excluded. Depreciation (consumption of fixed capital) shall neither be taken into account because they are likely to be offset or superseded by variation of market value of the dwelling. These latter are not covered in EU-SILC.' (Eurostat, 2013, p. 214)

## 7.2.2 Estimation methods

Balcazar et al. (2014) provide a thorough review of the various econometric and statistical methods to compute imputed rents. The most common methods are regression (semi-logarithmic models based on hedonic price theory) and stratification (i.e. using imputation cells). The principle is the same in both. First, the variation of actual rents of tenants in competitive markets is explained with covariates that are available for owners and subsidised tenants in the EU-SILC sample. In a typical regression model, logarithm of rent is the dependent variable and regional and physical characteristics of dwellings the independent variables. In the second step, the same covariates and the estimated model parameters are used to compute predicted rental values (i.e. imputed rents) for owner-occupiers and tenants who do not pay full market rent.



There may be systematic differences between renters and rented dwellings in competitive rental markets compared to owners and subsidised tenants. In the estimation, this may lead to selection bias, which can be taken into account in the regression based methods. A standard solution for this is to apply the so-called Heckman correction, which basically entails two-step modelling of both the tenure choice (owner/renter) and rental values of renters. In EU-SILC, some countries have applied Heckman correction (Törmälehto and Sauli, 2013, p. 14).

In the rental equivalence method, estimated rents should be based on observed rental values in the non-subsidised sector. The quality of data on rents (external data or the sub-sample of tenant in EU-SILC) is therefore very important. The imputed rental equivalences can be over- or under-estimated because the available rental price data may not be granular enough. This can lead to crude approximations from geographically large and heterogeneous rental markets, and also over-estimation if the rental prices are abnormally high in some regions (e.g. major cities).

As mentioned above, the very small size of the non-subsidised sector raises doubts about the suitability of the rental equivalence method for imputation in many countries. The Eurostat guidelines cited above set the threshold of the size of the market rent sector for choosing the user cost method rather low (at 10 %). The proportion of tenants who pay market rents varies considerably through Europe. However, only few of the countries with a small market rent sector (11 countries in Figure 7.1) have chosen the user cost method instead of the rental equivalence methods (Czech Republic, Estonia, Iceland, Slovakia). Only one country among countries with a small market rent sector and using the rental equivalence method has accounted for the possible selection bias emerging from the segregation between owners and tenants: Cyprus, where the share of population on the rental market was 9.9 % in 2007.

The inclusion of imputed rents in household income has a large impact on income levels. In some countries, the median gross disposable household income increases by more than 15 % after inclusion of imputed rents. Small details in calculation techniques may have substantial effects on the amounts imputed. Further harmonisation of the techniques is

therefore necessary. We recommend that Eurostat provide more detailed guidelines about the criteria regulating the methodological choices, the econometric techniques and covariates in the regression models, the use of Heckman corrections and choice of stratification criteria, and how to control for extreme outliers.

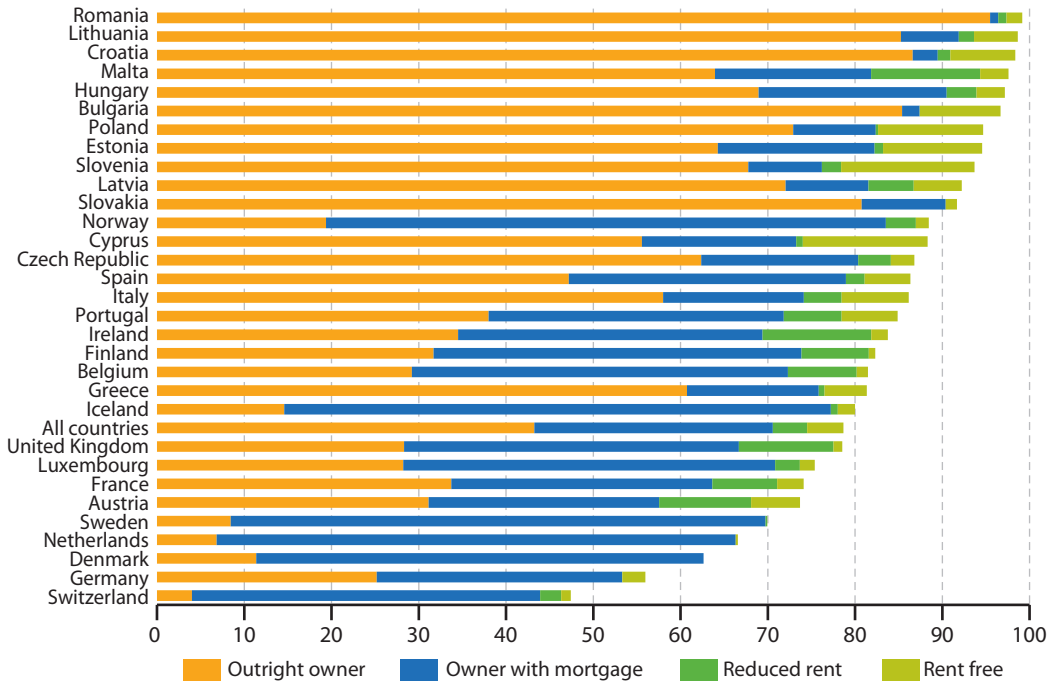
### 7.2.3 The prevalence of rental income imputation, by housing tenure

Imputed rents are a sort of 'mass imputation' on a European scale, affecting the great majority of population in nearly all countries. Figure 7.1 summarises the prevalence of imputations in 2012. Overall, 78 % of the populations in the 31 countries included in the data received some imputed income. The Eastern European countries, Baltic countries and Malta have incorporated imputed rents for more than 90 % of their population, i.e. individuals in households. This is a direct consequence of the tenure structure in those countries. At one extreme, imputed rents have been imputed to almost all households (Romania) and, at the other extreme, to 'only' between 50 % and 60 % of individuals in some countries (Germany, Denmark). The imputation rate is lowest in Switzerland (48 %).

In addition to the very different tenure structures in the countries, the prevalence of imputations also reflects some deficiencies in the underlying data. In EU-SILC, rents are to be imputed both to owner-occupiers and to tenants not paying full market rent. Correct identification of the latter is a more complicated issue. Our conclusion is that the variable on tenure status is not fully comparable across countries, and not always consistent with imputed rental values. For instance, according to EU-SILC data there is no social housing at all in Denmark and the Netherlands, which is incorrect.

Although tenants who pay full market rent cannot themselves receive imputed rents, their relative position in the income distribution changes. The prevalence of poverty is higher among this group when it is assessed using cash disposable income, and the inclusion of imputed rents in income moves them further down the income distribution. Moreover, the

**Figure 7.1: The share of population receiving imputed rents by tenure status, 2012**  
(% of total population)



NB: Countries ranked by the share of population receiving imputed rents.

Reading note: In Romania, approximately 95 % of the population are outright owners, and 99 % of the population receive imputed rents, the rest being market renters. By contrast, 45 % of the Swiss population receive imputed rents.

Source: Authors' computation, UDB August 2014.

size of this group is crucial for obtaining reliable estimates of rental equivalences for owner-occupiers (see above).

Owners with mortgages are an important subgroup as well, because interest repayments on mortgages are deducted from gross imputed rental income. There is significant variation in mortgage indebtedness across European countries, and between age groups within countries. Average income levels and mortgage take-up rates are positively correlated across countries, which may reflect the need for and access to finance, taxation, and transmission mechanisms of housing wealth (e.g. inheritances, privatisation in Eastern Europe). (See Törmälehto and Sauli, 2010.)

### 7.3 The data: definitions, completeness and outliers

We construct the main analysis variable, net imputed rent, by deducting interest payments (*HY100G*) from imputed rents (either *HY030G* or *HY030N*). It is important to note that, after choosing between *HY030G* and *HY030N*, we take the data as they are, i.e. derive net imputed rent in the same way for all countries. If the required variables are not available in the data, we do not derive net imputed rents.

While imputed rents are constrained to be positive in the data, the subtraction of interest repayments on mortgage may lead to negative values for the net imputed rents estimated for owner-occupiers. We retain any negative values since in the short run indebted households with high leverage may find

owning more costly than renting (Törmälehto and Sauli, 2010, p. 15). Moreover, negative net imputed rents generally do not lead to negative disposable income, which would be a challenge for distributional analysis.

Negative net imputed rents are far more prevalent than in most countries in the Netherlands as well as in the UK (2010-2012) and in Switzerland. We assume that net imputed rents cannot be constructed in a comparable way for the Netherlands. For the UK, there is a break in time-series in 2010.

### 7.3.1 Completeness and comparability

The data for survey years 2007 to 2012 include 21 countries with no documented reasons for breaks in time series or other obvious problems. Consequently, the data coverage is somewhat incomplete in the 2007-2012 datasets. Minimum requirement is to at least have the variables on imputed rents and mortgage interest repayments included in the data. In this respect, there are some gaps before 2011. For instance, net imputed rents could not be calculated for Germany 2007-2009 because mortgage interest repayments were missing.

It is sometimes difficult to judge if the variables needed for calculation of net imputed rent are comparably constructed by the data collectors. Imputed rent, before deducting interest repayments, may be recorded gross (*HY030G*) or net (*HY030N*); and Eurostat's instructions do not specify what is meant by 'net'. Net can be *net of actual costs* borne by the occupant, or *net of taxes* in case imputed rents are subject to tax. For most countries, we conclude that the variable *HY030G/N* includes imputed rents as the value of housing consumption minus the costs of occupation. As far as we know, imputed rents are subject to tax in Belgium, Luxembourg, Lithuania and the Netherlands (Juntto and Reijo, 2010; see also Balcazar et al., 2014, p. 19). EU-SILC Quality reports (which National Statistical Institutes have to submit to Eurostat) do not specify the treatment of the taxation. We use gross interest repayments (*HY100G*) in our analysis, with some uncertainty concerning the treatment of tax relief on mortgage interest.

The data on imputed rents have become more complete, and quality may have improved over the years with some developments in the applied methods. However, it is not easy to judge the consequences of the varied imputation methods and data sources to data comparability on the basis of the UDB data and/or metadata. A review of the distributions of imputed rental income in Törmälehto and Sauli (2013) shows great differences in the amounts of rent imputed and the shapes of the distributions across countries. Different methods and underlying data may produce similar outcomes, and vice versa.

### 7.3.2 Extreme values and excess housing consumption

Outlier estimates for imputed rents may result from households' preferences regarding housing consumption, the characteristics of the housing markets, or the estimation method. As discussed by Sauli and Törmälehto (2010), households may consume housing services 'excessively' relative to their needs. A typical example is an elderly person who lives alone in a large apartment after their children have left or the partner has passed away. Arguably, this adequately reflects the housing consumption and the resources available to the household because the household could downsize and/or re-locate if it preferred more liquid assets or an increase in non-housing consumption. This argument may be moot, however, since the quality of the services ('home') and other preferences (social relations, bequest motives) imply that a person's home is best characterised as a spatially-fixed illiquid asset.

As a more technical check of the impact of outliers, we compared winsorised (1 % top/bottom-coded to threshold value) and trimmed (1 observation or 1 % excluded) means of imputed rents and mortgage interest repayments, and examined how average values of estimates changed <sup>(72)</sup>. We found that the data were reasonably robust to extreme outliers. Nevertheless, we recommend that Eurostat's data checking routines should be adapted to eliminate very extreme outliers in case they are found.

<sup>(72)</sup> We also made some futile attempts to identify outliers based on robust multivariate regression, with characteristics of the dwelling and the household as explanatory and log of imputed rents as the dependent variable.

In Figure 7.2, we also examined the weighted shares of individuals in households with gross imputed rental values beyond the upper quartile plus or minus 1.5 times the interquartile range (the 'box-plot fences'). We also calculated the shares of those for whom the imputed rents (net) would at least double their income level. Overall, we find estimated shares to be quite stable over the four years, but with some variation across the countries, in particular in the proportion with values above the upper boxplot fence. For instance, the high shares outside the upper fence in Ireland and Slovenia seem to be anomalies of the survey year 2012, whilst in the Netherlands and Slovakia the proportions are fairly high in all of the years. The share of those for whom

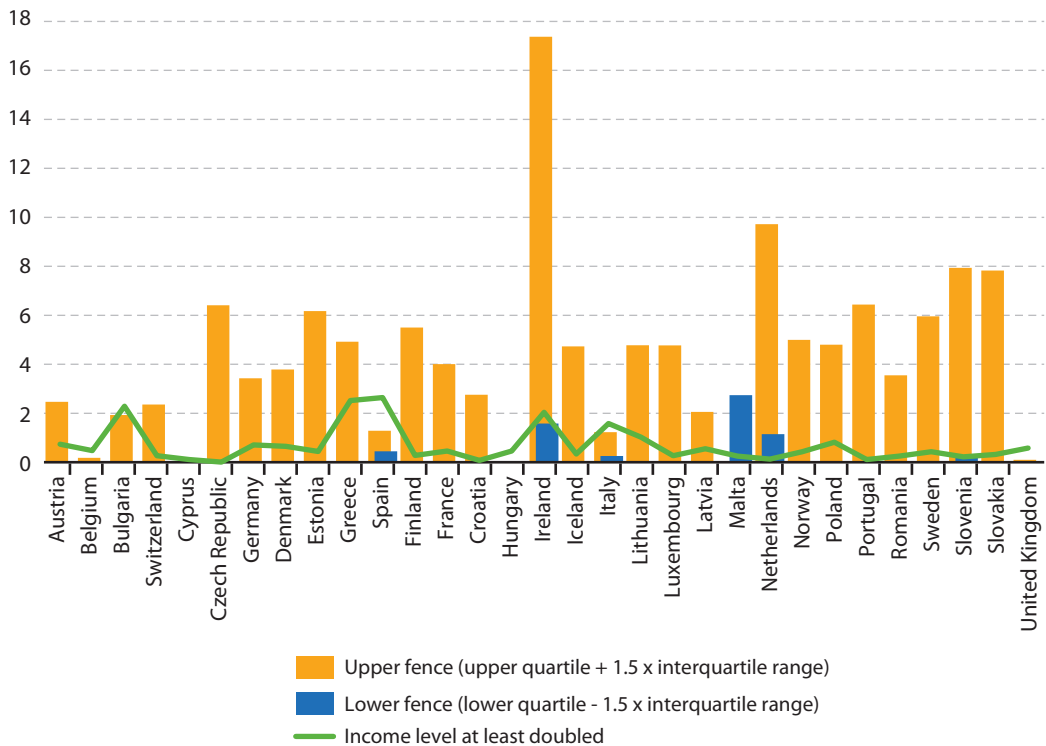
incomes would double is generally low, and with some decline over the years.

Although the data itself do not indicate outliers or excessive housing consumption as imminent problems, it is sometimes questioned whether one can reasonably assume a 100 % 'liquidity' of the economic advantage of home ownership. One way of dealing with 'excessive housing consumption' relative to needs could be to implement restrictions on the amount of imputed rent assigned to households.

With a view to start exploring how such a restriction could be concretely implemented, using EU-SILC 2007 data, Sauli and Törmälehto (2010) analysed the impact of a capping based on the number of rooms

**Figure 7.2: Prevalence of outlying values of imputed rents (HY030, gross of interest repayments) and doubling of income levels due to net imputed rents (HY030-HY100G), 2012.**

(% of population conditional on having imputed rents)



*Reading note:* In Spain, 1.3 % of individuals in households with imputed rents have imputed rents higher than the upper fence of 9 172 euros (75th percentile 6 257 euros + 1.5 times interquartile range 1 943 euros), while 0.5 % have imputed rents lower than 3 342 euro (lower fence). If imputed rents were added, equivalent disposable income would double for 2.6 % of Spanish individuals living in households with imputed rents.

*Source:* Authors' computation, UDB August 2014.

needed for not living in an overcrowded household (according to the agreed EU definition). For dwellings whose number of rooms is above the overcrowding norm, the imputed rent was capped at the norm level. For others, full value of imputed rent was allowed. The effects of capping on the overall at-risk-of-poverty rate were hardly distinguishable, although capped imputed rents reduced elderly poverty rates markedly less in some countries compared to full imputed rents. Capping also narrowed the dispersion of imputed rents substantially. The key advantage of the capping method used is that it was based on an EU social indicator that was agreed further to comparative analysis and in-depth discussion at EU level. Consequently, the method could be further explored as specific to the methodology of EU indicators, if 'liquidity' is seen as a vital requirement and excessive housing consumption a critical issue. However, in our view, 'capping' should be kept distinct from a more general estimation methodology of imputed rents.

## 7.4 Distributional effects

In general, EU-SILC data indicate that imputed rents reduce relative inequality, and in particular at-risk-of-poverty rates of the elderly. The average income levels increase quite significantly in most countries. These results are in line with many other studies (for a review, see Balcazar et al., 2014). In this section, we review the impact of adding imputed rents on average income levels, relative income inequality, at-risk-of-poverty (AROP), and at-risk-of-poverty-or-social-exclusion (AROPE) (see Chapters 1 and 3 in this book for a definition of these two indicators).

### 7.4.1 Changes in average income level and income inequality

The magnitude of the distributional effect depends on the income share of imputed rents (i.e. how average income changes when imputed rents are added), the distribution of imputed rents among those receiving them, and the correlation between imputed rents and cash disposable income.

First, we examine how average income levels change when imputed rent is added in (see Table 7.1). Taken at face value, the data indicate that changes in average income range from around minus 8 % in the Netherlands to around 20 % in Bulgaria. Disregarding the Netherlands, we still find extreme variations, from roughly minus 1 % in Switzerland to around 15 % in Spain, Greece, Italy and Poland.

The impact on average income depends on the homeownership rate, the proportion of tenants in subsidised housing, the average rents or housing prices, the average level of the costs that are deducted from rental equivalences, the mortgage indebtedness and interest rates. Of these factors, EU-SILC data show that both homeownership rates and proportions of households holding mortgage debt range widely across European countries (Törmälehto and Sauli, 2010). The share of outright owners is very high in some Southern and Eastern countries, while housing indebtedness is more prevalent in the Netherlands, the UK and the Nordic countries.

We have used data for all countries, including those with missing data or unstable series. The first years of data construction seem less stable than the later years, indicating changes in methods and possibly improvements in data quality. Such changes in methods are typically not explained in the documentation; only Portugal reported a change in its method in 2008 <sup>(73)</sup>. In particular, Switzerland <sup>(74)</sup>, the UK, Malta, and Estonia have changes in their estimates which signal possible changes in data practices, but their Quality reports do not mention such changes. Moreover, there are inexplicable changes in gross imputed rents for some countries, e.g. Poland (2008) and Belgium (2011). In the UK, gross imputed rents decrease considerably in 2010. The UDB documentation points to a change in the estimation method but the Quality reports do not give further details.

However, ignoring the seemingly unstable data fluctuations, one observes in many countries either no change or a slightly declining trend in the shares of imputed rents in household disposable income be-

<sup>(73)</sup> Portugal switched to regression rental equivalence from the subjective method in 2008, and this explains the observed change. The UK also changed its methodology in 2008, but the nature of the change is not explained in the Quality reports.

<sup>(74)</sup> Switzerland had a positive mean net imputed rent before 2010, then negative.

**Table 7.1: The impact on average equivalent income of adding in imputed rents, 2007-2012** (%)

	2007	2008	2009	2010	2011	2012		2007	2008	2009	2010	2011	2012
Netherlands	-8	-8	-8	-8	-9	-8	Germany				9	9	9
Switzerland		9	9	10	-1	-1	Norway	10	6	5	9	9	10
Czech Republic	2	2	1	1	1	1	Slovenia	11	10	10	10	16	10
Hungary					2	2	Lithuania	16	13	13	13	11	10
United Kingdom	10	7	9	1	2	2	Finland	10	9	8	10	11	11
Romania	2	3	2	2	2	2	Luxembourg	11	10	11	10	11	12
Portugal	18	4	2	2	3	3	Ireland	10	10	13		8	13
Malta			9	10	5	5	Cyprus	14	16	18		14	14
Latvia	11	6	5	5	6	6	Denmark	9	9	14	14	14	14
Iceland	8	8	5	5	6	6	Poland	15	27	15	16	14	15
Sweden	11	9	9	8	10	7	Spain	16	15	14	16	16	15
Austria	6	6	8	8	8	7	Hungary	23	23	20	20	18	16
Estonia	20	20	15	11	9	8	Italy	15	17	15	17	17	16
France	13	10	10	9	10	9	Greece	16	15	15	14	17	18
Slovakia	10	10	11	11	11	9	Bulgaria	23	13	14	16	16	19
Belgium	9	9	11	9	-3	9							

NB: Countries ranked according to impact in survey year 2012. Values (before rounding) less than 0, between 10 and 20, and more than 20 are highlighted — in light orange, dark orange and blue respectively.

Reading note: In almost all countries net imputed rents are positive, on average, and would increase disposable income if added to the income. In the Netherlands, average net imputed rent is negative and decreases disposable income.

Source: Authors' computation, UDB March/August 2014.

tween 2007 and 2012. Exceptions are Greece, Denmark, and Norway, which experienced increases after 2010.

Table 7.2 summarises our estimates of how inequality changes when imputed rents are added into income. Inequality and changes in inequality between 2007 and 2012 are measured using the Gini coefficients<sup>(75)</sup>. With a few exceptions, net imputed rents reduce inequality in all countries and in every year. In percentage point terms, imputed rents consistently reduce levels of inequality more in many Southern and Eastern European countries, although Portugal, the Czech Republic and Romania are exceptions.

Based on Gini coefficients of 2012 (Income year 2011), there are some interesting changes in the country

<sup>(75)</sup> See Törmälehto and Sauli (2010) for estimates based on other inequality indices and using 2007 EU-SILC data.

inequality ranking. If imputed rents were included, there would then be less inequality in Spain compared to the UK, and in Italy compared to France. Looking at the changes in inequality between 2007 and 2012, not much can be said because the data are not comparable over this period in all countries. Taken the figures as they are, Gini including imputed rents increases notably more (or decreases less) than Gini of cash income in a number of countries (e.g. Belgium, Bulgaria, Denmark, Estonia, Ireland, Luxembourg, Hungary, Portugal, UK).

As mentioned above, the change in relative inequality depends *inter alia* on how the imputed rents are concentrated over the distribution of cash disposable income. Net imputed rents (including also zero values) tend to be more evenly distributed than cash disposable income (Törmälehto and Sauli, 2010).

**Table 7.2: The impact on Gini coefficient of adding in imputed rents: Gini including imputed rents minus Gini without imputed rents (pp-change), Survey years 2007-2012/Income years 2006-2011 (percentage points)**

	2007	2008	2009	2010	2011	2012	Gini, cash DPI, 2012		2007	2008	2009	2010	2011	2012	Gini, cash DPI, 2012
Spain	-3.5	-3.0	-3.1	-3.5	-3.5	-3.2	35.0	Sweden	-0.7	-0.8	-0.8	-0.8	-0.7	-0.7	24.8
Italy	-2.5	-2.2	-2.3	-2.1	-2.4	-2.3	31.9	United Kingdom	-3.5	-1.8	-1.8	-0.9	-1.0	-0.6	32.8
Cyprus	-2.5	-2.4	-2.1	0.0	-2.3	-2.3	31.0	Croatia					-0.4	-0.5	30.5
Poland	-2.2	-2.7	-2.0	-2.1	-2.1	-2.3	30.9	Portugal	-2.3	-0.6	-0.2	-0.1	-0.4	-0.5	34.5
Greece	-2.4	-2.3	-2.3	-2.4	-2.6	-2.2	34.3	Finland	-0.6	-0.6	-0.6	-0.4	-0.4	-0.5	25.9
Estonia	-3.5	-2.6	-2.8	-1.9	-1.7	-1.7	32.5	Norway	-0.7	-0.4	-0.7	-0.5	-0.5	-0.4	22.6
Latvia	-1.8	-1.6	-1.4	-1.5	-1.4	-1.6	35.7	Germany				-0.4	-0.4	-0.4	28.3
Lithuania	-0.8	-1.4	-1.9	-2.8	-1.9	-1.6	32.0	Luxembourg	-1.1	-0.7	-0.8	-0.5	-0.4	-0.4	28.0
Malta			-2.6	-2.7	-1.5	-1.6	27.1	France	0.0	-0.1	-0.5	0.0	-0.3	-0.3	30.5
Slovenia	-1.4	-1.4	-1.5	-1.6	-2.5	-1.6	23.8	Switzerland	0.0	-1.0	-0.9	-0.9	-0.3	-0.2	28.8
Ireland	-2.6	-2.5	-2.8	0.0	-2.2	-1.5	29.9	Iceland	-0.6	-0.4	-0.1	0.3	0.6	-0.2	24.0
Belgium	-1.8	-1.4	-1.3	-1.3	0.0	-1.3	26.6	Romania	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	33.3
Slovakia	-0.9	-1.2	-1.2	-1.3	-1.4	-1.3	25.3	Czech Republic	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	24.9
Hungary	-1.8	-1.6	-1.3	-1.0	-1.2	-1.2	26.9	Netherlands	0.4	-0.1	0.3	0.2	0.2	0.2	25.4
Bulgaria	-2.0	-2.1	-1.2	-1.0	-1.0	-1.1	33.6	Denmark	-0.3	-0.4	0.9	0.4	0.5	0.6	28.1
Austria	-0.4	-0.6	-0.4	-0.8	-0.7	-0.7	27.6								

NB: DPI = Disposable personal income. Countries sorted according to impact in 2012 (Income year 2011).

Reading note: Decreases are highlighted in light orange, increases in blue. In most countries, imputed rents reduce income inequality. For example, in Spain, the Gini coefficient decreases by 3 percentage points.

Source: Authors' computation, UDB March/August 2014.

Looking at the conditional distributions of imputed rents (excluding zero values), we find that the variation of values differs quite a bit between countries. This may partly reflect differences in how disaggregated the imputation models are, particularly if the stratification method is used (cell-based mean imputation).

## 7.4.2 Changes in income poverty and social exclusion

Given the sizable effects on average income and income inequality, the addition of imputed rents to the income measure may also change estimates of

EU social indicators. We now examine the impact of adding in imputed rents on levels and on trends in estimates of AROP and AROPE rates.

Net imputed rents generally increase median income and consequently also the income poverty threshold (decrease in the Netherlands and Switzerland). This causes transitions out of poverty ('cash poor') and transitions into poverty ('house poor'), which depend on the distributions of both net imputed rents and cash disposable income.

**Table 7.3: Effects on the at-risk-of-poverty (AROP) rates of adding in imputed rent (IR), by age, 2012**  
(index, age-specific AROP excluding imputed rent = 100)

	AROP with IR (%)		Change in AROP when imputed rent is added to income (index AROP excluding IR = 100)																	
	All ages	All ages	0+	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Ireland	15.7	12.8	81	111	82	87	89	92	107	83	112	91	82	67	57	46	44	46	44	52
Cyprus	14.7	12.3	83	99	98	90	89	105	130	101	93	87	89	82	76	58	44	57	45	61
Slovenia	13.5	11.4	84	96	96	98	93	90	90	101	95	88	92	88	80	67	58	63	66	65
Malta	15.1	12.9	86	95	93	93	93	92	101	98	94	88	85	81	74	77	69	69	66	56
Greece	23.1	20.3	88	119	99	95	97	110	85	108	106	97	88	90	73	71	66	47	30	42
Spain	22.2	19.8	89	109	97	94	101	102	101	99	98	92	94	89	81	70	45	47	43	34
Italy	19.4	17.5	90	107	103	100	104	102	105	103	100	100	97	90	93	80	64	44	46	39
Poland	17.1	15.4	90	102	104	96	101	101	103	96	98	93	92	83	77	68	57	63	70	66
Slovakia	13.2	11.9	90	101	99	102	96	94	97	99	98	96	91	88	78	70	62	55	33	37
Belgium	15.0	13.6	91	109	110	108	97	99	92	108	102	98	93	94	79	79	61	52	63	77
Croatia	20.5	19.4	95	97	102	95	98	99	95	97	100	96	96	96	94	95	89	90	88	86
Estonia	17.5	16.6	95	115	106	102	100	107	101	110	101	100	98	89	95	81	71	67	69	76
Latvia	19.2	18.4	96	98	103	100	102	102	94	98	95	106	94	96	93	89	88	83	90	76
United Kingdom	16.2	15.6	96	120	116	114	115	104	113	119	111	122	103	97	84	77	49	41	39	34
Finland	13.2	12.8	97	111	103	98	96	115	123	110	113	103	99	101	100	85	90	66	64	69
Portugal	17.9	17.3	97	91	102	96	98	96	99	101	97	97	100	99	99	95	94	90	90	94
Austria	14.4	14.0	97	104	110	103	96	101	117	102	110	101	88	99	94	95	84	76	60	77
Switzerland	15.9	15.5	97	103	98	109	105	93	93	99	100	100	110	102	103	103	92	89	85	85
Netherlands	10.1	9.9	98	137	101	104	92	93	119	117	114	109	91	107	65	79	81	61	44	42
Hungary	14.0	13.9	99	117	114	111	104	100	110	117	105	99	100	89	73	71	63	80	73	58
Czech Republic	9.6	9.6	99	100	102	99	101	100	100	99	100	101	100	99	98	98	97	91	95	94



AROP (%)	Change in AROP when imputed rent is added to income (index AROP excluding IR = 100)																		
	All ages	0+	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
France	14.1	100	109	114	103	94	113	116	110	109	100	102	93	81	78	66	76	89	77
Lithuania	18.6	100	146	113	113	105	122	110	103	104	113	101	96	89	89	75	68	80	66
Romania	22.6	100	99	101	100	99	101	99	101	100	100	101	100	101	102	100	100	100	102
Bulgaria	21.2	101	112	106	101	115	106	106	98	109	106	109	96	101	93	92	90	91	84
Sweden	14.2	101	118	110	107	102	112	112	108	109	104	104	107	95	88	65	86	68	84
Germany	16.1	103	121	114	117	100	111	112	119	120	111	100	105	95	91	87	90	77	75
Norway	10.1	103	114	144	130	105	105	111	128	135	115	105	100	91	78	75	32	36	53
Iceland	7.9	110	120	110	121	115	111	121	119	111	113	114	98	94	78	59	55	44	92
Denmark	13.1	110	117	94	120	114	118	122	107	105	119	122	125	125	133	87	106	82	76
Luxembourg	15.1	116	129	122	115	108	109	123	124	132	129	111	105	109	112	82	104	83	100

NB: Countries ranked by overall relative effect. Light orange = at-risk-of-poverty rate decreases when imputed rent is included. Blue = at-risk-of-poverty rate increases by more than 10 % when imputed rent is included.

Reading note: In a majority of countries, the change in income concept results into lower overall at-risk-of-poverty rates. The effect is greatest in Ireland. In households with children and in younger adults' households, the change is less marked or even opposite than in the households of the elderly. The elderly householders experience a decrease in the AROP rate almost in all countries.

Source: Authors' computation, UDB August 2014.

**Table 7.4: Effects on the at-risk-of-poverty-or-social-exclusion (AROPE) rates of adding in imputed rent (IR), by age, 2012**  
(index, age-specific AROPE excluding imputed rent = 100)

	AROPE (%)		Change in AROPE when imputed rent is added to income (index AROPE excluding IR = 100)																	
	All ages	with IR (%)	0+	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Slovenia	19.6	17.9	92	97	98	97	98	96	96	96	96	94	98	96	98	78	70	73	73	73
Malta	23.1	21.5	93	101	96	97	96	98	99	100	98	95	96	97	94	86	76	78	75	80
Spain	28.2	26.4	93	107	98	95	99	102	101	101	100	97	96	97	98	76	53	56	49	44
Cyprus	27.1	25.4	94	99	99	101	99	101	113	99	99	96	99	98	98	81	60	69	50	65
Italy	29.9	28.4	95	104	101	99	102	101	102	101	100	100	99	96	99	89	80	69	70	70
Belgium	21.6	20.6	95	104	107	104	98	102	97	103	102	102	98	100	97	82	70	56	64	80
Finland	17.2	16.4	95	104	100	98	95	112	109	105	98	102	100	102	99	82	84	67	67	70
Slovakia	20.5	19.5	95	100	96	97	97	100	103	99	95	97	96	96	95	89	83	90	71	81
Poland	26.7	25.5	95	100	100	97	100	100	101	98	98	95	96	93	96	83	81	85	88	89
Greece	34.6	33.1	96	103	101	100	100	99	97	100	104	99	96	98	98	84	83	73	75	72
Ireland	30.0	28.9	96	106	101	101	97	96	104	103	103	102	100	94	98	69	59	54	51	60
Austria	18.5	17.8	96	101	103	98	97	101	107	100	104	100	92	100	97	95	84	78	67	78
United Kingdom	24.1	23.3	97	108	105	107	109	102	105	107	105	114	104	100	94	80	54	46	44	37
Estonia	23.4	22.8	97	105	106	104	101	103	105	109	100	101	101	95	99	85	80	81	77	80
Croatia	32.3	31.5	98	99	100	98	99	99	96	100	101	98	98	99	100	97	95	94	93	89
Switzerland	17.5	17.2	98	103	99	110	106	94	95	98	100	101	110	102	102	103	92	89	85	85
Portugal	25.3	24.9	98	100	100	98	99	98	101	99	99	97	100	98	99	96	96	95	96	96
Latvia	36.2	35.8	99	100	101	99	100	100	98	101	98	100	99	100	100	98	98	94	99	96
Hungary	32.4	32.2	99	102	103	102	100	99	102	103	101	100	98	99	98	93	94	96	95	94
Norway	13.8	13.8	99	104	117	112	103	104	106	110	113	106	102	104	98	80	72	36	41	53
Bulgaria	49.3	49.1	100	99	101	101	102	100	100	98	101	101	100	100	100	99	98	99	100	97
Romania	41.7	41.6	100	99	100	100	100	100	99	100	99	100	100	100	100	101	100	100	100	100
France	19.1	19.0	100	105	110	103	96	110	107	107	107	99	102	98	96	83	71	78	92	80

AROE with IR (%)		Change in AROPE when imputed rent is added to income (index AROPE excluding IR = 100)																	
All ages		0+	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Czech Republic	15.4	100	100	102	100	101	100	100	101	101	101	100	100	100	99	99	96	98	96
Sweden	15.7	100	116	112	106	102	111	109	106	109	105	102	100	97	86	66	85	69	84
Germany	19.6	100	111	111	107	99	106	104	112	114	102	99	103	99	91	87	91	80	78
Denmark	19.0	101	100	95	101	105	110	107	102	93	104	100	104	100	128	88	109	82	78
Lithuania	32.5	102	122	105	107	105	108	112	103	103	106	103	102	99	98	97	84	90	90
Netherlands	15.0	104	132	107	109	105	95	119	115	116	107	104	111	98	84	83	65	53	50
Iceland	12.7	104	114	104	109	105	107	112	111	107	106	101	98	98	82	65	60	44	93
Luxembourg	18.4	112	127	119	114	106	104	116	123	124	125	104	104	105	112	82	104	83	100

NB: Countries ranked by overall relative effect. Light orange = At-risk-of-poverty-or-social-exclusion rate decreases when imputed rent is included. Blue = At-risk-of-poverty-or-social-exclusion rate increases by more than 10% when imputed rent is included.

Reading note: With the inclusion of imputed rent, the at-risk-of-poverty-or-social-exclusion rate in Slovenia would be 8% smaller in the overall population and 3% smaller for young children, and 27-30% smaller for elderly people.

Source: Authors' computation, UDB August 2014.

Table 7.3 shows changes in overall AROP rates, as well as relative changes by age groups. Countries differ greatly in the magnitude and pattern of effects by age. The general effect of adding in net imputed rents is to decrease the AROP rates of elderly people in a majority of countries. The elderly tend to have high home-ownership rates and high shares of outright owners compared to younger households. The elderly therefore have, on average, more net housing wealth, which shows up in relatively large net imputed rents. In general, at-risk-of-poverty rates of outright owners decrease substantially in nearly all countries, while those of owners with mortgage and market renters usually increase (Törmälehto and Sauli, 2013, Table 6).

By contrast, among children and young adults, the AROP rate increases in a few countries and changes fairly little in most of them. This is again a reflection of the lower home-ownership rate among this group, and the constraints of mortgages. This age-based polarisation can be observed in the countries with an increase or no change in the overall AROP rate due to imputed rents, but it also is very visible for instance in the United Kingdom.

There is sometimes substantial yearly variation in the age-specific effects (see Törmälehto and Sauli, 2013, Figure 12). The high rates of change in the AROP rate for the elderly age groups, in particular vary more between years. However, with the exception of a few countries, we do not consider the ranges of change rates to be alarming.

One of the most important indicators derived from EU-SILC is the 'at-risk-of-poverty-or-social-exclusion' (AROPE) rate. Income poverty is one of the three dimensions used to construct this indicator, the other two being severe material deprivation and (quasi-)joblessness. Clearly, AROPE changes if imputed rents are added to disposable income, because the income dimension and the joint distribution of the three dimensions of the AROPE change.

Because imputed rents re-rank people in the income dimension, there will be exits from and entries into the pool of people who are counted as income-poor or materially deprived or living in (quasi-)jobless households. Sauli and Törmälehto (2010) concluded that imputed rents improve consistency of income poverty and non-monetary indicators, such as material deprivation. When imputed rents are added, the income-poor tend to have higher non-monetary deprivation rates than with cash disposable income.

The net effects on AROPE rates of adding in imputed rents are shown for the 2012 distribution in Table 7.4. Exits are concentrated among the elderly population. The countries with a decrease in the overall AROPE rates are mostly also countries with a decrease in AROP rates of the elderly.

Table 7.5 summarises trends over time (2008-2012) in the effect of adding in imputed rent on the estimates of AROP and AROPE rates. Unsurprisingly, the changes of both indicators move in parallel in each country. In a majority of countries, both at-risk-of-poverty rates and at-risk-of-poverty-or-social-exclusion rates decrease by one or two percentage points. The impact is substantial in all Southern countries (except Portugal), Belgium, Estonia, Ireland, Poland and Slovenia. The exceptions from the general pattern are Luxembourg, Denmark as well as, to a lesser extent, Iceland and Germany, where both AROP and AROPE increase when net imputed rents are added.

During this short time span any trends of changes in the impact of imputed rent in each country are hardly detected. The effect on the two indicators discussed here seems to change in some countries. For example, the decreasing effect weakens clearly in Spain and Estonia, while the increasing effect intensifies in Luxemburg, but it is hard to discover any general trend.

**Table 7.5: Effects on AROP and AROPE rates of adding in imputed rent, 2008-2012**  
(percentage points)

	AROP					AROPE				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Belgium	-1.4	-1.8	-1.3	-1.2	-1.3	-1.0	-1.4	-1.0	-0.6	-1.0
Bulgaria	-0.3	-0.7	0.3	0.6	0.1	0.3	-0.4	-0.2	0.0	-0.9
Czech Republic	-0.1	-0.1	-0.3	-0.1	-0.1	-0.2	-0.1	-0.3	-0.1	0.0
Denmark	-0.4	1.4	1.3	1.8	1.3	-0.9	0.7	0.3	0.8	0.3
Germany	.	.	1.0	0.8	0.5	.	.	0.6	0.4	0.1
Estonia	-4.3	-4.7	-1.3	-1.3	-0.9	-3.8	-4.2	-1.0	-1.0	-0.6
Ireland	-3.7	-3.8	.	-1.4	-3.0	-2.4	-1.7	.	-0.5	-1.1
Greece	-2.6	-2.6	-1.8	-3.8	-2.7	-1.7	-1.8	-1.2	-2.6	-1.5
Spain	-3.9	-3.0	-3.2	-2.8	-2.4	-3.5	-2.5	-2.4	-2.2	-1.9
France	0.8	-0.2	1.1	-0.4	0.0	0.6	-0.2	0.7	-0.3	0.0
Croatia	..	..	..	-0.9	-1.1	..	..	..	-0.5	-0.8
Italy	-1.8	-1.9	-1.0	-1.7	-1.9	-1.6	-1.7	-0.8	-1.7	-1.6
Cyprus	-2.6	-1.0	.	-2.7	-2.4	-2.3	-1.4	.	-2.3	-1.8
Latvia	-2.2	-2.2	-1.1	-0.4	-0.8	-1.3	-1.4	-0.4	-0.2	-0.4
Lithuania	0.0	-2.1	-2.5	-0.5	0.0	0.4	-0.8	-1.4	0.1	0.7
Luxembourg	0.4	1.3	1.2	2.2	2.5	0.4	1.3	1.2	1.9	2.3
Hungary	-1.1	-0.3	0.3	0.5	-0.1	-1.1	-0.6	0.0	0.0	-0.2
Malta	.	-3.7	-3.8	-1.8	-2.2	.	-2.8	-2.9	-1.2	-1.5
Netherlands	-1.0	0.1	-0.2	-0.9	-0.2	-0.1	0.9	0.3	-0.1	0.7
Austria	-0.3	0.5	0.0	0.2	-0.4	-0.5	0.2	-0.1	0.0	-0.7
Poland	-1.2	-2.2	-2.0	-2.1	-1.7	-0.9	-1.3	-1.3	-1.4	-1.2
Portugal	0.0	-0.8	-0.5	-0.5	-0.6	-0.1	-0.6	-0.5	-0.5	-0.4
Romania	-0.1	-0.2	0.0	-0.2	0.2	-0.5	-0.3	-0.2	-0.6	-0.4
Slovenia	-1.5	-1.8	-2.2	-3.4	-2.2	-1.1	-1.5	-1.6	-2.6	-1.6
Slovakia	-0.7	-0.6	-0.6	-0.6	-1.3	-0.5	-0.4	-0.6	-0.5	-1.0
Finland	-0.6	-0.9	-0.3	-0.7	-0.4	-1.0	-1.1	-0.7	-1.3	-0.8
Sweden	0.2	-0.4	-0.2	0.0	0.1	-0.1	-0.6	-0.3	-0.3	0.0
United Kingdom	-1.2	-1.7	-1.3	-1.4	-0.6	-1.7	-2.1	-1.0	-1.2	-0.8
Iceland	0.3	0.7	-0.2	0.9	0.8	0.0	0.4	-0.3	0.5	0.5
Norway	-0.6	-1.1	0.2	-0.4	0.3	-0.8	-1.0	-0.1	-0.6	-0.1
Switzerland	-0.4	-0.1	-0.9	-1.1	-0.5	-0.4	-0.1	-0.8	-1.0	-0.4

Reading note: Decreases are highlighted in orange, increases in blue. Darker colours indicate larger effects. For example, in Austria, the changes in the AROP rate vary between -0.3 and +0.5 percentage points, and in the AROPE rate between -0.7 and +0.2 percentage points.

Source: Authors' computation, UDB March/August 2014.

## 7.5 Conclusions

EU-SILC data quality has improved in many respects in recent years. This is also the case with imputed rents. Since survey year 2011, EU-SILC data have been sufficiently complete to allow calculation of net imputed rents for all countries. Nevertheless, we believe that disposable income including imputed rents is best considered as a supplementary or complementary income concept, to be analysed and published as a memorandum item to the current cash-based income concept. There are suspicious changes in time-series, and shortcomings in comparability of the data between countries and within countries across time. The derivation of imputed rent estimates should be further analysed from both methodological and substantive perspectives. We propose changes in various aspects of the data derivation process in order to enhance the transparency of the concept and measures (see also Törmälehto and Sauli, 2013).

The definition of imputed rent in EU-SILC includes two concepts. First, home ownership is seen as an asset to which returns accrue. Second, tenants whose rents are set below the prevailing market level are assumed to receive economic benefits. The definition of imputed rents given in the EU-SILC guidelines needs to be revised and clarified. In particular, the nature of the deductions from the imputed rental equivalences should be clarified. It needs to be made more explicit what should be deducted and what not. The reasons for excluding depreciation should be clarified, because their exclusion is inconsistent with the treatment in the National Accounts.

The treatment of social housing is a complicated issue. We conclude that the variable summarising tenure structure in EU-SILC is not fully comparable across countries and not always consistent with the imputed rental values. Since imputed rents of tenants are an in-kind social transfer, they could be considered as such. As a remedy to the data problems, imputed rents could be added to income only for the owner-occupiers, while imputed rents of tenants could be added to adjusted disposable income only in situations in which other social transfers in kind are included (education, health, etc.).

The countries employ different methods to derive imputed rent estimates, but a proper assessment of comparability requires a study that applies and compares the different imputation methods in each country. Another methodological cross-national exercise similar to that conducted by Frick et al. (2010), with focus on applicability in EU-SILC is called for. In particular, the suitability of the user cost (capital market) method should be reconsidered, due to its better transparency, relative simplicity, and lower production and respondent burden. The quality of data about the current market prices of dwellings may be better than that of data about competitive market rents, even if market price values were derived from survey respondents. Moreover, this would mean that in most countries at least two thirds of the total value of household assets would be covered. This follows from the fact that the value of main residences is, invariably and by far, the most significant asset type in household sector.

Many countries estimate imputed rents using either standard ordinary least-squares log-linear regression or stratified (cell-based) mean imputation. Given the differences across countries in the owner-occupied and rented dwellings (number of rooms, amenities, etc.), the current methods should be systematically benchmarked against results obtained with a method that takes into account the possible selection bias (Heckman selection models).

Since the imputed rental variables that are available and the data flags do not tell us about the underlying methods, these should be properly documented in the EU-SILC Quality reports. National Statistical Institutes should comply with Eurostat's guidelines (which should be reviewed) as to the composition of housing costs (*HH070*), imputed rents (*HY030G* or *HY030N*) and interest repayments on mortgages (*HY100G* or *HY100N*); if they are not able to comply, they should report relevant deviations in their Quality reports.

From the point of view of substantive results, it is safe to conclude that adding imputed rent into the measure of income reduces relative inequality and increases average income levels. AROP and AROPE rates fall in a majority of countries when imputed rent is added in, although there are a few countries

where the effect is the reverse. The effects on AROP and AROPE rates are greatest for elderly people and also younger people.

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# 8

## The distributional impact of public services in European countries

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### 8.1 Introduction

The purpose of this chapter is to extend the conventional income distribution studies by accounting for the value of public services received by the households. In a previous study Aaberge, Langørgen and Lindgren (2010) included the value of primary and secondary education and healthcare services, while the present analysis also includes the value of early childhood education and care (ECEC services) and long-term care (care for the elderly and disabled) <sup>(77)</sup>. The 2010 study was restricted to 17 European countries for which 2006 EU-SILC data and OECD expenditure data on primary and secondary education and healthcare services were available. Extensions of the data sets have made it possible to include 23 countries in the present chapter. The additional six countries are Greece, Iceland, Ireland, Italy, Slovenia and the UK. Moreover, the dataset is also extended with observations from 2009, which allows us to analyse the changes in income inequality and (financial) poverty from 2006 to 2009. This period is of particular interest since the Great Recession took place in 2007-2008. Assessing the value of public services enjoyed by different households cannot be achieved

without relying on various basic assumptions. First, since most public services are produced by public institutions we only observe expenditures and not prices. This chapter draws on standard practice by assuming that the total value of public services is equal to the total costs of producing them. To this end, we use the national spending data on childcare, education, healthcare and long-term care provided by the OECD. The recipients are classified by gender and age group, and individuals are assumed to receive the average benefit in their respective groups of each public service, while the average benefit is allowed to vary across countries. The value of public services received by a given household is equal to the sum of the values received by the members of the households.

The importance of accounting for needs and economies of scale in households when analysing the distributional impact of public services is universally acknowledged. However, since equivalence scales designed to account for needs and economies of scale in disposable income are not necessarily appropriate for public services, it is required to relax the assumption that the relative needs of different subgroups remain unchanged when the definition of income is extended to include the value of public services. To this end, Aaberge, Bhuller, Langørgen and Mogstad (2010) and Aaberge, Langørgen and Lindgren (2010) introduced theory-based equivalence scales for extended income. These equivalence scales, denoted the needs-adjusted (NA) scales, can be expressed as a weighted average of the EU scale and a scale accounting for public services. The NA scale assigns higher weights to children and the elderly compared to the EU scale, because children

<sup>(76)</sup> The authors are with Statistics Norway. They would like to thank Anthony B. Atkinson, Andrea Brandolini, Anne-Catherine Guio, Eric Marlier and Cathal O'Donoghue for most helpful comments and suggestions. Of course, these persons are not responsible in any way for the present contents. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), an international research project funded by Eurostat. Financial support from the Norwegian Research Council is also gratefully acknowledged. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [audun.langorgen@ssb.no](mailto:audun.langorgen@ssb.no).

<sup>(77)</sup> For an extended version of this chapter see Aaberge, Langørgen and Lindgren (2013).

and the elderly have higher needs for basic public welfare services like education and healthcare.

This chapter also introduces a simplified representation of the NA scale, denoted the SNA scale, which solely depends on the number of household members in different age groups. Thus the SNA scale can be computed for any micro-dataset with household information that includes the age of household members. Moreover, we find that the SNA scale is highly correlated with the NA scale, and therefore can be considered as an appropriate approximation of the NA scale.

The chapter is organised as follows. Section 8.2 provides a discussion of the theoretical foundation for needs-adjusted (NA) equivalence scales and presents a theory-based common equivalence scale for European countries. Section 8.3 discusses empirical methods, and presents estimation results for the NA scale and SNA scale. Section 8.4 displays the results of the empirical analysis of income inequality and poverty in 23 European countries. A brief conclusion is provided in Section 8.5. For more detailed information of data and empirical methods, see Aaberge, Langørgen and Lindgren (2013).

## 8.2 Needs for public services and equivalence scales

By adjusting for differences in needs, equivalence scales justify interpersonal comparability of incomes across heterogeneous households, and thus play an important role in analysis of income inequality and poverty. While theoretically justified equivalence scales can be derived from the cost functions of households with different demographic characteristics, most empirical analyses typically use more pragmatic scales adjusting crudely for differences in household size and composition (see e.g. Coulter et al., 1992). However, as argued by Radner (1997) equivalence scales designed to account for needs and economies of scale in disposable income are not necessarily appropriate when analysing an income concept that includes the value of public services. For instance, the elderly tend to utilise health

services more frequently than younger people due to differences in health status, whereas children have comparably higher needs for education<sup>(78)</sup>. As a consequence, studies using equivalence scales designed for disposable income risk overestimating the equivalent incomes of groups with relatively high needs for public services.

A contribution of this chapter is to relax the assumption that the relative needs of different subgroups remain unchanged when the definition of income is changed. However, we rely on the previous literature on income inequality and poverty by applying the modified OECD scale to account for heterogeneity of needs for disposable income. The EU scale assigns weight 1 to the household head, 0.5 to each member aged 14 and above and 0.3 to each member aged below 14. Scale economies in consumption are used as justification for assigning a higher weight to the first adult of the household. Jointly consumed goods, such as cars and housing, are assumed to contribute to economies of scale. The relatively low weight that is given to children in the EU scale is due to the fact that children generally consume small quantities of basic goods, such as food and beverages. Thus, it is implicitly assumed that children have smaller needs for private consumption goods than adults. Even if this assumption is correct for consumption of goods financed by disposable income, the picture may change when we extend the needs concept to include needs for public education services. Thus, if the weight 0.3 is considered appropriate for children when analysing the distribution of disposable income, it makes sense to increase the weight for children when income is extended to include public childcare and education expenditures. This proposition is based on the assumption that children are in needs of childcare and education, and that the children and the associated household members should not suffer economically when they belong to a household with high needs for childcare and education services. This means that the value of childcare and education services allocated to households with children should be adjusted for the childcare and education needs of children. Moreover, higher needs for healthcare and elderly care among the elderly means that the equivalence scale should

<sup>(78)</sup> The equivalence scales estimated by Jones and O'Donnell (1995) and Zaidi and Burchardt (2005) show that the disabled have relatively high needs for non-cash as well as cash income.

differentiate between adults in different age groups when the income definition includes public health-care and care for the elderly.

## 8.2.1 Needs-adjusted equivalence scale

The purpose of this section is to provide a brief presentation of a needs-adjusted EU equivalence scale proposed by Aaberge, Langørgen and Lindgren (2015). The needs-adjusted EU equivalence scale is designed to deal with situations where the income concept is extended to include public in-kind transfers. The first step of designing a common needs-adjusted EU scale for European countries consists of estimating needs-adjusted scales for each of the European countries that is included in this chapter. Next, the country-specific needs-adjusted scales are assigned to all households in the total population of the countries in the chapter. Finally, the common scale is determined by the average of the country-specific needs-adjusted equivalence scales for every household in all countries. A more detailed presentation of this method for deriving a common needs-adjusted EU scale is given below.

Let  $H$  be the number of households in the European countries that are included in this chapter, and let  $Y_{hk} = (Y_{0,hk}, Y_{1,hk}, \dots, Y_{S,hk})$  be a vector of good-specific needs parameters, where  $Y_{ihk}$  ( $i = 0, 1, \dots, S$  and  $h = 0, 1, \dots, H$  and  $k = 1, 2, \dots, K$ ) is a measure of the need for service  $i$  targeted to household  $h$  derived from the public service and living standard prevailing in country  $k$ .

In line with the approach of Aaberge, Bhuller, Langørgen and Mogstad (2010), we use the cost function approach to justify the following family of relative equivalence scales:

$$(2.1) \quad NA_{hk} = \frac{Y_{+hk}}{Y_{+rk}}, \quad h = 1, 2, \dots, H$$

where  $Y_{+hk}$  and  $Y_{+rk}$  is the total need of extended income of household  $h$  and the reference household  $r$ , as evaluated by the needs parameters of country  $k$ . Thus,  $NA_{hk}$  is the scale factor for household  $h$  derived on the basis of the assessed needs parameters for country  $k$ . Accordingly, equivalent income is given by  $C_n / NA_{hk}$  where  $C_n$  is the extended income

of household  $h$ , i.e. the sum of disposable income and the value of local public services that household  $h$  enjoys. Equivalent income can be interpreted as the cost required for attaining the same welfare level for the reference household as household  $h$  enjoys from extended income  $C_n$ .

It follows from (2.1) that the  $NA_{hk}$  scale admits the following decomposition:

$$(2.2) \quad NA_{hk} = \theta_{rk} C_{I_h} + (1 - \theta_{rk}) NC_{hk}$$

where  $C_{I_h} = Y_{0,hk} / Y_{0,rk}$  is the equivalence scale for disposable income <sup>(29)</sup>,  $NC_{hk} = (Y_{+hk} - Y_{0,hk}) / (Y_{+rk} - Y_{0,rk})$  is the scale for public services, and  $\theta_{rk} = Y_{0,rk} / Y_{+rk}$  is the weight assigned to disposable income in the composite NA scale for extended income. This weight is equal to the ratio between the needs for disposable income and the needs for extended income of the reference household  $r$ . As demonstrated by expression (2.2) the  $NA_{hk}$  scale can be considered as a disposable income scale that is adjusted for the needs of public services.

Since the scale for public services differs across countries the composite equivalence scale (2.1) for extended income will also vary across countries. However, to justify comparison of extended income distributions across countries it is required to derive a common equivalence scale on the basis of the available country-specific scales. As indicated by Ebert and Moyes (2003) a common scale for extended income should satisfy the conditions of unit consistency and reference independence. Unit consistency means that the equivalence scale is invariant with respect to changes in measurement unit or currency for any country. This condition implies that measures of inequality and poverty are independent of the choice of scale of measurement for a given country. Reference independence means that measures of (relative) inequality and poverty are independent of choice of reference household for the definition of the equivalence scale.

As demonstrated by Aaberge, Langørgen and Lindgren (2015) the following equivalence scale satisfies the conditions of unit consistency and reference independence:

<sup>(29)</sup> The equivalence scale for cash income is common for all countries.

$$(2.3) NA_h = \frac{\sum_{k=1}^K w_k \frac{Y_{+hk}}{Y_{+++}}}{\sum_{k=1}^K w_k \frac{Y_{+rk}}{Y_{+++}}}, \quad h = 1, 2, \dots, H$$

where  $Y_{+++} = \sum_{h=1}^H Y_{+hk}$  and  $w_k, k = 1, 2, \dots, K$  are country-specific weights that are constant and independent of the needs parameters and the reference household. Note that the equivalence scale defined by (2.3) is common for all countries.

Choosing  $w_l > 0$  and  $w_k = 0$  for all  $k \neq l$  means that country  $l$  is treated as a reference country, i.e. the NA scale derived for country  $l$  is applied for all countries. An alternative approach is to give all countries equal weights or to weight countries by the proportion of the total population. The method chosen in this chapter is to weight each country by population size. This method assigns higher weights to the service standards of larger countries than of smaller countries.

As is demonstrated by Aaberge, Langørgen and Lindgren (2015) the theoretical basis underlying the methods used in this chapter ensure that measures of equivalence scales, welfare, inequality and poverty can be considered as a unified framework that secures internal consistency between different parts of the methodology and has a transparent normative justification.

## 8.2.2 Estimation method

Aaberge, Bhuller, Langørgen and Mogstad (2010) used detailed accounting data of municipalities as a basis for estimating the NA scale for local public services in Norway. Minimum quantity parameters for different service sectors and target groups are considered as measures of the local governments' assessment of the need of different services for different population subgroups. The justification for this approach is that the estimated minimum quantities can be considered as a result of central government regulations, expert opinion, or a consensus among local governments about how much spending the different target groups need, given the budget constraint of the municipalities. Moreover, it is assumed that the social planner uses the same functional

form for measuring the welfare produced by public services as is used by local governments to decide the spending on public services.

As for large international comparisons detailed municipal accounting data are difficult to find, we estimate needs parameters for European countries relying on the national mean public spending targeted to different population subgroups defined by age and gender. Average spending per person received by the different target groups of public services, such as children and the elderly, is used as indicators of the population groups' need for child-care, education, healthcare and long-term care. The mean in-kind transfers received by different target groups are assumed to reflect the relative needs of the target groups. Since the estimated need parameters for public services are referring to individuals, household specific need parameters are obtained by simply aggregating the need parameters of the individuals in each household.

We use the EU scale to account for differences in needs of disposable income for households who differ in size and composition and the median of the distribution of equivalent income in a given country as a basis for determining the needs parameter for the reference group. Thus, the needs parameter  $Y_{ork}$  of disposable income for the reference household in country  $k$  is defined by the median of the distribution of individual equivalent disposable income in country  $k$  <sup>(80)</sup>.

For households that are not of the reference type we use the chosen EU scale to assess the need for disposable income in the following way:

$$(2.4) \quad Y_{ohk} = Y_{ork} EU_h$$

where  $EU_h$  is the EU scale for disposable income pertaining to household  $h$ . Thus, the size of the needs for disposable income for household  $h$  relative to the reference household  $r$  is equal to the EU scale. Note that the country-specific needs parameters of disposable income are used as a basis for assessing the weights of the common equivalence scale defined by (2.2).

<sup>(80)</sup> In this study, the reference household type is defined by childless single male adults aged 35-44 years.

## 8.3 Empirical implementation

This section presents the empirical implementation of the methods for allocating the value of public services to individuals, and the methods used for evaluating the income distribution.

### 8.3.1 Population of analysis

This chapter relies on the EU-SILC 2007 and 2010 cross-sectional data. The data sets refer to the year the data were collected (2007, 2010), although the income data were earned in 2006 and 2009. However, the demographic information refers to 2007 and 2010. We assume that the household composition was the same in 2006 (2009) as in 2007 (2010). The data provide access to cross-sectional data for 29 European countries: 27 EU Member States as well as Norway and Iceland. The results in this chapter concern 21 EU countries, plus Norway and Iceland. Six EU-SILC countries were omitted from the chapter due to limited data on public services (Bulgaria, Cyprus, Latvia, Lithuania, Malta and Romania). A lack of participation in the OECD data systems is the reason for not including all the countries reporting data to EU-SILC.

A fairly large share of the households is constituted by two adults below 65 years of age with one or more children. In particular, this household type is rather common in the Nordic countries and in Ireland, Luxembourg and the Netherlands. Households with three or more adults are rather common in Estonia, Greece, Spain, Italy, Hungary, Poland, Portugal, Slovenia and Slovakia. Denmark, Finland, Germany, Norway and Sweden have relatively high shares of single adults aged 18-64 without children, while Denmark, Iceland, Ireland, Norway and the UK have high shares of single adults with children. For further details on the demographic composition of different countries in the chapter, see Aaberge, Langørgen and Lindgren (2013).

### 8.3.2 Value of public services

Analyses of extended income normally assume that the value of public services is equal to the cost of

providing them (Smeeding et al., 1993; Garfinkel et al., 2006; Paulus et al., 2010). Aaberge and Langørgen (2006) question this assumption by demonstrating that local governments provide public services at different costs. Furthermore, the production cost approach disregards differences in quality and efficiency in the service production, and does not account for the possible welfare losses when the government imposes quantity constraints in the consumption of public services. Nevertheless, the production cost approach might provide a useful benchmark by offering an estimate of the value of public services, whereas the standard approach simply ignores the impact of public services on welfare.

We have chosen to include four publicly financed services: health services, long-term care, education and early childhood education and care (ECEC). While Aaberge, Langørgen and Lindgren (2010) focused on the distributional impact of education and health services, this chapter extends the analysis by also including long-term care and ECEC services based on OECD data. The data are net public expenditure, and thus the households' out-of-pocket payments and other financial sources beyond government sources are excluded.

The OECD System of Health Accounts provides expenditure data on healthcare and long-term care. In the System of Health Accounts long-term care spending comprises both health and social support services to people suffering from chronic conditions and disabilities who need care on an ongoing basis. Since the reporting practices of the allocation of long-term care spending between the health and social components may differ between countries, we have chosen to include total spending on both components to facilitate comparability across countries. For Ireland, Greece, Italy and the UK, the OECD data do not allow for splitting between healthcare and long-term care. Instead, estimates for these countries are based on Oliveira Martins et al. (2006) who report expenditures for both health services and long-term care as shares of GDP. The relative size of healthcare and long-term care from that study is utilised here.

Education expenditure is available from the Education Database at OECD Statistics. The data are separated into primary, lower secondary and upper secondary education. This enables us to identify

the value of three levels of basic education in European countries. The data also include information on pre-primary education, but we have instead included pre-primary education as part of the ECEC services.

The OECD Family Database provides public expenditure on childcare and pre-primary education as a share of each country's gross domestic product (GDP). As the OECD also offers GDP data, these data are combined to calculate the value of ECEC services in millions of the national currency. A limitation is that the Family Database does not provide a separation between different types of public financial support for ECEC services. Consequently, in-kind transfers are mixed with cash transfers and support through the tax system in the figures for public spending on ECEC services. In some countries this may lead to double counting of benefits, for instance in the United Kingdom where many parents pay for private childcare and are partly reimbursed through the tax system.

Aaberge and Langørgen (2006) and Aaberge, Bhuller, Langørgen and Mogstad (2010) account for regional differences in public service provision. This is enabled by detailed accounting data for Norwegian municipalities. Due to data limitation, it is not possible to account for spending differences across geographical regions within the European countries.

### 8.3.3 Allocation of public services

Who receives what of public services is an outcome of government decisions. The governments are assumed to target public services to specific sub-populations based on evaluation of relative needs for public services associated with different demographic characteristics. Children are provided education services because they need to develop their skills, while the elderly need to receive healthcare and long-term care due to their high likelihood of becoming ill or disabled. Since both the selection of recipients and the amount of public services are decided by the government, it is important to account for the targeting policies of different governments. Different welfare regimes may have consequences for economic inequality when countries provide different levels of public services.

### Education and childcare services — the actual consumption approach

Two methods are used to assess the value of public services per receiver. Either the value is based on actual consumption or on the probability to use the service. In the former case, the *ex post* perspective, the value consumed by each individual forms the basic measurement unit. This method is applied for the value of education and ECEC services. Enrolment numbers in each education level (primary, lower secondary and upper secondary) is accessible from OECD. Total expenditure divided by the enrolment number provides an estimate of the value received per pupil. We assume that participants at a given education level and country receive an equal share of the value. In the EU-SILC data, actual participation in education institutions is only known for people aged 16 years or above. For younger children, however, education participation is largely compulsory and we therefore assume 100 % participation rates for these children. All three education levels are seen as necessary for acquiring the required skills to participate actively in a developed society. Thus, people that are in the age-group for which education is targeted but do not participate will thus have a need for education that is not fulfilled. Older persons that do in fact participate in one of the education levels acquire a value that they do not seem to need at the time <sup>(81)</sup>.

A limitation of the data is that information on participation in public or private education is not accessible. Thus, it is assumed that every pupil in a certain education level receives the same amount of government funding, irrespective of whether or not the person actually participates in publicly funded schooling.

Our method assumes that the value of childcare and pre-primary education is allocated to users only. The calculation from total public expenditure to per hour value is based on actual participation. Since there are no reliable data on children's total use of childcare and pre-primary education in European countries,

<sup>(81)</sup> Several of these data challenges are rooted in the methodological choice of analysing only 1 year. By applying a perspective of such a short time span, we are not able to account for inter-temporal planning and adjustment. In a life-cycle perspective, on the other hand, the understanding of income, needs, and public services can be tackled in a less rigid manner.

we have assumed that total use in a country equals a weighted sum of the individual participation rates in the EU-SILC data. EU-SILC data include variables that provide information about the average hours of participation per week in childcare and pre-primary schooling. We estimate the public expenditure per hour per week given to children in each country, and allocate this value multiplied by the number of hours attended in ECEC services to the actual recipients registered in EU-SILC. EU-SILC data do not distinguish between children in private and public ECEC institutions, which means that we allocate benefits to all children receiving ECEC services, irrespective of whether or not the child actually participates in publicly funded childcare or pre-primary education.

### Probability to use healthcare and long-term care — the insurance approach

Healthcare and long-term care services are treated as insurance arrangements, i.e. the value is assessed on an *ex ante* basis, which means that it is the probability to consume rather than the actual use of the service that matters. Such a view has been applied by Smeeding et al. (1993), Aaberge, Bhuller, Langørgen and Mogstad (2010), Aaberge, Langørgen and Lindgren (2010) and Paulus et al. (2010). The probability of receiving healthcare and long-term care services depends on demographic characteristics — age and gender. The European Commission have established user profiles by age and gender for both healthcare and long-term care services <sup>(82)</sup>. By combining these user profiles with population data, the relative provision to each citizen is established. Multiplication with the total expenditure gives the individual healthcare and long-term care insurance. Since the probability of using healthcare and long-term care services differs across individuals by age and gender, the allocation procedure is carried out separately for health services and long-term care. It is important to note that the probability of using healthcare and long-term care is solely determined by demographics. For instance, we assume that the value of the health premium is unaffected by the individuals' position in the income distribution <sup>(83)</sup>.

<sup>(82)</sup> See European Commission, 2010, pp. 111-112.

<sup>(83)</sup> We rely on this simplification despite the fact that empirical evidence from European countries suggests that there is positive relationship between the health conditions and the income levels of individuals.

## Heterogeneous population

Since individuals' needs of education, childcare, healthcare care and long-term care depend on age and gender, we classify the population into target groups defined by age and gender. The following age groups are employed by EU-SILC: 0-17 years, 18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years and 75 years and above. We find it required to introduce a more detailed classification for children and infants. The reason is that government expenditures per person to different levels of education (primary, lower secondary and upper secondary) vary. Moreover, the participation rate in ECEC services varies by age. Children in pre-education age are divided into three target groups: 0 year, 1-2 years and 3 years to primary education age. Since the age intervals for attending different education levels vary between countries, the age group classification is allowed to vary between countries to take into account the features of different education systems. The classification combines 14 age groups with gender (males and females), which makes up a total of 28 different target groups.

### 8.3.4 Estimation and simplified representation of the NA scale

To estimate the NA scale as outlined in Section 8.2, it is not sufficient to have data on household size and composition. It is also required to estimate the  $\gamma$ -parameters that account for the relative needs for disposable income and public services as a function of household characteristics. As explained in Section 8.2.3 these estimates are based on median disposable income and on spending levels as well as spending profiles by age and gender for different public services. Since the computational complexity may reduce the practicability and therefore prevent utilisation of the NA scale, we develop a simplified representation of the NA scale, termed the SNA scale. The SNA scale requires only data for household size and composition by age groups, and is easily computed for any dataset with household information that includes age of the household members. The SNA scale is computed in the same way as the EU scale, except that the SNA scale includes several age groups and moreover assigns weights to the age groups that differ from the EU scale.

The SNA scale is derived from a linear regression (OLS) of the NA scale on the number of household members in different age groups:

$$(3.1) \quad NA_h = \alpha_0 + \sum_{j=1}^8 \alpha_j n_{hj} + \varepsilon_h$$

where  $NA_h$  is the estimated NA scale for household  $h$  (included in the EU-SILC sample),  $n_{hj}$  is the number of members of household  $h$  in age group  $j$ , and  $\varepsilon_h$  is the error term in the regression. The SNA scale is defined as the predicted NA scale from the regression model (3.1), i.e.  $SNA_h = \hat{\alpha}_0 + \sum_{j=1}^8 \hat{\alpha}_j n_{hj}$ , where  $\hat{\alpha}_j$  are parameter estimates ( $j=0,1,\dots,8$ ). Some of the age groups have been merged in the regression model, which is why the model in (3.1) includes only eight different age groups. The SNA scale is also simplified in the sense that it does not distinguish between females and males, since it turns out that the effect of gender on the NA scale is modest<sup>(84)</sup>.

Economies of scale in household consumption are captured by a positive estimate for the constant term  $\alpha_0$  in the regression equation (3.1), while a zero estimate for the constant term implies that there are no economies of scale. When a similar regression as (3.1) is performed with the EU scale on the left hand side, the parameter  $\alpha_0$  is estimated equal to 0.5, since the first adult is assigned a weight 1, which is 0.5 higher than the weight of other adults in the EU scale<sup>(85)</sup>. However, since the NA scale is normalised to 1 for the reference household type, we impose the restriction  $\alpha_0 = 1 - \alpha_r$ , where  $r$  is the age group of the (single) reference household type<sup>(86)</sup>. This re-

striction secures that the SNA scale is equal to 1 for the reference household type<sup>(87)</sup>.

In order to allow for flexibility we have estimated the NA scale and the SNA scale for each of four different public services, and also for different combinations of the public services that are included in this chapter. This procedure also provides information about the contribution of different public services to the SNA scale.

The estimation results are reported in Table 8.1. As a measure of model fit  $R^2$ -adjusted shows that the goodness of fit is almost perfect for the six different models for different combinations of public services. The results show that children and elderly are given higher weights in the SNA scale than in the EU-scale, depending on which public services are included in the NA scale. Including childcare and education increases the weights of children, while including long-term-care and healthcare increases the weights of the elderly.

The SNA scale is an approximation of the NA scale that can be easily applied by scholars interested in examining the distribution of extended income when services such as childcare, long-term care, healthcare and/or education are included in the analysis. The SNA scale that includes all four services is computed by using the weights for age groups that are reported in the last column of Table 8.1. For comparison of the SNA scale estimates across household types and their close agreement with NA scale estimates, we refer to Table 5 in Aaberge et al. (2013).

<sup>(84)</sup> The NA scale is estimated based on 28 target groups (14 age groups times 2 genders). When all 28 target groups are included in the regression model for the NA scale, we find that the model explains 100 % of the variation in the NA scale. Thus, the reduction in the number of target groups is the reason why the SNA scale is not an exact representation of the NA scale.

<sup>(85)</sup> Furthermore, the parameter estimate for adults is 0.5 and the parameter estimate for children is 0.3 in a similar regression with the EU scale on the left hand side.

<sup>(86)</sup> While the reference household type for the NA scale includes single males aged 35-44 years, the reference household type for the SNA scale is broader by including single households of both genders above education age to 54 years of age.

<sup>(87)</sup> When healthcare is included in the definition of extended income, the estimate of  $\alpha_0$  is below 0.5. This owes to the fact that healthcare is the most important service received by the reference household. A positive need for public services for the reference household implies that economies of scale are less important in the NA scale than in the EU scale, since the NA scale for public services does not include economies of scale.



**Table 8.1: SNA scale estimation results, including different public services in the scale, 2009**

Variable	ECEC	Education	Healthcare	Long-term care	Education and healthcare	All 4 services
Constant	0.50	0.50	0.46	0.50	0.46	0.46
0-3 years	0.39	0.30	0.33	0.30	0.33	0.41
3 years to education age	0.56	0.30	0.33	0.30	0.33	0.57
Education age (below 14 years)	0.30	0.67	0.34	0.30	0.69	0.69
Education age (above 13 years)	0.50	0.95	0.53	0.50	0.95	0.95
Above education age — 54 years	0.50	0.50	0.54	0.50	0.54	0.54
55-64 years	0.50	0.50	0.60	0.50	0.60	0.60
65-74 years	0.50	0.50	0.67	0.51	0.67	0.69
75 years and above	0.50	0.50	0.75	0.57	0.75	0.86
<b>R<sup>2</sup> adjusted</b>	1.000	1.000	0.999	1.000	0.999	0.999

*Reading note:* Figures are estimated weights assigned to individuals in different age groups. When all four services are included, a person 75 years old contributes (additively) with a weight of 0.86. The constant weight is added to the sum of weights over individuals in a given household to derive the household equivalence scale. The reference household scale equals unity, where the reference group is childless single adults below 55 years and above education age.

*Source:* Authors' computation, UDB October 2012 and OECD data.

**Table 8.2: Definitions of equivalent income**

Income definition	Equivalence scale	Equivalent income definition
Disposable income	EU scale	Disposable income (EU)
Extended income	EU scale	Extended income (EU)
Extended income	NA scale	Extended income (NA)
Extended income	SNA scale	Extended income (SNA)

### 8.3.5 Income definitions

We consider four different combinations of income definitions and equivalence scales in this chapter. First, we use the standard approach combining disposable income and the EU equivalence scale. Furthermore, extended income is combined with three different equivalence scales. For the sake of comparison the EU scale is used in combination with extended income, since many studies have used the disposable income equivalence scale also for making comparisons across heterogeneous households in the analysis of extended income. However, using the extended income in combination with the NA scale has a more convincing theoretical justification. Thus, we provide empirical evidence on the potential bias in inequality and poverty estimates when using EU scale rather than the NA scale for analysing the dis-

tribution of extended income. Finally, we include the combination of extended income with the SNA scale as a test of the sensitivity of the empirical results by replacing the NA scale with the SNA scale. Table 8.2 displays the different combinations of income definitions and equivalence scales used in this chapter.

The EU-SILC variable *HY020* is used as a measure of disposable income<sup>(68)</sup>. The disposable income variable is defined by the sum of earnings, self-employment income, capital income, public cash transfers, imputed rent and subtracted income taxes. Note that this variable also includes non-cash components, such as non-cash employee income, imput-

<sup>(68)</sup> Disposable income in national currency is defined by *HY020* (disposable income in Euros) \* *HX010* (Exchange rate) \* *HY025* (Inflation factor).

ed rent <sup>(89)</sup> and value of home produced goods for household consumption. We refer to Table 7 of Aaberge et al. (2013) who presents country-specific relative distributions of extended income by income components. The results show that while disposable income is by far the most important income component in all countries, there are significant differences in relative disposable income. Note also that health insurance and education account for a major share of in-kind transfers from the government to the households.

### 8.3.6 Household weights

When estimating measures of inequality in a heterogeneous population, there are different methods for weighting different household types. The standard approach, favoured for instance by Shorrocks (2004), assigns a weight given by household size (number of household members) to each household. This means that the unit of analysis is given by individuals, and the Lorenz curve is defined over the population of individuals and equivalent incomes assigned to individuals. An alternative method is proposed by Ebert (1997) where household needs as measured by the equivalence scale are used to weight the households. This means that the unit of analysis is given by 'equivalent adults'. Ebert and Moyes (2003) and Shorrocks (2004) argue that the two weighting methods are supported by different ethical principles. In this chapter, we follow the standard approach weighting households by their size which means that individuals are treated as the unit of analysis. For a comparison with results based on households weighted by their needs, we refer to Aaberge et al. (2015).

In this chapter, statistics on income distribution are generally calculated on the basis of equivalent incomes allocated to individuals, using cross-sectional sampling weights available in the EU-SILC data set. The purpose of weighting is to reduce biases in the estimation in order to draw inference from the EU-SILC sample to the whole population. For obtaining population estimates, respondents are given weights which are inversely proportional

to the probability of being selected. Moreover, the sample weights are adjusted to counterbalance non-response. However, we do not have full information on how these weights are constructed in each country, because the national statistical institutions are not obliged to provide full details.

## 8.4 Empirical Results

This section examines the impact on income inequality and poverty estimates of accounting for non-cash income from public services, while accounting for differences in needs for such services across individuals and households.

### 8.4.1 Income inequality

Empirical analyses of inequality in income distributions are normally based on the Lorenz curve. To summarise the information content of the Lorenz curve and to achieve rankings of intersecting Lorenz curves we follow the standard approach by using the Gini coefficient, which is equal to twice the area between the Lorenz curve and its equality reference.

Table 8.3 shows that disposable income inequality is low in Slovenia, Sweden and Norway and high in Estonia, Greece, Italy, Poland, Portugal, Spain and the UK — the Gini coefficient shows a difference of around ten percentage points. By replacing disposable income with extended income, the estimates of inequality become significantly smaller in all countries; the reduction of the Gini coefficients is approximately 20 %. When extended income with the NA scale is used, the estimated Gini coefficients are slightly higher than when extended income EU scale is used. Hence, some of the equalising effect of public services is offset when we adjust for needs for public services. Table 8.3 shows that the SNA scale produces estimates that are rather close to the estimates based on the NA scale. Note that the 2008 financial crisis appears to have had an ambiguous short run effect on income inequality in European countries, since inequality increases or is unchanged in some countries whereas it decreases in other countries.

<sup>(89)</sup> Imputed rent is defined as the value of owning your dwelling or having access to below-market or free-of-rent dwelling, and is estimated as the market rent. For an analysis of the distributional impact of imputed rent in EU-SILC, see Chapter 7 in this volume.

**Table 8.3: Gini coefficient for the distribution of income by income definition and country, 2006 and 2009**  
(%)

Country	Disposable income (EU)		Extended income (EU)		Extended income (NA)		Extended income (SNA)	
	2006	2009	2006	2009	2006	2009	2006	2009
Belgium	26.2	26.1	20.8	20.6	21.3	21.0	21.3	21.0
Czech Republic	25.2	24.8	19.6	19.3	20.8	20.5	20.9	20.5
Denmark	24.0	24.8	18.6	19.1	18.4	19.1	18.5	19.3
Germany	29.8	28.9	24.4	23.4	25.4	24.3	25.4	24.4
Estonia	32.8	31.2	27.1	25.7	28.3	26.4	28.2	26.3
Ireland	31.3	32.8	24.3	24.7	25.7	26.1	25.7	26.1
Greece	34.3	32.8	28.1	27.3	28.9	28.1	29.0	28.1
Spain	31.2	33.2	24.8	26.1	25.9	26.9	25.9	27.0
France	-	29.5	-	23.8	-	24.1	-	24.1
Italy	32.1	31.0	25.5	24.7	26.4	25.8	26.5	25.8
Luxembourg	27.4	27.7	21.7	21.0	21.8	21.5	21.9	21.5
Hungary	25.5	24.0	19.9	19.1	20.3	19.6	20.3	19.6
Netherlands	27.1	25.2	20.7	19.3	21.3	19.6	21.4	19.7
Austria	26.1	26.0	20.7	20.7	21.3	21.1	21.4	21.2
Poland	32.0	31.1	26.1	25.5	26.9	26.5	26.9	26.5
Portugal	36.6	33.5	29.0	26.3	29.8	27.2	29.8	27.3
Slovenia	22.6	23.8	18.7	19.8	18.8	19.8	18.8	19.8
Slovakia	24.6	26.0	18.8	20.2	20.4	21.8	20.4	21.8
Finland	25.9	25.2	20.9	20.4	21.3	20.6	21.4	20.7
Sweden	23.2	23.8	17.0	18.1	17.3	18.1	17.4	18.2
United Kingdom	32.8	32.8	26.3	25.8	27.6	26.6	27.7	26.7
Iceland	27.8	25.5	21.8	20.2	22.1	20.6	22.2	20.7
Norway	23.2	22.8	17.8	17.5	18.0	17.7	18.2	17.9

NB: France is treated as missing in 2006 due to a break in time series.

Reading note: In Austria, the Gini coefficient is equal to 21.3 in 2006 and 21.1 in 2009 when the income measure is extended income adjusted by NA scale.

Source: Authors' computation, UDB October 2012 and OECD data.

## 8.4.2 At-risk-of-poverty

Table 8.4 displays the at-risk-of-poverty rates in European countries, according to four different income definitions in 2006 and 2009. In line with the EU definition, a person is at risk of poverty if he or she has an income lower than 60 % of the median income of the country where he or she lives (this approach is followed for either concept of income — disposable and extended). By replacing disposable income (EU) with extended income (NA), the estimated propor-

tion of people who are at risk of poverty is reduced by at least 40 % in most countries.

A breakdown of the population by household type (not presented here) shows that households with single adults below 65 years (with or without children) are exposed to a relatively higher risk of poverty when needs for public services are accounted for. Elderly couples aged 65 years and above face a lower risk of poverty in most European countries. For elderly single adults aged 65 years and above the impact on the risk of poverty varies considerably between

tween European countries, depending on the level of public cash and in-kind transfers received by the elderly. For further results, see Aaberge et al. (2013).

Poverty estimates based on our extended income measure do not change much when the NA scale is replaced by the SNA scale. Moreover, the ranking of countries by the poverty headcount is rather

insensitive to changes in the income measure. For all definitions, the Czech Republic, Iceland and the Netherlands have a low poverty rate, while Estonia, Greece, Spain, Italy, Poland, Portugal and the UK have relatively high poverty rates. Most countries experience a rise in poverty from 2006 to 2009, irrespective of the income definition that is used.

**Table 8.4: At-risk-of-poverty by income definition and country, 2006 and 2009**

(%)

Country	Disposable income (EU)		Extended income (EU)		Extended income (NA)		Extended income (SNA)	
	2006	2009	2006	2009	2006	2009	2006	2009
Belgium	15.1	14.6	9.0	9.7	7.3	7.4	7.4	7.3
Czech Republic	9.5	8.9	5.0	5.1	4.8	4.8	4.8	4.7
Denmark	10.5	12.4	8.1	9.4	5.2	6.8	5.2	6.8
Germany	14.7	15.5	10.6	10.6	9.3	8.8	9.2	8.8
Estonia	19.6	15.7	14.5	12.1	14.1	11.1	14.3	11.1
Ireland	16.5	15.2	9.2	9.6	7.0	6.6	7.1	6.4
Greece	20.5	20.0	12.7	13.1	12.5	13.1	12.4	13.2
Spain	19.7	20.6	11.2	12.8	11.8	12.8	11.7	12.6
France	-	12.8	-	7.5	-	6.5	-	6.6
Italy	19.7	18.1	11.6	11.4	11.5	11.0	11.5	11.1
Luxembourg	13.4	14.5	8.2	8.5	5.9	6.2	6.0	6.3
Hungary	12.2	12.1	7.2	6.4	5.6	5.0	5.6	5.0
Netherlands	9.8	9.6	6.2	6.6	4.2	4.3	4.2	4.3
Austria	11.8	11.9	7.5	7.2	5.6	5.3	5.7	5.4
Poland	17.3	17.4	11.4	11.4	10.3	10.9	10.4	10.7
Portugal	18.2	18.0	10.0	9.3	9.4	9.3	9.4	9.3
Slovenia	10.8	12.7	7.7	9.2	6.2	7.8	6.1	7.7
Slovakia	10.5	12.0	5.3	7.1	5.9	7.6	6.0	7.5
Finland	12.5	12.8	8.8	9.2	5.9	6.6	5.8	6.5
Sweden	10.1	12.5	7.5	8.9	5.3	6.4	5.4	6.5
United Kingdom	18.8	17.1	11.3	11.3	10.6	9.3	10.6	9.4
Iceland	9.5	9.0	6.2	6.7	3.7	5.0	3.6	5.1
Norway	11.2	10.0	8.4	7.4	6.6	5.2	6.5	5.1

NB: France is treated as missing in 2006 due to a break in time series.

Reading note: In Austria, the poverty rate is equal to 5.6 % in 2006 and 5.3 % in 2009 when the income measure is extended income adjusted by NA scale.

Source: Authors' computation, UDB October 2012 and OECD data.

When the EU scale is replaced with the NA scale in the analysis of extended income, the results presented in this chapter show that the change in income inequality and poverty is modest. For most countries, inequality estimates become higher and poverty estimates smaller when the EU scale is replaced with the NA scale. However, as has been demonstrated by Aaberge et al. (2013) the choice of equivalence scale has a significant impact on poverty estimates of sub-groups of the population.

### 8.4.3 Overlap between poverty and material deprivation

The 'standard' (as opposed to 'severe') EU indicator of material deprivation rate expresses the inability to afford at least three items out of nine specified items, considered by most people across Europe to be desirable or even necessary to provide an adequate life (see Guio et al. (2012) as well as Chapters 10 and 13 in this book). So, material deprivation (MD) is based on respondents reporting a lack of items and assessing this lack as being due to a lack of financial resources. By contrast, the at-risk-of-poverty definition (based on disposable and extended income) is 'objective', in the sense that it is derived from an income measure.

Table 8.5 displays a breakdown of the population into groups with different types of overlap between MD and poverty measures based on disposable income (EU scale) and extended income (NA scale). Note that the total rate of MD can be calculated by adding figures in columns number one, three, four and seven in Table 8.5.

Material deprivation and poverty are known to capture different aspects of poor living conditions and to overlap (very) imperfectly, for a variety of reasons, besides measurement errors for both indicators (see among others Fusco et al., 2011). Even if a non-negligible proportion of the population suffers from both income poverty (disposable and extended income) and MD (see Table 8.5, first column 'yes-yes-yes'), the two measures do not overlap for a substantial proportion of the population, who suffers:

1. either from MD, but not income poverty;
2. from income poverty, but not MD.

The first group, which is deprived but not poor (whatever the income poverty measure used — see the seventh column 'no-no-yes'), is relatively large in Hungary, Ireland, Poland, Portugal and Slovakia, whereas this group constitutes small proportions in wealthy nations like the Nordic countries, Germany, Luxembourg and the Netherlands. This reflects the difference between the use of relative poverty measures and a measure of MD which is designed to capture differences in national level of living standards.

The second group consists of people who are income-poor but not materially deprived. This is the case, in particular, of people who can rely on savings/assets or on transfers in-kind. Indeed, all things being equal, people who benefit from ample in-kind transfers can more easily spend a larger share of their budget on other expenses (such as food, heating, durables or holidays) than those who have to pay for social services. Our approach allows disentangling different explanatory factors at the international level. In Table 8.5, those (disposable) income-poor but not deprived may also be income-poor once the extended definition is used (second column ('yes-yes-no') or may no longer be income-poor on the basis of the extended definition (fifth column 'yes-no-no'). For this last group, the non-overlap between income poverty and MD disappears once transfers in-kind are taken into account. This group represents a substantial share of those 'disposable income-poor and not deprived'. This share (i.e. the share of the fifth column in the sum of the second and fifth columns) attains 60 % or more in Austria and Luxembourg, and is between 50 % and 60 % in Belgium, the Czech Republic, Finland, France, Ireland, Hungary, the Netherlands and Norway, meaning that in these countries more than half of the lack of overlap between 'income poverty' and 'non-deprivation' may (partly) be explained by the role of transfers in-kind (Germany and Sweden are borderline).

Finally, Table 8.5 confirms previous results, showing that using the extended income definition rather than the disposable income definition decreases the income poverty risk. Indeed, the proportion of people not poor according to the disposable income definition, who would become poor once the extended income is used, is almost non-existent (see fourth column 'no-yes-yes' and sixth column 'no-yes-no').

**Table 8.5: Overlap between poverty and material deprivation by income definition and country, 2009 (%)**

	Incidence of poverty and material deprivation by combination							
	Yes	Yes	Yes	No	Yes	No	No	No
Disposable income (EU) poverty	Yes	Yes	No	Yes	No	Yes	No	No
Extended income (NA) poverty	Yes	No	Yes	Yes	No	No	Yes	No
Material deprivation	Yes	No	Yes	Yes	No	No	Yes	No
Belgium	3.3	4.0	2.5	0.0	4.7	0.0	6.6	78.7
Czech Republic	2.9	1.9	1.8	0.0	2.4	0.0	10.6	80.4
Denmark	1.3	5.3	1.0	0.1	4.8	0.1	3.6	83.9
Germany	4.1	4.7	2.1	0.0	4.7	0.0	4.9	79.6
Estonia	5.3	4.6	3.4	0.4	2.5	0.9	13.6	69.5
Ireland	2.0	4.6	3.1	0.0	5.5	0.0	14.4	70.4
Greece	8.1	5.0	3.7	0.0	3.3	0.0	12.1	67.8
Spain	3.9	8.8	2.1	0.0	5.6	0.0	7.5	71.9
France	3.0	3.6	2.3	0.0	4.0	0.0	7.4	79.7
Italy	4.7	6.3	2.5	0.0	4.6	0.0	8.9	73.0
Luxembourg	1.3	4.9	0.8	0.0	7.5	0.0	1.9	83.6
Hungary	3.8	1.0	6.0	0.1	1.2	0.1	30.5	57.3
Netherlands	1.1	3.2	1.5	0.0	3.8	0.0	4.5	85.8
Austria	2.5	2.8	2.3	0.0	4.3	0.0	5.8	82.3
Poland	6.4	4.3	3.8	0.1	3.0	0.1	18.6	63.7
Portugal	4.5	4.8	4.0	0.0	4.7	0.0	14.4	67.6
Slovenia	3.5	4.3	1.9	0.0	3.0	0.0	11.0	76.2
Slovakia	4.9	2.5	2.4	0.0	2.1	0.0	18.0	70.0
Finland	2.2	4.1	1.3	0.0	5.1	0.3	4.7	82.3
Sweden	1.0	5.3	0.9	0.0	5.2	0.1	1.9	85.5
United Kingdom	2.6	6.5	2.1	0.2	5.9	0.1	8.3	74.4
Iceland	0.9	4.1	0.6	0.0	3.4	0.0	4.9	86.1
Norway	1.5	3.4	0.8	0.1	4.3	0.2	2.8	86.9

NB: Students are omitted from the population.

Reading note: In Austria, the population share that is classified as materially deprived, and also as poor according to disposable income (EU) and extended income (NA) definition, equals 2.5 %.

Source: Authors' computation, UDB October 2012 and OECD data.

## 8.5 Conclusions

This chapter analysed the distributional impact of public welfare services in 23 European countries by using an equivalence scale that accounts for differences in needs of public services; i.e. the scale accounts for the fact that different public services are associated with needs profiles that differ from the profile exhibited by the EU scale for disposable income. The most common income definitions for analysing income inequality and poverty are disposable income and extended income, normally adjusted by the EU scale. However, both income defini-

tions prove to be biased as measures of economic living standards in a community where the welfare state provides substantial transfers in-kind to the households. These biases arise due to the fact that disposable income is obtained by subtracting taxes used to finance public welfare services but without including the value of received services, while using the EU scale for extended income assumes that needs for public services do not differ from needs for disposable income. A major aim of this chapter was to account for economies of scale in private consumption as well as for heterogeneity in needs for publicly funded services by using a theoretically just-

tified needs-adjusted equivalence scale (NA scale). The NA scale reflects the fact that elderly have relatively high needs for healthcare and long-term care and children for childcare and education.

The empirical results show that the at-risk-of-poverty estimates are reduced by 40 % and the estimated Gini coefficients by approximately 20 % when the extended income (NA) definition is used. The ranking of countries by estimates of overall inequality (Gini) and poverty is however only slightly affected by the choice between the EU scale and the NA scale, whereas poverty estimates by household types are significantly affected by the choice of equivalence scale. Reliable information of the origin of income inequality and poverty is however crucial for the design of welfare and tax systems in European countries.

Finally, Table 8.5 extends our understanding of the well-documented modest overlap between income poverty and material deprivation. It shows, for example, that in a certain number of countries, taking into account transfers in-kind increases the population share that is neither income-poor nor materially deprived.

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# 9

## Intra-household pooling and sharing of resources: a tentative 'modified' equivalised income

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### 9.1 Introduction

Conventional estimates of individual economic well-being (alternatively named 'equivalised income'), including the EU at-risk-of-poverty indicator (see Chapter 3 in this volume), are measured on the basis of two fundamental assumptions: the first is that all the incomes received by all the household members are pooled and consumed jointly; the second is that this pooled income, enhanced by economies of scale, is equally shared between all household members (including children) <sup>(91)</sup>. Under these assumptions, all the members of a given household achieve the same level of economic well-being, and all the members of a given household are thus either at risk of poverty or not. But in fact, not much is known about the actual extent of income pooling and sharing within households, and assuming that incomes are fully pooled and equally shared may result in biased estimates of individual economic well-being, with important implications for the assessment of inequality between individuals, especially between men and women. This chapter investigates an alternative approach allowing for incomplete income

pooling within households. Using the EU-SILC 2010 thematic module on 'Intra-household sharing of resources', the first large scale dataset addressing the issue of the distribution of resources within households, it explores a 'modified' approach to individual equivalised incomes allowing for the possibility that the household members keep some of their incomes separate from the common pool. The exploration is applied to couple-households with a focus on gender inequality.

The key information used in the chapter is based on a question of the module, which asks from each household member aged 16 or above: 'What proportion of your personal income do you keep separate from the common household budget?' (question PA010). Over the 21 EU countries where the question was asked from all the adults in multi-person households (whether couple-households or any household with two or more adult members), significant proportions reported keeping at least some of their personal income separate. Once their responses are combined at household level, the proportion of 'full pooling' households, i.e. households where no adult reported keeping any of their personal income separate, was only about 45 % on average (Ponthieux, 2013, p. 22). This suggests that the assumption of full income pooling could be inappropriate for a significant proportion of households. Couple-households are more likely to pool all their incomes than other types of multi-person households, but not all couples report pooling all their incomes. A traditional division of work between spouses increases the likelihood of full income pooling; on the contrary, dual-earner couples are less likely to report full income pooling, as well as unmarried couples or, 'patchwork' families (see Bonke and Uldall-Poulsen, 2007; Bur-

<sup>(90)</sup> French National Statistical Institute (INSEE). The author thanks Anthony B. Atkinson for comments at early steps of this work, Rolf Aaberge for his discussion of a later draft presented at the 2014 Net-SILC2 Conference in Lisbon, and Anne-Catherine Guio, Eric Marlier, Olga Rastrigina and Holly Sutherland for additional comments. This work has been supported by the Net-SILC2 Network, funded by Eurostat. The European Commission and INSEE bear no responsibility for the analyses and conclusions, which are solely those of the author. Any error would be her own. Email address for correspondence: [sophie.ponthieux@insee.fr](mailto:sophie.ponthieux@insee.fr).

<sup>(91)</sup> Technically, the equivalised income is measured as the household total income divided by the number of 'equivalent adults' living in the household. The equivalence scale used in EU statistics is the so-called 'modified-OECD scale' (see Chapter 3 in this volume).

goyne and Morison, 1997; European Commission, 2012; Hamplova and Le Bourdais, 2009; Heimdal and Houseknecht, 2003; Heikel et al., 2010; Kenney, 2006; Laporte and Schellenberg, 2011; Lyngstad et al., 2011; Ponthieux, 2012; Vogler et al., 2006; Yodanis and Lauer, 2007). Since most multi-person households are couples, these analyses make the issue of intra-household distribution of income even more serious: considering the trends of decreasing marriage, increasing cohabitation, increasing divorces and recomposed families, and the increasing proportions of dual-earner couples, there are reasons to think that the share of 'full pooling' households is likely to go down.

The remainder of the chapter is organised as follows: Section 9.2 presents a brief survey of the related literature, Section 9.3 describes the data and the methodology used for the proposed (tentative) 'modified' equivalised income, Section 9.4 compares the estimates of gender inequality obtained with the standard and the 'modified' approaches, and Section 9.5 discusses the interest and also the limits of the exercise.

## 9.2 Theoretical framework and related literature

Concern about the lack of knowledge of the distribution of income within households and its implications for the measurement of inequality and poverty are not new: Young (1952, p. 305) deplored that '*In place of knowledge, the assumption has often been made, though not stated, that the family [...] can still be treated as a unit for the purposes of spending. It has been taken for granted that some members of a family cannot be rich while others are poor. [...] He also warned that 'To replace assumption by information is no small venture.'* 40 years later, Jenkins (1991) addressed the same issue, underlining that standard poverty measurement still ignores intra-household distribution. Two decades later, individuals' economic well-being is still conventionally measured on the basis of household level information, relying on the assumptions that incomes are fully pooled and equally shared within households.

These assumptions of full income pooling and equal sharing within households refer to the so-called 'unitary' approach to household economic behaviour. In this approach, the household is assumed to behave as if it was a single entity, precisely a rational consumer maximising a unique utility function under a single budget constraint. For households to function 'as if' they are individuals, two main assumptions are then needed: first, individual preferences have to converge one way or the other, so that the household can be considered a single decision unit; and secondly, household members' resources have to be pooled so that there is only one budget constraint. In this framework, income pooling then means that how the income is used depends only on the level of the pooled income and the household's preferences. The fact that individuals' preferences may diverge is ignored, and issues of intra-household distribution are bypassed. Individuals are then not discernible within the household which operates as a 'black box'. This model, criticised from a theoretical perspective (Chiappori, 1992) is now generally considered as unsatisfactory. In addition, empirical results tend to show that household allocation of resources may differ depending on who receives an income (e.g. the emblematic paper of Lundberg et al., 1997) — while, in principle, this should not happen since household decisions are expected to result only from the household budget constraint (the pooled income) irrespective of whose income it is. Since the 1980s, alternative models have been developed (see a survey by Donni and Chiappori, 2009). These non-unitary models consider that each household member (most models consider two decision-makers) has his/her own utility function and incomes are not assumed to be pooled. But estimating these models is also quite complex and clearly not an operational option for statistical purposes.

Statisticians may well be aware of these developments, and also of the fact that deriving indicators of inequality from variables collected at household level and based on an assumption of equal sharing may conceal intra-household inequalities. But once the issue is acknowledged, the argument is still held that it is preferable to assume that incomes are fully pooled and shared rather than the contrary (e.g. Förster and Mira d'Ercole, 2009, p. 7). However, while it is not questionable that sharing occurs within households — especially within families (between

partners and between parents and children) — assuming that it entails no intra-household inequality is debatable. As highlighted by Jenkins (1991), this may result in seriously biased estimates of the incidence of poverty risk, and more generally biased estimates of inequality.

It is then relevant to investigate the extent of this bias. Not knowing much about the actual distribution of income within households, one way to assess the impact of the standard assumptions is to implement alternative assumptions on the extent of pooling/sharing, and compare the outcome to that obtained with the standard assumptions. This has been the strategy of a number of studies seeking to explore the impact of these assumptions on gender inequality in poverty rates (Borooah and McKee, 1994; Davies and Joshi, 1994; Phipps and Burton, 1995; Findlay and Wright, 1996; Fritzell, 1999), on gender inequality in individual income (Sutherland, 1997) or on gender gaps in financial autonomy (Meulders and O’Dorchai, 2010).

The general principle of these studies is to adopt assumptions other than intra-household equality. In most studies, the ‘unequal’ distribution of income is based on direct assumptions on the extent of income sharing: Davies and Joshi (1994), Phipps and Burton (1995), or Meulders and O’Dorchai (2010) apply a form of minimal sharing restricted to the household’s non-labour income; Findlay and Wright (1996) assume unequal transfers of income between the household members; Borooah and McKee (1994) assume an unequal sharing of the household market income. Sutherland (1997) compares the distribution of household incomes and individual incomes computed using microsimulation, making different pooling assumptions by source of income. Fritzell (1999) resorts to modelling the extent of income pooling. All these studies, whatever the year, country or methodology, find that departing from the standard assumptions results in dramatic changes in the level of the indicator examined: women’s shares of income tend to be dramatically lower, their rank in the distribution of incomes sinks to the bottom quantiles, their poverty risk rate is much higher whereas that of men is significantly reduced.

Such results might be expected, but the magnitude of the differences between the standard and the alternative estimates is convincing enough to suggest

that deriving measures of inequality between individuals from household-level income fails to capture individual disparities within households<sup>(92)</sup>. Not only does it understate overall inequality but also gender inequality in particular.

### 9.3 Methodology: definitions and construction of a ‘modified’ equivalised income

As in the studies briefly reviewed above, the purpose of the tentative measure of individual ‘modified’ equivalised income proposed in this chapter is to explore the impact of the standard and alternative assumptions on the assessment of gender inequality. However, contrary to these studies, only the assumption of full income pooling is challenged, meaning that the assumption that pooled incomes are equally shared is not addressed. The basis of our approach is a breakdown of the household income into ‘pooled’ and ‘separate’ incomes; this breakdown is based on the ‘observed’ shares of personal incomes that are kept separate as reported in the variable PA010 (see above) of the EU-SILC module. The first advantage of using this information is that it allows one to avoid making extreme assumptions, such as full income pooling or complete income separation. A second advantage is that, instead of assuming that all individuals adopt one or another type of arrangement as in most previous papers, it allows for a variety of individual behaviour — including different arrangements within a given household. In this chapter, the use of an EU-wide source (EU-SILC) offers the advantage of making it possible to compare the impact of a large diversity of national contexts, especially in terms of women’s participation in the labour market (and subsequent gender inequality in personal incomes) and in terms of a departure from the assumption of full income pooling.

Our main assumption in relation to income sharing (as mentioned above, we do not analyse this aspect in this chapter) is that incomes kept separate may

<sup>(92)</sup> Not pooling income does not mean that consumption is unequal (and vice versa); below, we come back to the relationship between income and consumption in this context.

not be used in the same way as pooled incomes, because they are available only to those who keep them. This is, obviously, a restrictive interpretation because how incomes are actually used (whether pooled or separate) remains unobserved in the survey: the income that a person keeps separate may be used exclusively for him/herself or (also) for expenditures benefiting one or more other household members. So, we adopt the straightforward view that incomes kept separate are not considered as 'common'. This means that in our modified approach, these separate incomes are not 'equivalised' and distributed equally between the household members.

The analysis is restricted to couples (married or cohabitant, with or without children), i.e. households with a maximum of two decision-makers. Households with more than one couple, couples with active children (aged between 18 and 24 years old and economically active) or with adult children (older than 24) are excluded. Obviously, couples where the value of variable PA010 is missing for one or both partners cannot be included (this results in excluding all the countries using a 'selected respondent' approach to data collection: Denmark, Netherlands, Slovenia, Finland and Sweden). France is excluded too because the question on the share of income kept separate was not asked with the exact same meaning as in other countries<sup>(93)</sup>. We also exclude couples with a negative disposable income (or couples in which one partner's personal income is negative). Finally, given the focus on gender inequality, same sex couples are excluded. The resulting population of couples is referred to as 'targeted couples'<sup>(94)</sup>. We refer to 'husband', 'wife', spouses and partners, regardless of the type of union.

This section presents firstly the central variable underlying the computation, then the steps taken in the measurement of individual 'modified' equivalised incomes.

<sup>(93)</sup> The formulation was more restrictive, referring exclusively to the share of personal income the person uses for her/himself, hence a different meaning.

<sup>(94)</sup> In increasing order, the national sample sizes (number of targeted couples) are as follows: Malta (1 623), Estonia (1 916), Austria (1 953), Cyprus (1 965), Ireland (2 050), Latvia (2 072), Slovakia (2 079), Bulgaria (2 233), Lithuania (2 342), Portugal (2 432), Luxembourg (2 772), Belgium (3 077), Romania (3 147), Greece (3 313), United Kingdom (3 385), Poland (3 709), Hungary (4 165), Czech Republic (4 348), Spain (6 133), Germany (6 859) and Italy (8 281).

### 9.3.1 To what extent do couples pool their personal incomes?

As mentioned earlier, the key information for the computation of individual 'modified' equivalised incomes is based on individual responses to a question asking about the share of their personal incomes that each partner keeps separate (question PA010). Six possible answer categories were proposed:

1. all my personal income
2. more than half of my personal income
3. about half of my personal income
4. less than half of my personal income
5. none
6. no personal income<sup>(95)</sup>.

Table 9.1 displays the responses of men and women in target couples.

The distribution of men and women who have a personal income is very similar. The most striking difference is in the proportion of men/women who report having no personal income which, with a few exceptions, is considerably higher among women than among men.

The fact that responses of men and women living in couples are close to each other does not imply that, within couples, both partners report the same behaviour: when both have a personal income, both may keep none of it, one may keep some and the other none, etc. And when one has no personal income, the other may pool/keep more or less of his/her personal income. Once the partners' responses are combined at couple level, three main pooling regimes can be distinguished: 'full income pooling' corresponds to the case where neither of the partners keeps any of his/her personal income separate. In Table 9.2, which shows the distribution of couples in the different pooling regimes, the full income pooling is either the case where both partners have personal income and both do not keep it separate (column a) or the case where only one partner has

<sup>(95)</sup> In Ireland, the modality 'no income' was not proposed, because the question was asked the other way: people were asked about the share of personal income contributed to the common pool, meaning that people with no income were then included among those who keep none of their personal income.

**Table 9.1: Distribution of men and women living in couple-households by the share of personal income he/she keeps separate from the common pool, 2010**

(%)

	With a personal income										No personal income	
	Men					Women					Men	Women
	all	>50 %	50 %	<50 %	none	all	>50 %	50 %	<50 %	none		
Belgium	11.6	3.3	3.2	8.5	73.4	12.1	4.3	3.7	8.8	71.1	4.1	20.4
Bulgaria	5.1	2.3	2.9	15.0	74.7	5.7	1.2	2.4	12.1	78.6	5.4	12.2
Czech Republic	4.6	6.7	6.9	10.3	71.5	6.8	5.8	6.8	8.0	72.6	0.9	3.9
Germany	3.5	6.5	4.2	7.0	78.8	5.4	6.7	6.4	6.7	74.7	1.3	11.1
Estonia	12.6	5.0	10.3	22	50.2	13.0	4.5	10.4	20.4	51.8	7.2	6.6
Ireland	2.0	5.5	8.7	17.9	65.9	13.9	5.7	8.8	12.4	59.3	n.a.	n.a.
Greece	9.2	4.1	5.4	25	56.3	7.9	4.6	5.8	23.9	57.9	1.4	26.5
Spain	1.4	1.6	3.0	4.2	89.7	1.5	1.4	3.8	4.8	88.4	2.3	27.8
Italy	3.9	2.6	4.8	26.6	62.0	4.7	3.2	6.2	25.3	60.6	3.5	31.7
Cyprus	2.0	3.2	3.1	44.1	47.6	2.6	4.0	5.2	41.2	47.0	2.8	24.4
Latvia	4.3	5.1	5.3	44.0	41.3	5.4	4.2	4.4	41.9	44.1	13.3	15.0
Lithuania	2.4	3.4	2.8	8.3	83.1	3.6	2.3	4.5	7.4	82.2	4.8	5.7
Luxembourg	5.2	6.2	4.2	9.7	74.8	8.7	5.9	5.2	10.4	69.8	0.9	21.4
Hungary	1.0	1.5	1.7	12.4	83.5	1.5	1.1	1.2	10.6	85.6	1.3	3.9
Malta	2.8	4.0	9.6	59.8	23.8	5.2	6.5	10.9	53.4	24.1	1.3	39.4
Austria	0.3	9.9	14.7	26.6	48.5	2.9	12.9	16.2	21.9	46.2	0.3	12.8
Poland	7.5	2.4	2.0	13.3	74.7	8.3	2.6	2.2	11.2	75.7	2.3	13.4
Portugal	7.5	3.1	2.8	11.2	75.4	8.4	2.7	2.0	10.1	76.8	3.0	16.6
Romania	9.0	4.5	4.0	48.7	33.8	9.3	4.2	4.8	46.3	35.5	2.2	20.3
Slovakia	3.6	4.3	3.8	45.4	43.0	4.5	4.0	3.9	40.7	46.9	2.6	4.8
United Kingdom	6.2	5.2	5.5	20.0	63.1	9.3	5.9	6.4	16.6	61.8	2.1	3.9
Mean %	5.0	4.3	5.2	22.9	62.6	6.7	4.5	5.8	20.7	62.4	3.1	16.1

NB: 'n.a.' means not available. Population: men and women in targeted couples. The mean is the arithmetic mean of the national percentages.

Reading note: Over the 21 countries analysed, the mean percentage of men living in targeted couples who report having no personal income is 3 %; among those with a personal income, 5 % report keeping all their income separate from the common budget, whereas 62.6 % declare to keep none of their personal income separate from the common household budget.

Source: Author's computation, UDB 2014.

income and he/she does keep none of it separate (column e). At the opposite, 'no pooling' corresponds to the case where both partners keep all their personal incomes separate (column c) or the case where only one partner has a personal income and keeps it separate (column g). In between, the other configurations can be grouped under a label 'partial pooling', including cases where both partners keep some of their personal incomes (column b), cases where part-

ners report different behaviours (e.g. one keeps all and the other some or none — column d ('other cases')), and cases where only one partner has personal income and keeps a share separate (column f). When one partner has no personal income, the couple's pooling regime is defined by the share of his/her personal income kept by the partner who has a personal income. The few cases where neither partner has an income are included in 'full income pooling'.

**Table 9.2: Distribution of couples by pooling regime, 2010**

(%)

	Both partners have personal incomes				One partner has no personal income			Couple's pooling regime (**)		
	and both keep:				and the other keeps (**):			Full pooling	Partial pooling	No pooling
	none(*)	some	all	other cases	none	some	all			
a	b	c	d	e	f	g	a+e	b+d+f	c+g	
Belgium	56.4	11.8	7.2	5.5	15.0	1.2	2.9	71.5	18.5	10.1
Bulgaria	62.9	12.0	3.5	7.2	10.5		3.9	73.4	22.2	4.4
Czech Republic	66.1	18.6	3.4	7.5			4.4	69.6	26.5	3.8
Germany	61.9	13.6	1.8	10.7	11.0		1.1	72.9	25.1	2.1
Estonia	39.1	27.5	9.0	12.0	8.1		4.2	47.2	42.1	10.6
Ireland	55.0	24.1		21.0	n.a.	n.a.	n.a.	55.0		45.0
Greece	36.2	21.1	4.8	10.3	17.3	8.0	2.3	53.6	39.4	7.1
Spain	61.1	6.7		2.8	27.9		1.5	88.9	9.9	1.2
Italy	36.7	18.9	1.7	10.2	21.3	10.0	1.2	58.0	39.1	2.9
Cyprus	30.3	33.3		10.6	13.8		11.9	44.2		55.8
Latvia	30.0	35.3	2.3	10.5	11.0		11.0	40.9	55.6	3.5
Lithuania	70.2	10.0	1.6	7.9			10.3	79.4	18.5	2.1
Luxembourg	52.4	15.6	4.1	5.8	19.9		2.1	72.3	23.3	4.3
Hungary	79.5	11.5		5.5			3.6	82.5		17.5
Malta	13.0	41.9		6.0	10.7		28.5	23.6		76.4
Austria	31.8	37.7		17.5	9.4	3.6	0.0	41.2		58.8
Poland	59.8	11.2	4.5	9.3	11.5	1.9	1.8	71.3	22.3	6.3
Portugal	59.0	10.4	4.5	8.1	13.8	2.6	1.6	72.8	21.1	6.1
Romania	23.5	40.2	5.4	9.7	7.9	11.0	2.4	31.4	60.9	7.7
Slovakia	35.7	40.9	2.3	15.2	3.0		2.9	38.7	58.5	2.8
United Kingdom	53.0	22.6	4.3	14.8	3.7		1.6	56.7	38.4	4.9
Mean %	48.3	22.1	3.1	9.7	11.6	5.1	1.0	59.3	36.6	4.1

NB: (\*) Including the few cases where neither partner has a personal income. (\*\*) When there are less than 40 observations, breakdowns are not provided. Population: targeted couples. 'n.a.' means not available.

Reading note: In Belgium, 10.1 % of targeted couples do not pool any of their personal income; this consists of 7.2 % of couples where both partners have a personal income and both keep all of it separate (column c) and of 2.9 % of couples where one partner has no personal income and the other keeps all of his/her personal income.

Source: Author's computation, UDB 2014.

In 14 of the 21 countries analysed in this chapter, the majority of couples correspond to the standard assumption of full income pooling: neither partner reports keeping any of her/his personal income separate — or one or the other of the partners has no personal income (most often the wife (3.1 % vs 16.1 %); see Table 9.1) and the other partner contributes all his income to the common pool <sup>(6)</sup>. But other pooling regimes are frequent enough

in all countries (the average proportion over the 21 countries is about 40 %) to justify our analysis, i.e. which is to test the impact of not assuming full income pooling systematically.

### 9.3.2 Computing individual 'modified' equivalised incomes

The principle of the 'modified' equivalised income is simple: it consists of applying the standard approach, but only to the pooled income instead of the total disposable income. So the standard and the

<sup>(6)</sup> The very low share of full pooling in Malta seems 'suspect'; but since the objective is to test a methodology, not to provide statistics, we have considered that it was interesting as an extreme case of deviation from the standard assumption.

'modified' approaches result in the same equivalised income in the case of 'full income pooling' couples. In the other cases, when one or both partners keep at least some of their personal incomes separate, the two measures will differ in two ways. First, the size of economies of scale will be lower since only the pooled income is 'equivalised' <sup>(97)</sup>. Secondly, the partners' individual 'modified' equivalised incomes will not necessarily be equal; the difference will come from the respective amounts of personal income kept separate by each partner. The first part of this section presents the shift from standard to modified approach; the second part discusses a point about data limitations and the third part describes the full sequence of computation of the individual 'modified' equivalised income.

### From the standard to the 'modified' approach

In the standard approach, the household equivalised income ( $Y_{eq}$ ) is computed as the household disposable income ( $D$ ) adjusted for the size and composition of the household:

$$Y_{eq} = D / N_{eq}$$

where  $D$  is the sum of all the cash income received in the household (earnings, pensions, capital income, social benefits and allowances, inter-household transfers) net of the social contributions and taxes paid.  $N_{eq}$  is the equivalised size of the household, obtained with the OECD modified equivalence scale (see above), to account for the economies of scale resulting from shared consumption (e.g. sharing a dwelling, a car, appliances and so on). The equivalised income is assigned to each household member; then, using subscripts  $W$  for the wife,  $H$  for the husband and  $K$  for each dependent child, one can write:

$$Y_{eqW} = Y_{eqH} = Y_{eqK} = Y_{eq}$$

This equivalised 'individual' income represents the average potential consumption available to each household member — i.e. the income a person liv-

ing alone would need to achieve the same equivalised income. The implicit assumption is that any initial difference of income between the household members is counterbalanced by transfers from the 'richer' to the 'poorer' household members (between partners and from parents to children).

The modified approach takes into account the possibility that personal incomes can be kept separate from the household common pool. It results in individual 'modified' equivalised incomes that may differ between household members. We start by detailing the couple's disposable income ( $D$ ) as the sum of the partners' personal incomes ( $Y_W$  and  $Y_H$ ) and a set of common incomes ( $Y_C$ ), net of social security contributions and taxes ( $T$ ):

$$D = Y_W + Y_H + Y_C - T$$

Then, we introduce the information on the share of his/her personal income each partner keeps separate from the common pool, and re-write  $D$  (the total disposable income) as the sum of the partners' 'separate incomes' (noted  $y_W$  and  $y_H$ ) and the household pooled income ( $P$ ), equal to the sum of common incomes ( $Y_C$ ) and the amounts of personal incomes pooled by the partners (the difference between their personal income and the amount they keep separate):

$$D = P + y_W + y_H, \text{ with } P = (Y_W - y_W) + (Y_H - y_H) + Y_C - T$$

The equivalised household income ( $Y_{eq-mod}$ ) is then computed as in the standard approach but only on  $P$ , the amount of pooled incomes:

$$Y_{eq-mod} = P / N_{eq}$$

If the partners keep none of their personal incomes separate,  $P = D$  and all the household members get the same 'amount' of  $Y_{eq-mod}$  as in the standard approach. If one partner keeps some of his/her personal income separate, he/she gets  $Y_{eq-mod}$  plus the amount of his/her personal income kept separate.

### Dealing with data

The principle is quite simple, but its implementation requires some adaptations because not all income components are available at individual level in the data. There are three main problems to be dealt with:

<sup>(97)</sup> As mentioned above, we do not know how the income kept separate is actually used. Economies of scale may still result from joint consumption of separate incomes (for instance, if rent or fuel bills are equally shared and paid out of income kept separate, the total amount paid by the partners remains lower than if they lived separately).

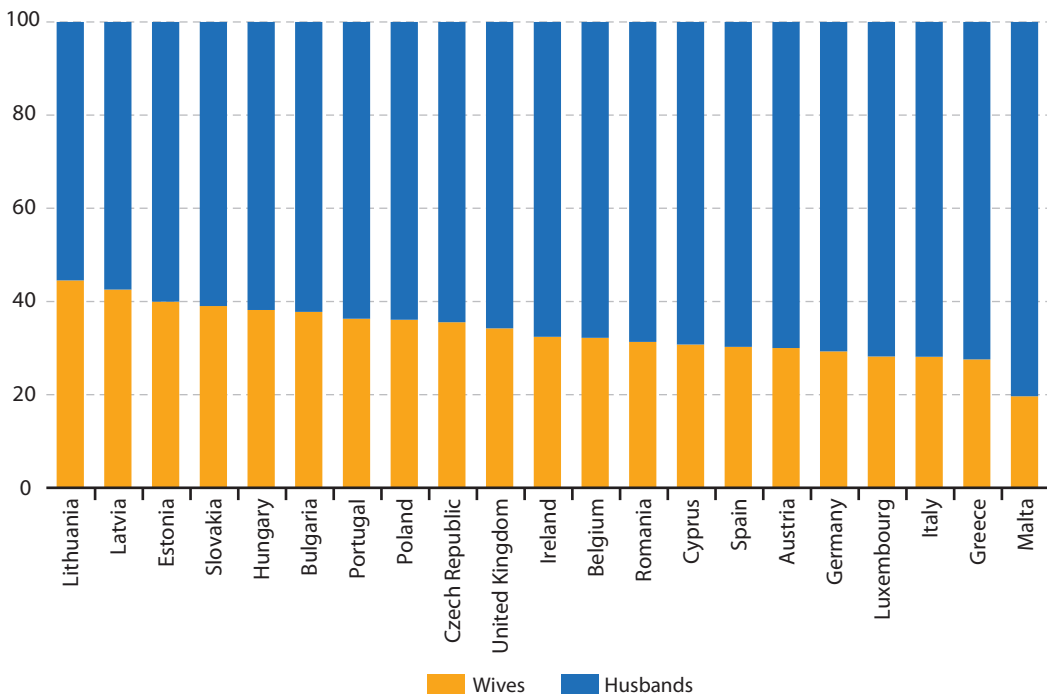
1. EU-SILC, as almost all large scale income surveys, does not collect all income components at individual level.
2. Both 'separate' and 'pooled' components of the household total disposable income have to be measured net of taxes; but in EU-SILC the amount of social security contributions and income tax is available only as an aggregate and at household level, while the amounts of incomes available at individual level are gross amounts.
3. The information on the shares of personal incomes kept separate is not as precise as one would wish.

In EU-SILC, earnings, pensions, and most benefits (unemployment, disability, education-related allowances) are provided at individual level. All the other components of the household disposable income ( $Y_C$  above) are available only as household-level aggregates.

These components include: other market incomes (incomes from property, interests, dividends, etc.), inter-household transfers (including alimonies), some state transfers (family benefits, housing allowances, other benefits from social assistance, and parental leave allowances), taxes on wealth, social contribution and taxes on income (to which we come back below). The problem is that these various income components may concern only one partner (depending on the couple's marital status, pre-marital arrangements, possible former unions, etc.). For instance, it is likely that one partner only receives/pays alimony from/to an ex-partner; parental leave allowances are most often received by women; incomes from financial investments are not necessarily 'common' in unmarried couples (or in married couples who keep their assets separate — and taxes on wealth, if any, may not be pooled). One option is to impute a share of these 'common' components

**Figure 9.1: Distribution of partners' personal incomes, 2010**

(%)



*NB:* Only couples where both partners have a personal income are taken into account.

*Reading note:* In Estonia, wives' personal incomes represent 40 % of the sum of partners' personal incomes.

*Source:* Author's computation, UDB 2014.



to each partner, either a share proportional to their relative personal incomes (with the drawback of imputing no income to partners with no personal income) or a share equal to half the 'common' incomes (with the drawback of assuming a form of sharing). Neither of these solutions is satisfactory and we have therefore chosen the simple (and simplistic) solution of assuming that these income components are pooled <sup>(98)</sup>.

So, personal incomes are measured only partly, on the basis of what is available at individual level in EU-SILC, essentially work-related incomes and pensions. Figure 9.1 shows the distribution between partners of these personal incomes.

The other important issue is related to the fact that social security contributions and taxes on income are provided in one single household level variable in the micro-data made available to researchers through the Users' Database (UDB). In order to ensure consistency between the net personal incomes and the rest of the household disposable income, the total amount of social security contributions and taxes on income is distributed between the partners' personal incomes ( $Y_W$  and  $Y_H$ ) and the household common income ( $Y_C$ ) proportionally to the respective share of each of these components in the household total gross income ( $Y_W + Y_H + Y_C$ ). This does not change either the partners' relative personal incomes or, of course, the total amount of social security contributions and income tax paid by the household, and allows net incomes to be kept consistent at individual and household level. But it is not satisfactory, because we have to treat social contributions and taxes on income as a whole, and because we apply a same implicit flat tax rate to all categories of incomes; in addition, given that female personal incomes are lower, this treatment may result in a downwards bias of the female/male net income ratio as it neglects the effect of progressive taxation (see Figari et al., 2011).

Finally, another limitation of the exercise is that question PA010 does not provide directly usable shares of

personal income kept separate, but answer categories which have to be 'translated' into coefficients in order to compute separate incomes. This translation is quite straightforward for categories 1, 3 and 5 (corresponding to 100 %, 50 % and 0 % of the personal income kept separate, respectively). For the remaining modalities (more than half and less than half) there are many possibilities since the interval is quite large between 100 % and 50 % on one side and between 0 % and 50 % on the other. To keep things simple, we have set a value at mid-interval, i.e. 75 % for category 'more than half', and 25 % for category 'less than half'. Each partner's separate income is then computed by applying an individual coefficient of 'separation' (*pa10*) to their personal income; the set of possible values of this coefficient is then (0, 0.25, 0.5, 0.75, 100).

### Sequence of computation

This section describes the sequence of computation of the individual 'modified' equivalised income step by step <sup>(99)</sup>.

#### 1) Personal incomes net (*Ynet*)

We note  $t_i$  (with  $i$  for  $W,H$ ) the share of social contributions and income tax each partner has to pay (see above), with  $t_W = Y_W / (Y_W + Y_H + Y_C)$  and  $t_H = Y_H / (Y_W + Y_H + Y_C)$ .

Net personal incomes are then computed as:

$$Ynet_i = Y_i(1 - t_i)$$

#### 2) Separate incomes ( $y_i$ ) and pooled income

Separate incomes are measured by applying to each partners' net personal income his/her coefficient of 'separation' *pa10<sub>i</sub>* as defined above.

Then for each partner  $y_i = Ynet_i * pa10_i$

The amount contributed to the household pool is equal to  $Ynet_i - y_i$

If  $pa10_W = 0$  and  $pa10_H = 0$ , our approach gives the same result as the standard approach.

#### 3) Household 'modified' equivalised income ( $Y_{eq-mod}$ )

<sup>(98)</sup> We have also included in the common incomes the income received by children aged under 16 (variable *HY110*). It would have been more consistent to assign them as 'separate incomes' to the children who earned these incomes, but it would have entailed complex assumptions about how they are shared between children if there are several children; we have therefore opted for a more simple solution.

<sup>(99)</sup> The programme (in SAS) is available from the author on request.

Only the pooled and common incomes are equivalised (using the OECD modified scale):

$$Y_{\text{eq-mod}} = [(Y_{\text{net}_W} - y_W) + (Y_{\text{net}_H} - y_H) + Y_{\text{net}_C}] / N_{\text{eq}}$$

#### 4) Individual 'modified' equivalised incomes

The last step consists in adding the amount of his/her private income to each partner. Children, if any, get only the household 'modified' equivalised income (necessarily lower than the standard equivalised income if the parents do not pool all their incomes <sup>(100)</sup>):

- the wife gets  $y_{\text{eq-mod}W} = Y_{\text{eq-mod}} + y_W$
- the husband gets  $y_{\text{eq-mod}H} = Y_{\text{eq-mod}} + y_H$
- each child gets  $Y_{\text{eq-mod}}$

## 9.4 Standard and 'modified' measures of individual equivalised income

This section compares the results of the two approaches. First, by looking between spouses at 'intra-household' level; then, at aggregated level by looking at differences between men and women living in (targeted) couples.

### 9.4.1 Intra-household distribution of individual equivalised income

At intra-household level, the expected outcome of the modified approach is to highlight a difference in the partners' individual equivalised incomes which does not appear when using the standard approach. Figure 9.2 displays the distribution of wives' and husbands' shares <sup>(101)</sup> of 'modified' incomes.

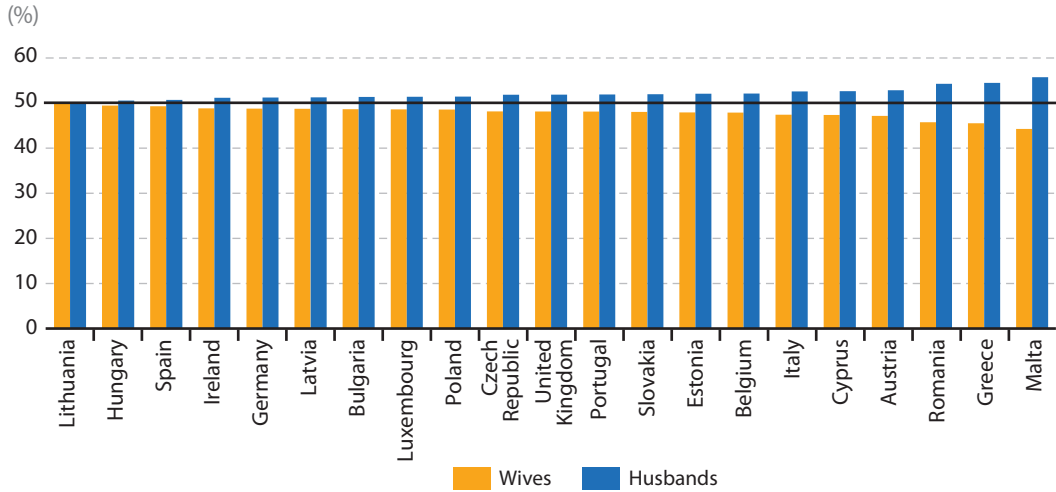
As expected, in all countries we observe a difference (even though extremely small and not statistically significant in most cases) between the wives' and husbands' shares of modified equivalised income, instead of no difference with the standard approach where both partners' shares would be exactly 50 %. On average, wives' shares tend to be smaller with the 'modified' measure than with the standard approach (it is of course exactly the opposite for men). The difference between the two measures results from the combined effect of differences in personal incomes and in the shares of income kept separate by each partner: intra-couple differentials in personal incomes are more or less counterbalanced by the distribution of couples' pooling regimes. At one extreme, there is virtually no difference in Lithuania, where the difference between the partners' personal incomes is relatively small (the smallest of the 21 countries, see Figure 9.1), and where a large share of couples (about 80 %, see Table 9.2) keep none of their personal incomes separate; at the other extreme, in Malta, the large difference in partners' personal incomes combined with a large share of couples where personal incomes are kept (at least partly) separate result in a significant difference in the individual equivalised incomes between wives and husbands.

The difference between the two measures is relatively small in most countries because, as we have seen above, large shares of couples report pooling all or a large part of their personal incomes and also because personal incomes may be under-estimated due to the fact that some income components are collected at household rather than individual level (and we have considered these as equally shared between partners). Yet, the result is no less illustrative of the potential bias in the standard approach.

<sup>(100)</sup> This almost automatically results in children having less individual income than their parents if the parents keep significant shares of their personal incomes from the pool. As our focus is on gender inequality between partners, we do not analyse further the impact of this problematic issue.

<sup>(101)</sup> The wife's (husband's) share is measured as the ratio of her (his) income to the sum of the two partners' income.

**Figure 9.2: Intra-household distribution of modified equivalised income between partners, 2010**

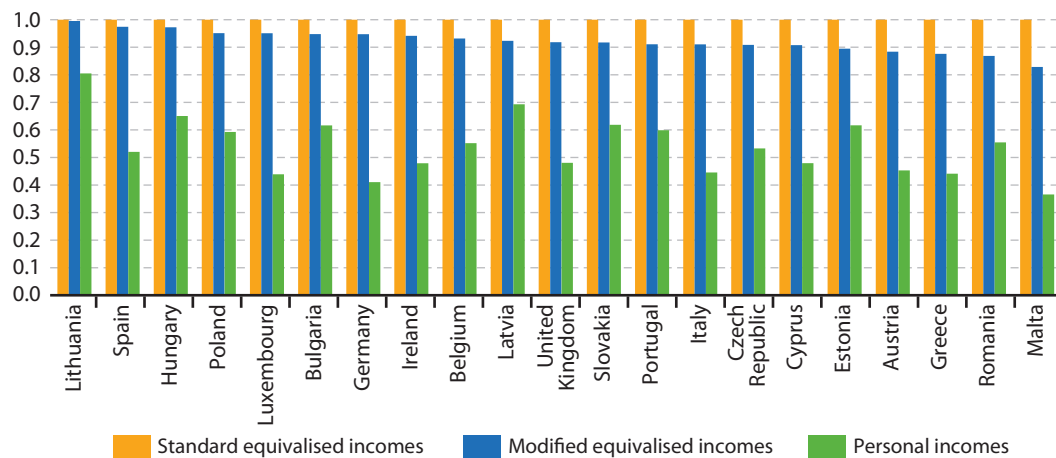


NB: Population: targeted couples.

Reading note: In Malta, wives get on average 43 % of couples' modified equivalised income, instead of 50 % with the standard approach.

Source: Author's computation, UDB 2014.

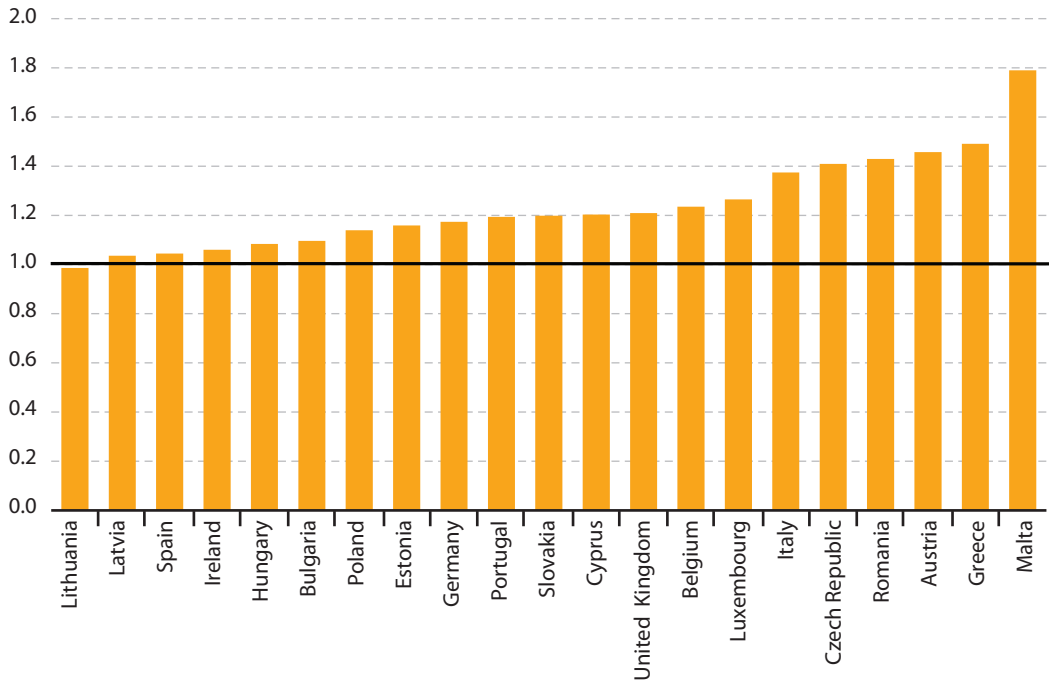
**Figure 9.3: Gender income ratios (women/men), 2010**



NB: Countries ordered by the gender ratio of equivalised modified incomes. Population: men and women of the targeted couples.

Reading note: In the Czech Republic, Estonia, Greece, Italy, Cyprus, Malta, Austria and Romania, the ratio (women to men) of modified equivalised income is 10 to 12 percentage points lower than the ratio of standard equivalised incomes, with ratios of personal incomes standing between 0.45 and 0.60.

Source: Author's computation, UDB 2014.

**Figure 9.4: Gender ratio (women/men) of 'modified' poverty risk, 2010**

NB: Countries ordered by size of the gender ratio of at-risk-of-poverty rates. Population: adults of the targeted couples.

Reading note: In all countries except Lithuania, the women to men ratio of at-risk-of-poverty rates is greater (e.g. by 20 % in Portugal) than 1, which is the ratio obtained with the standard measure of equivalised incomes (represented by the horizontal line).

Source: Author's computation, UDB 2014.

## 9.4.2 Comparing gender inequality in equivalised incomes and in poverty risk

We turn now to measures of gender inequality at national level, computed not between partners within couples, but on average (at the aggregated level) between men and women living in targeted couples<sup>(102)</sup>. We look first at the ratio of women's to men's mean incomes (see Figure 9.3) and then at the ratio of women's to men's rate of poverty risk (see Figure 9.4).

In the standard approach, the ratio of women's to men's mean incomes equals one for adults living in couples, by construction (i.e. due to the equalising effect of this approach). With the modified approach, this ratio is in all countries lower than one,

from barely in Lithuania (where the difference is not statistically significant) to substantially in Malta (see Figure 9.3). Again, the difference between the two measures (standard and modified) of equivalised income is small; the gender ratio of individual equivalised incomes is much larger than that of personal incomes, but the interest of the 'modified' measure is to highlight some of the inequality observed among personal incomes, which is completely concealed with the standard approach.

As for the gender income ratio, the gender ratio of poverty risk is by construction equal to one in the standard approach since within each couple, the same equivalised income is imputed to both partners. In contrast, because the modified approach allows for differences in equivalised incomes within couples, men's and women's 'modified' poverty risk — measured with the usual methodology but

<sup>(102)</sup> This population is very much distorted, since it excludes children and other types of households.

using modified equivalised incomes <sup>(103)</sup> — may differ (see Figure 9.4).

In all countries (again with the exception of Lithuania), women's 'modified' poverty risk appears higher than men's. The difference is substantial in a number of countries (Malta, Greece, Austria, Romania, Czech Republic, Italy — 20 % or more). This result is comparable to those obtained in previous research, showing that deviating from the standard assumptions, here by allowing for the possibility that incomes are not fully pooled, results in higher poverty risks for women than for men.

## 9.5 Conclusions

By construction, the assumptions underlying the standard approach to individual equivalised income limit the possibilities of assessing gender inequality (and inter-individual inequality in general). In this chapter, we have explored the effect of departing from one of these assumptions (full pooling of personal incomes) on the assessment of inequality, with a focus on gender inequality. For this, we have made use of the information provided in the EU-SILC 2010 module on 'Intra-household sharing of resources', which allows identifying the proportion of incomes that partners keep separate from their household's common budget.

Our results do not show dramatic differences between the standard approach and our 'modified' approach, but these differences are large enough to encourage further work in this direction. The relatively small differences between standard and 'modified' estimates result partly from various data limitations, one being that for a number of income components, the amounts are only provided at household level. Even though the major sources of personal incomes (earnings and some social transfers, including pensions) are available at the individual level, it is clear that not being able to assign precisely the other income components is a serious limitation, and may result in under-estimating the share of incomes kept separate.

<sup>(103)</sup> On the basis of a threshold equal to 60 % of the median of the distribution of the OECD modified equivalised incomes in the population of adults of the targeted couples.

If incomes are not actually fully pooled and distributed equally within households, what does this imply in terms of public policies? Many social transfers are targeted at households (families, fiscal units), or conditioned by resources assessed at household level, under the implicit assumption that meeting the needs of individuals is achieved by meeting the needs of households. How this may affect individual economic well-being within households is difficult to assess precisely because conventional measures of economic well-being and policy targets are derived from household-level information. But policies which condition what an individual is entitled to with the resources of another member of his/her household can reinforce inequalities between individuals and particularly the imbalance of resources between women and men (see Bennett and Sutherland, 2011). This would lead to recommendations for an individual-based right to social transfers.

One difficulty faced by any assessment of the extent of biases resulting from unmeasured inequality within households is the lack of data on individual income in EU-SILC: some income variables are aggregated at household level even though based on individual-level information. This is the inheritance of a conceptualisation of the household as a black box, assuming that incomes are pooled and equally shared. As Woolley and Marshall (1994, p. 429) wrote, 'The standard approach solves the problem of measuring resource distribution within households by ignoring it'. In EU-SILC, a blatant example is that of social security contributions and taxes, which are most often applied to individual earnings, but which are not made available at individual level. More individual-level information would avoid the situation in which the measurement of individual economic well-being and the analysis of inequality between individuals are conditioned in the first place by the assumption of equality within households.

This said, it does not mean that the issue is an easy one and that it is only a question of data availability: transfers between partners can take place without income pooling, hence no pooling does not mean no sharing; conversely, income pooling does not necessarily entail equal or fair sharing. From the perspective of statistics, the appeal of developing 'pooling' questions as a tool to account for intra-household inequality does not solve questions that can

be raised about the meaning and interpretation of 'the share of personal income kept separate from the common pool': is it to be understood as the amount available to a person, or rather in terms of command over resources or in terms of autonomy? One may also wonder whether the pooling regime identified on this basis actually corresponds to the income pooling assumption of the theory. Caution is then required. Conceptually, the crux of the issue is the lack of a paradigm for analysing the 'intra-household' level and this entails being able to combine individual-level and household-level information in order to avoid replacing the neglect of individuals within households of the past by a neglect of the household dimension of individual well-being. As pointed out by Bennett et al. (2012), the recognition of interdependence within households is essential. Actually, incomes received by individuals may be poor indicators of economic well-being in terms of consumption and expenditure, but being able to assess unequal command over resources within the household is crucial for the assessment of economic autonomy, beyond a narrow notion of economic well-being in terms of consumption.

The conventional measure of equivalised incomes conflates individuals and households incomes and makes individual situations difficult to compare. With the perspective of gender inequality, this calls for a change of framework: when women's labour market outcomes are less favourable than men's, as is still the case, the standard approach conceals gender inequality. By the same token, it conceals inter-individual inequality in general, and may result in biased estimates of the risk of poverty. The EU-SILC 2010 module on intra-household sharing, by allowing the investigation of some unknown aspects of what takes place in the household's black box, is a first step in the right direction, and the imperfections of the module should not discourage further efforts.

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# Material deprivation and multidimensional poverty





# 10

## Amending the EU material deprivation indicator: impact on size and composition of deprived population

Anne-Catherine Guio and Eric Marlier <sup>(104)</sup>

### 10.1 Introduction

Since 2009, the portfolio of social indicators used by EU countries and the European Commission for monitoring progress towards the EU social protection and social inclusion objectives (see Chapter 1 in this book) includes measures of material deprivation (MD) <sup>(105)</sup>. These MD measures have been endorsed at EU level as a response to the need to complement EU income poverty and social exclusion indicators with indicators that better reflect differences in actual standards of living across the EU — a need which had become even more urgent after the 2004 and 2007 enlargements.

Based on the limited information available from the EU-SILC data-set and building on the work by Guio (2009), the ‘standard’ EU MD rate is currently defined as the proportion of people living in households

who are confronted with at least three of the following nine lacks:

1. they cannot face unexpected expenses;
2. they cannot afford 1 week annual holiday away from home;
3. they cannot avoid arrears (in mortgage or rent, utility bills or hire purchase instalments);
4. they cannot afford a meal with meat, chicken, fish or vegetarian equivalent every second day;
5. they cannot keep their homes adequately warm;
6. they cannot afford a washing machine (enforced lack) <sup>(106)</sup>;
7. they cannot afford a colour TV (enforced lack);
8. they cannot afford a telephone (enforced lack);
9. they do not have access to a car/van for personal use (enforced lack).

Since June 2010, when EU leaders launched the Europe 2020 strategy and set in this context an EU social inclusion target, the importance of EU MD indicators has grown considerably. Indeed, this target, which consists of lifting at least 20 million people out of the risk of poverty or social exclusion in the EU by 2020, is based on three indicators (see Chap-

<sup>(104)</sup> Anne-Catherine Guio and Eric Marlier are from LISER (Luxembourg). We are grateful to Tim Goedemé for very useful statistical advice and to Marco Pomati and Karel Van den Bosch for discussing a previous draft of this chapter. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat as well as by the ‘Poverty reduction in Europe: social policy and innovation (imPRoVe)’ FP7-funded research project. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [Anne-Catherine.guio@liser.lu](mailto:Anne-Catherine.guio@liser.lu).

<sup>(105)</sup> On the EU social objectives and the related EU portfolio of social indicators, see Chapter 1 in this book. And on the use of EU social indicators as well as the methodological EU framework under which these are developed, see: Atkinson et al. (2002), Marlier et al. (2007) and Social Protection Committee (2015).

<sup>(106)</sup> *Enforced* lack means that the household (or the person in the case of items related to individual persons rather than households) would like to possess/ have access to the item but cannot afford it; put differently, the lack is not a choice of the household (person).

ters 1 and 3 in this book). One of them is a measure of 'severe' MD, which is built in the same way as the 'standard' measure but with a threshold set at four rather than three lacks.

Even though the current EU indicators of MD represented a major step forward in the measurement and monitoring of non-monetary poverty at Member States' and EU levels, they have also been criticised (see in particular: Guio, Gordon and Marlier (2012), Nolan and Whelan (2011)). Main criticisms relate to the weak reliability of some of these items. This is a primary reason why a thematic module on MD was added to the 2009 Wave of EU-SILC<sup>(107)</sup>.

Guio et al. (2012) have suggested two new MD indicators: one for the whole EU population (i.e. people aged 0+; see also Chapter 21 in this book and Guio et al. (2016)); and one specifically focused on children (defined here as people aged 1-15; see Chapter 11 in this book). For identifying the final optimal list of MD items to be included in these indicators, they considered four aspects:

1. The suitability of each MD item, in order to check that citizens in the different EU countries (as well as the different population sub-groups within each country) perceive them as necessary for people to have an 'acceptable' standard of living in the country where they live. 'Suitability' should thus be understood as the 'face validity' of the measure among EU citizens.
2. The validity of individual items, to ensure that each item exhibits statistically significant relative risk ratios with independent variables known to be correlated with MD (income poverty, subjective poverty and health problems).
3. The reliability of the MD scale, to assess the internal consistency of the scale as a whole — i.e., how closely related the set of MD items are as a group. This assessment was done on the basis of the Cronbach's Alpha statistic and a Classical

<sup>(107)</sup> A second equally important reason is the need to respond to the willingness of EU countries and the European Commission to complement the current set of EU social indicators with additional measures reflecting the situation of children. See *inter alia* Chapter 11 in this book, de Neubourg et al. (2012), Gábos et al. (2011), Guio et al. (2012), Watson et al. (2012) and Whelan (2012) for proposals for comparative indicators of child deprivation.

Test Theory (CTT) framework (Nunally, 1978), and complemented with additional tests on the reliability of each individual item in the scale based on Item Response Theory (IRT), see for example Cappellari and Jenkins, 2007.

4. The additivity of items, to check whether a person with a MD indicator score of '2' is in reality suffering from more severe MD than a person with a score of '1', i.e. that the MD indicator's components add up.

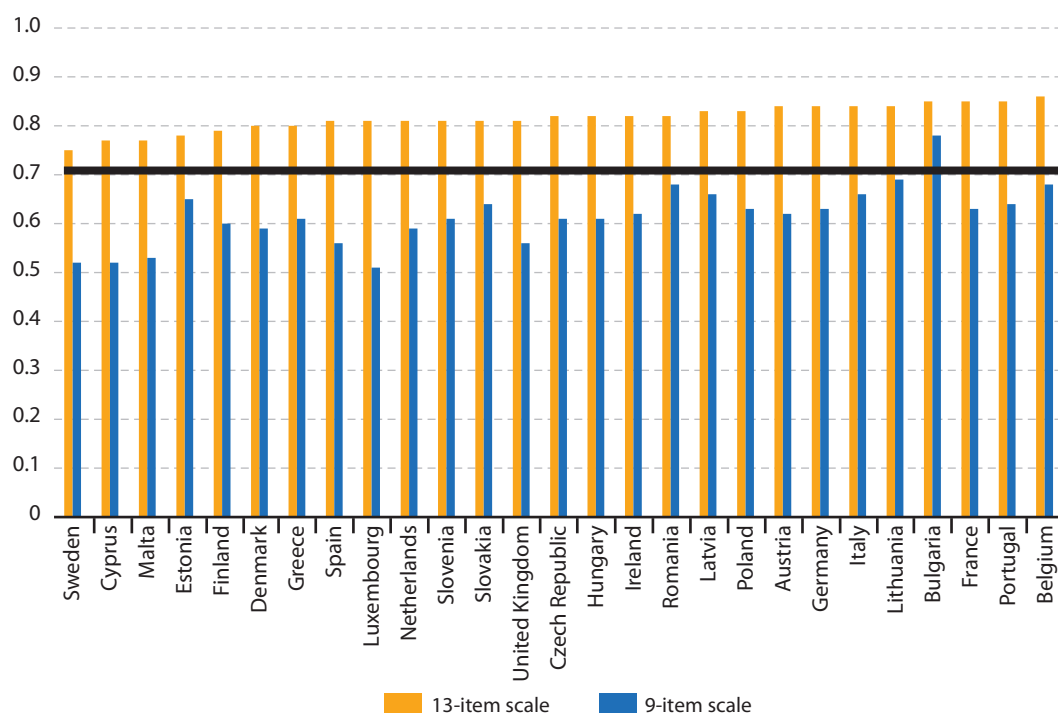
Only the MD items that successfully passed these four steps were considered eligible for being aggregated into a MD indicator. Among the nine items included in the current EU MD indicators, six items successfully passed them, namely the incapacity for a household to:

1. face unexpected expenses;
2. afford 1 week annual holiday away from home;
3. avoid arrears (in mortgage or rent, utility bills or hire purchase instalments);
4. afford a meal with meat, chicken, fish or vegetarian equivalent every second day;
5. keep their home adequately warm;
6. have access to a car/van for personal use (enforced lack).

Among the items collected in the 2009 MD module, seven also satisfactorily met the criteria; each of these items contributes to a robust measure of what can be seen as a common underlying concept of MD across the EU. Five of these new items are enforced lacks which adult household members are confronted with. In the households concerned, a majority<sup>(108)</sup>

<sup>(108)</sup> So, for each of these five items collected for adults aged 16 or above a household MD variable is computed as follows: a household (i.e. all its members, adults and children) is deprived of an item if at least half of the adults living in the household cannot afford this item. Guio et al. (2012) opted for this approach in order to ensure the within-household consistency of the MD status in line with the EU indicators of poverty risk and (quasi-)joblessness included in the Europe 2020 social inclusion target (see Chapter 1 of this volume). An alternative approach would consist of using this adult information to make the MD indicator gender- and age-sensitive. This approach was explored by A.-C. Guio, D. Gordon, H. Najera and M. Pomati in the context of a Eurostat grant aimed at revising the EU MD variables based on an in depth analysis of the 2014 EU-SILC Wave. The results of this and other analyses funded through this grant will be summarised in various articles which should be published in 2017.

**Figure 10.1: Cronbach's alpha by country, 2009**



NB: The Cronbach's Alpha statistic measures the internal consistency of a scale, i.e. how closely related a set of items are as a group. A 'high' value of Alpha is often used as evidence that the set of items measure a 'latent' construct. An Alpha of 0.70 or higher is considered as 'satisfactory' in most social science research situations.

Reading note: The Cronbach's attains 0.86 in Belgium for the 13-item scale and 0.69 for the 9-item scale.

Source: Authors' computation, UDB August 2011.

of members aged 16 or above cannot afford (but would like to):

1. replacing worn-out clothes by some new ones;
2. having two pairs of properly fitting shoes (including a pair of all-weather shoes);
3. spending a small amount of money each week on him/herself;
4. having regular leisure activities;
5. getting together with friends/family for a drink/meal at least monthly.

The other two new items consist in the incapacity for the household to afford (enforced lack):

6. replacing worn-out furniture;
7. having a computer and an internet connection.

The reliability of the 13-item scale proposed by Guio et al. is very high, for the EU-27 as a whole and also for each EU Member State. The Cronbach's Alpha statistic, which measures the internal consistency of a scale, is 0.85 for the pooled EU-27 dataset and ranges from 0.75 in Sweden to 0.86 in Belgium (see Figure 10.1). The fact that in each country, the reliability largely exceeds the 0.70 acceptability threshold (Nunally, 1978) is a major improvement on the current (9-item) indicator. This means that the alternative 13-item MD indicator is (much) more reliable for the EU as a whole and in all EU countries and, therefore, measures deprivation with greater precision than the current MD indicator.

## 10.2 Choice of the threshold

As explained above, the current EU measure of MD is defined as the proportion of people living in households who cannot afford at least three (standard MD) or four (severe MD) items out of a list of nine items. The severe measure of MD is used for the Europe 2020 social inclusion target, in combination with the EU 'at-risk-of-poverty' indicator (see Chapter 3 in this book) and a measure of (quasi-)joblessness (see Chapter 16 in this book).

Guio et al. (2012) tested different MD thresholds (common to all countries) and compared the resulting values to the 'standard' and 'severe' MD indicators. A threshold of at least five items lacked (out of 13) leads to a MD rate for the EU-27 weighted average that is very close to that provided by the current standard EU-27 MD indicator (3+ items out of nine; hereafter 'EU MD'). And a threshold of at least seven items lacked (out of 13) leads to an EU-27 MD rate that is slightly higher than the current EU severe MD indicator (4+ items out of 9; hereafter 'EU SMD'). In view of the purpose of our chapter, we have opted for these two different thresholds, which we refer below to as 'MD 5+' and 'MD 7+'. There are two main reasons for this choice. First, we consider that the closeness of the results at EU level makes it easier to compare the national figures provided by the alternative measures proposed by Guio et al. with those produced by the current EU measures. Second, we believe that this choice is likely to allow for a smoother transition between the two measures, which is especially important for the severe MD indicator given its political prominence in the Europe 2020 strategy.

## 10.3 Impact of the definition change on the incidence of material deprivation in the EU

### 10.3.1 Impact on the Standard EU MD indicator

Figure 10.2 compares the proportion of people deprived according to the current 'standard' MD indicator (EU MD) and the alternative 13-item MD indica-

tor with a threshold set at 5+ deprivations (MD 5+). Figure 10.3 presents for each country the confidence intervals for the *difference* (expressed in percentage points) between these two indicators. All confidence intervals presented in this chapter are computed on the basis of Goedemé (2013) and Osier et al. (2013) (see also Chapter 26 in this book). Confidence intervals refer to the accuracy of the estimates. Yet, even though it is a pre-requisite that the observed performances are different, we have also to ask about the differences which are of interest to the user. Suppose that in a country the level of MD according to the alternative indicator is  $x$  percentage points higher than that shown by the current indicator. How large does  $x$  have to be for this country to consider that the situation reflected by the two indicators is different and may then require different policy interventions? In other words, which difference should be interpreted as 'socioeconomically' (as opposed to statistically) significant? Here, we consider that only impacts higher than two percentage points are significant from a socioeconomic point of view.

As can be seen from Figure 10.3, in a majority of countries (16) moving from the current EU MD indicator to the alternative MD 5+ indicator has either no statistically significant impact on the proportion of people deprived (Slovenia, Spain, Netherlands, Austria, Belgium, France) or this impact is maximum two percentage points (in Estonia, Greece, Sweden, Italy, Denmark, United Kingdom, Luxembourg, Hungary, Latvia, Lithuania as well as for the EU-27 average). In five countries (Germany, Malta, Portugal, Bulgaria, Romania), the alternative indicator produces deprivation levels which are higher by more than two percentage points. By contrast, deprivation levels are lower by more than two percentage points in Cyprus, Ireland, Slovakia, Poland, Czech Republic and Finland.

### 10.3.2 Impact on the Severe EU MD indicator

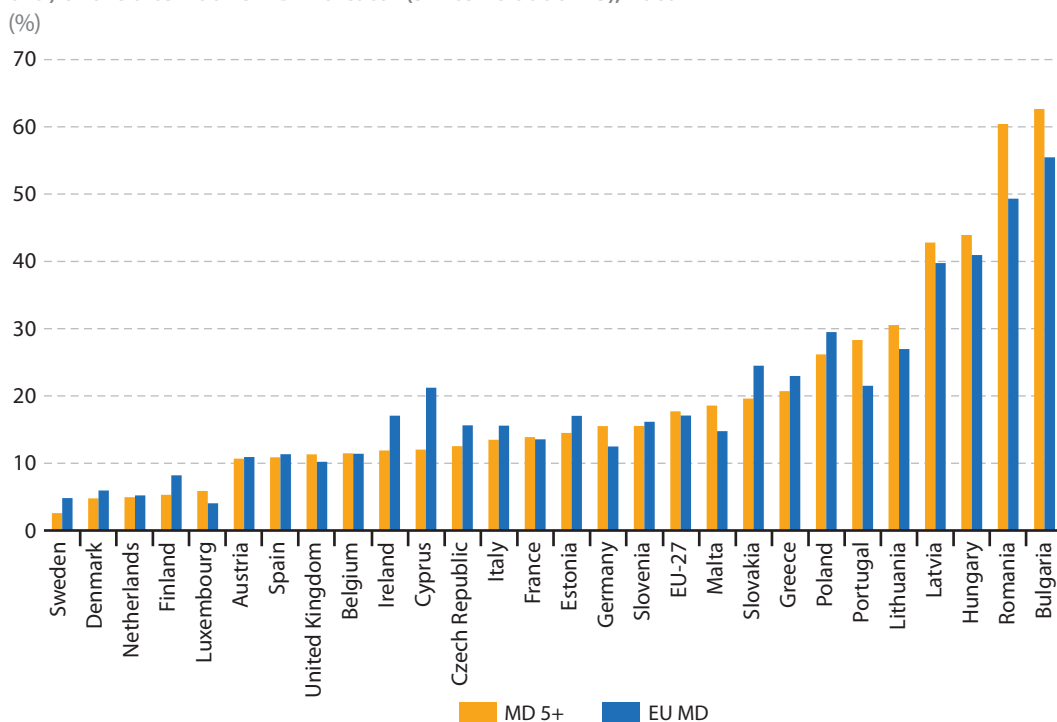
Figure 10.4 compares the proportion of people deprived according to the current 'severe' MD (EU SMD) indicator and the alternative MD indicator with a threshold set at 7+ deprivations (MD 7+).

Moving from the current severe EU SMD indicator to the alternative MD 7+ indicator has no statistically significant impact on the proportion of people se-

verely deprived in five Member States: Czech Republic, Estonia, Denmark, Netherlands, Austria (see Figure 10.5). This impact is statistically higher than 2 percent-

age points in Cyprus (MD 7+ lower than EU SMD) and in Lithuania, Latvia, Hungary, Portugal and Romania (MD 7+ higher than EU SMD).

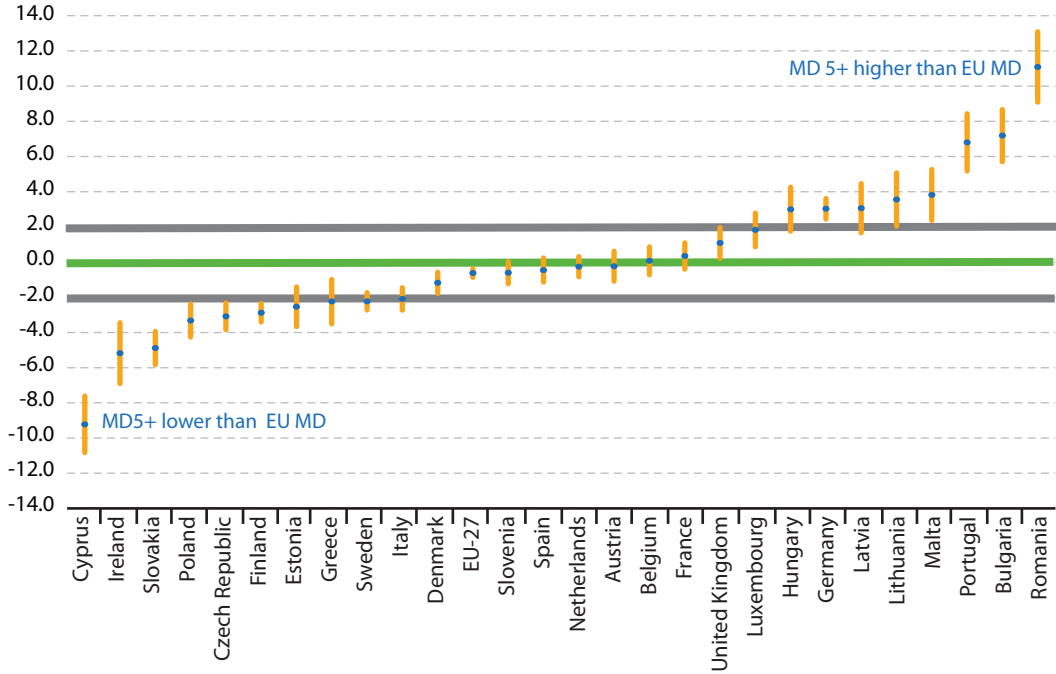
**Figure 10.2: People deprived, using either the current EU standard MD indicator (3+ items out of 9) or the alternative MD indicator (5+ items out of 13), 2009**



Source: Authors' computation, UDB August 2011.

**Figure 10.3: Difference between the proportion of people deprived using the current EU standard MD indicator (3+ items out of 9) and the proportion of people deprived using the alternative MD indicator (5+ items out of 13), 2009**

(percentage points with 95 % confidence intervals)

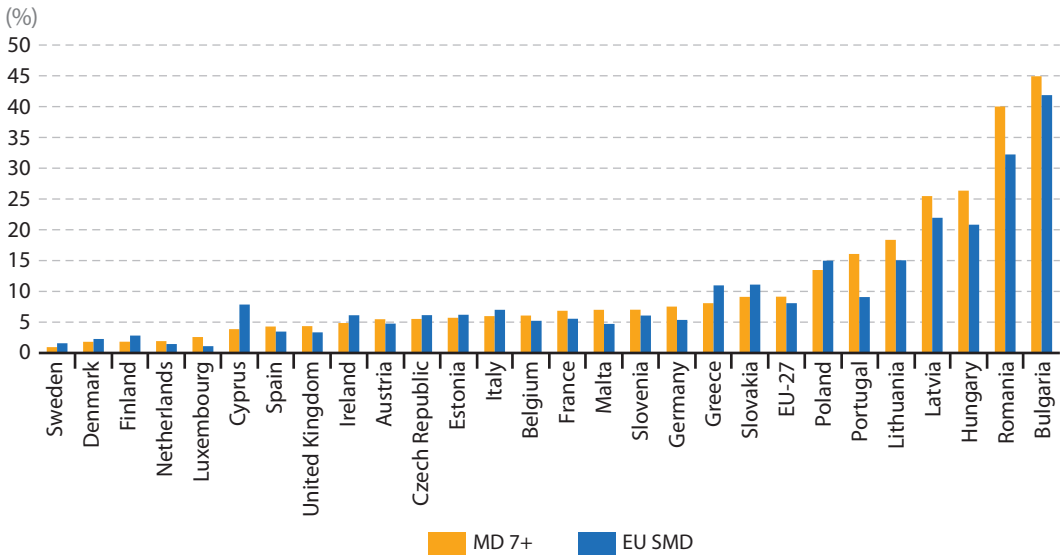


*Reading note:* In Cyprus, the proportion of people deprived using the alternative MD indicator (5+ items out of 13) is 9.2 percentage points lower than the proportion of people deprived using the current EU standard MD indicator (3+ items out of 9). The interval comprised between 7.6 % and 10.8 % has 95 % probability of containing the 'true' difference between these two indicators.

*Source:* Authors' computation, UDB August 2011.



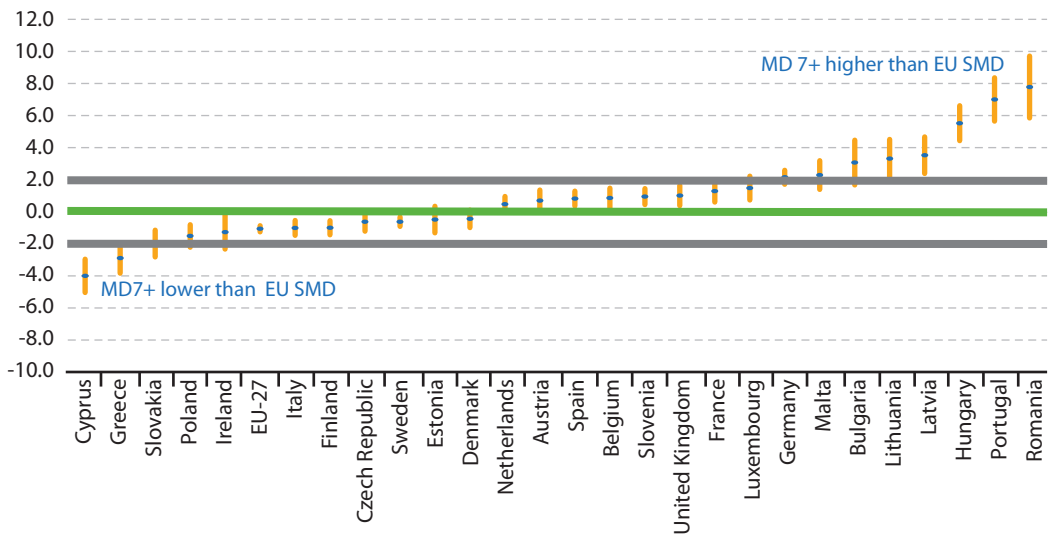
**Figure 10.4:** People deprived, using either the current EU severe MD indicator (4+ items out of 9) or the alternative MD indicator (7+ items out of 13), 2009



Source: Authors' computation, UDB August 2011.

**Figure 10.5:** Difference between the proportion of people deprived using the current EU severe MD indicator (4+ items out of 9) and the proportion of people deprived using the alternative MD indicator (7+ items out of 13), 2009

(percentage points with 95 % confidence intervals)



Reading note: See Figure 10.3.

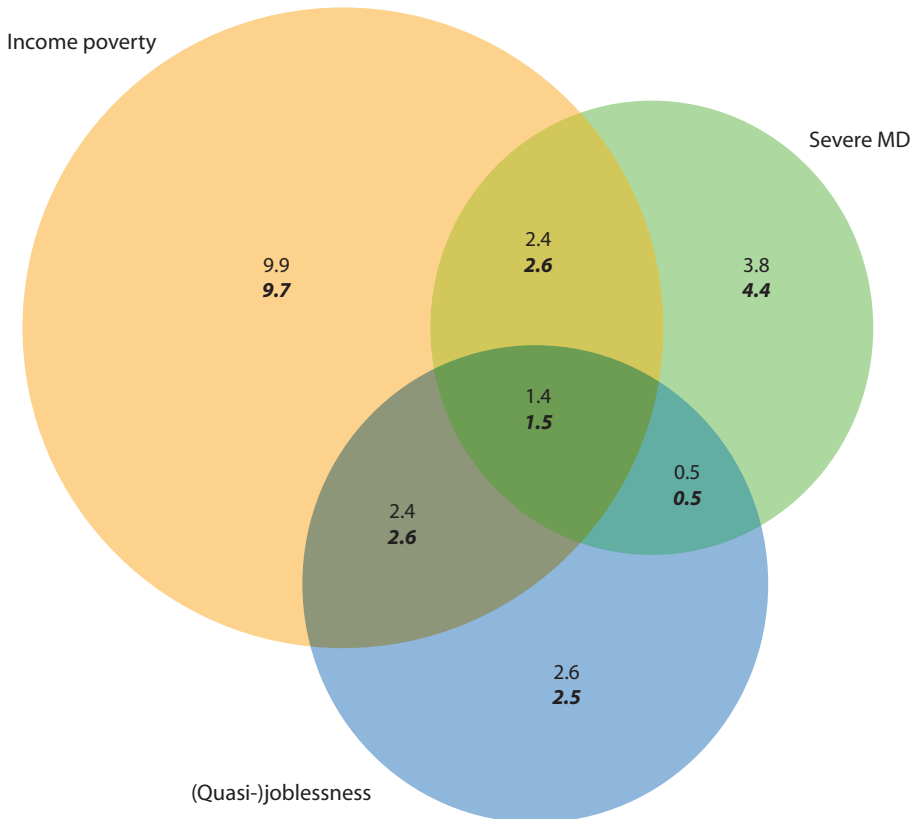
Source: Authors' computation, UDB August 2011.

### 10.3.3 Impact on the Europe 2020 social inclusion target

Figure 10.6 compares the levels of the ‘at-risk-of-poverty-or-social-exclusion’ (AROPE) indicator used for the Europe 2020 social inclusion target (see Chapter 1 in this book for more details on the AROPE indicator) when computed with the alternative MD 7+ indicator rather than the current ‘severe’ MD (EU SMD) indicator. The total proportion of AROPE people at EU level is 23.7 % according to the alternative indica-

tor versus 23.1 % according to the current indicator. This very small difference is mainly due to the slight increase in the proportion of people ‘only’ deprived (from 3.8 % (EU SMD) to 4.4 % (MD 7+)). At the country level (Figure 10.7), the proportion of AROPE people increases by more than two percentage points only in Portugal, Hungary and Romania if we switch to the alternative definition. In the other 24 countries, the difference is either not statistically significant (Finland, Estonia, Denmark, Netherlands, Austria, Spain and Belgium) or is less than two points.

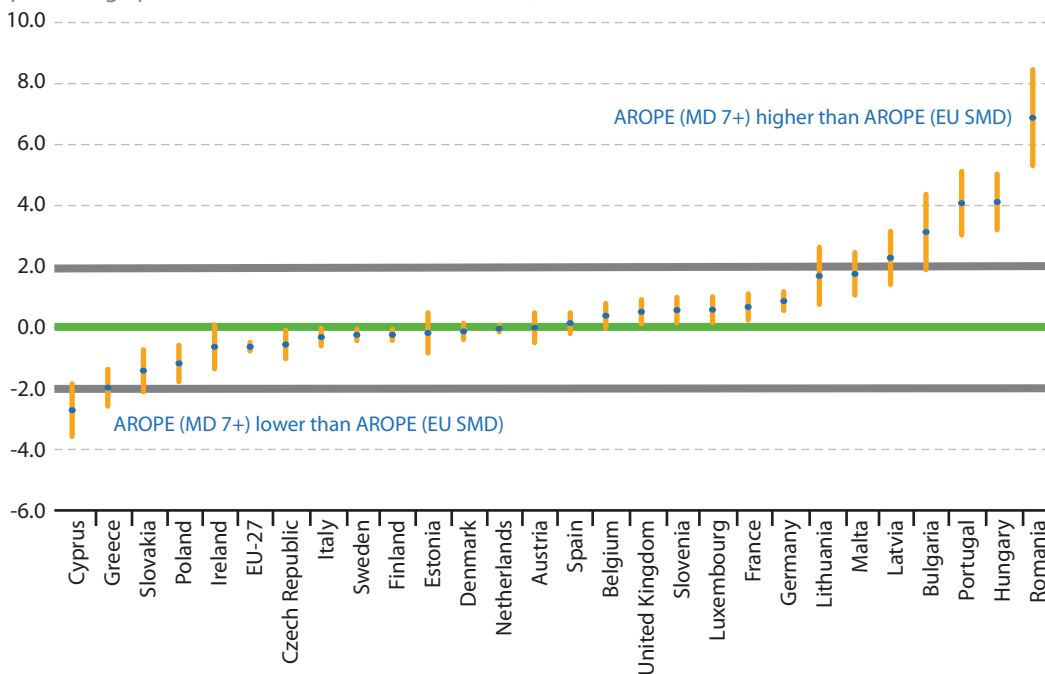
**Figure 10.6:** Intersections of the Europe 2020 ‘At risk of poverty or social exclusion (AROPE)’ indicator, using either the current EU severe MD indicator (normal font) or the alternative MD 7+ indicator (bold and italics font), EU-27, 2009 (%)



*Reading note:* 9.9 % of the total population at EU level is ‘only’ income-poor (i.e. neither severely deprived nor living in a (quasi-)jobless household), if the MD criterion chosen for the AROPE target is the current severe MD indicator (EU SMD); this figure is 9.7 % if the MD criterion chosen is the alternative MD 7+ indicator proposed by Guio et al. (2012). The proportion of people in the EU who combine income poverty and severe material deprivation (but not (quasi-)joblessness) is 2.4 % with EU SMD as opposed to 2.6 % with MD 7+.

*Source:* Authors’ computation, UDB August 2011.

**Figure 10.7:** Difference between the people at risk of poverty or social exclusion, using either the current EU severe MD indicator or the alternative MD 7+ indicator, 2009 (percentage points with 95 % confidence intervals)



Reading note: See Figure 10.3.

Source: Authors' computation, UDB August 2011.

## 10.4 Overlap between the current and alternative indicators

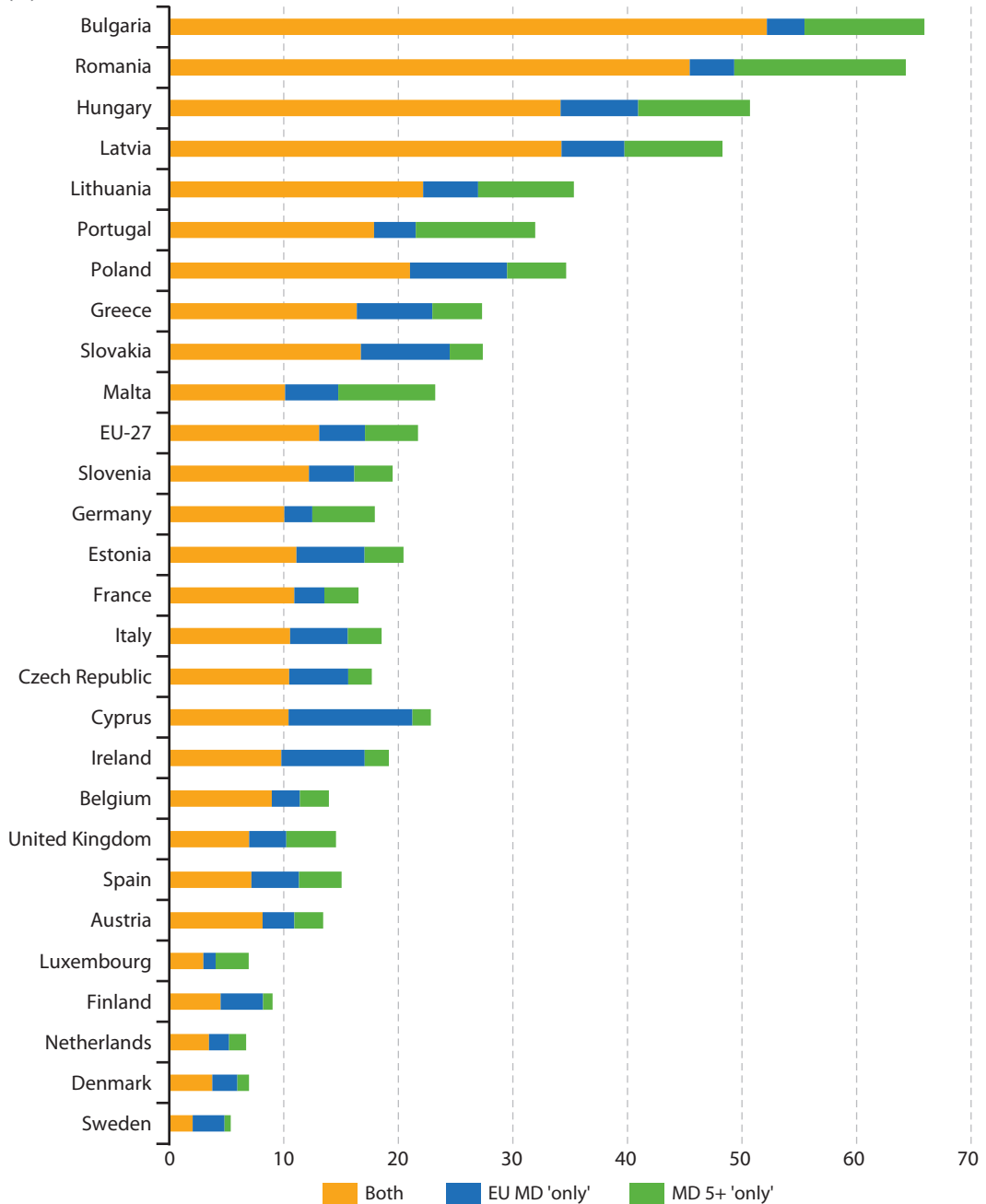
The previous results provide the overall changes in the level of MD due to the definition change but do not tell us anything about the degree of overlap between the alternative MD indicators and the current EU MD indicators. Figure 10.8 shows that the composition of people deprived may change, even in countries where the definition change has no statistically significant impact on the total proportion of people deprived.

So, at the EU level, 13.1 % of people are deprived according to both the current EU 'standard'

MD (3+ lacks out of 9) indicator and the alternative MD 5+ indicator (5+ lacks out of 13). Around 9 % of people are identified as deprived either by the alternative indicator or by the current EU MD indicator but not by both indicators at the same time — i.e., they are EU MD 'only' (4.0 %) or MD 5+ 'only' (4.6 %). Put differently, this means that at EU-27 level 74 % of those deprived according to the alternative MD 5+ indicator are also deprived according to the current EU MD indicator (13.1/(13.1+4.6)). This proportion varies a lot between countries, as highlighted in Figure 10.8. In Bulgaria, Latvia, Poland, Slovakia, Cyprus, Ireland, Czech Republic and Finland, it exceeds 80 %. At the other extreme, this proportion is around 50 % in Malta and Luxembourg. In the remaining countries, it varies between 60 % and 80 %.

**Figure 10.8:** Overlap between the current EU standard MD indicator (EU MD, i.e. 3+ lacks out of 9) and the alternative MD 5+ indicator (5+ lacks out of 13), 2009

(%)



NB: The MD 5+ 'only' category refers to those who suffer from 5+ lacks according to the alternative MD 5+ indicator but are not deprived according to the current EU MD indicator. The EU MD 'only' category refers to those who suffer from EU MD but are not deprived according to MD 5+. Finally, the 'Both' category consists of those who are deprived according to both MD indicators (EU MD and MD 5+).

Source: Authors' computation, UDB August 2011.

**Table 10.1:** Distribution of those suffering from MD 5+ 'only' (5+ items lacked in the alternative 13-item MD indicator), EU MD 'only' (3+ items lacked in the current 9-item indicator) or from deprivation on both the alternative and current indicators, by level of MD (9-item scale), 2009 (%)

Number of items lacked from the current 9-item list	EU MD 'only'	MD 5+ 'only'	Both
0	0	2	0
1	0	17	0
2	0	82	0
3	89	0	40
4	11	0	33
5	0	0	18
6	0	0	7
7	0	0	2
8	0	0	1
9	0	0	0

*Reading note:* 82 % of those deprived 'only' according to the alternative 13-item indicator (MD 5+ 'only') lack two items from the current 9-item list.

*Source:* Authors' computation, UDB August 2011.

Table 10.1 highlights three interesting results:

1. 82 % of those deprived 'only' according to the alternative 13-item indicator (MD 5+ 'only') lack two items from the current 9-item list. So, these people lack at least three items out of the 'new' seven items (as they lack in total at least five items out of the 13 items of the alternative list). It is therefore important to include them in a standard indicator of deprivation.
2. An extremely large proportion (89 %) of those EU MD 'only', i.e. those who are not included in the alternative MD 5+ indicator, are also not severely deprived: they lack exactly three items from the current 9-item list (not four). Moreover, additional analysis shows that these people lack none or only one of the seven 'new' items included in the alternative scale (as they do not reach the 'at least 5 out of 13' threshold).
3. Those suffering from both forms of MD are by far the most deprived in terms of the number of items lacked, with almost 30 % of people lacking five items or more out of the current 9-item list. As can be seen from Figure 10.9, this

group suffers from the highest incidence of deprivation for the whole list of items used in both scales.

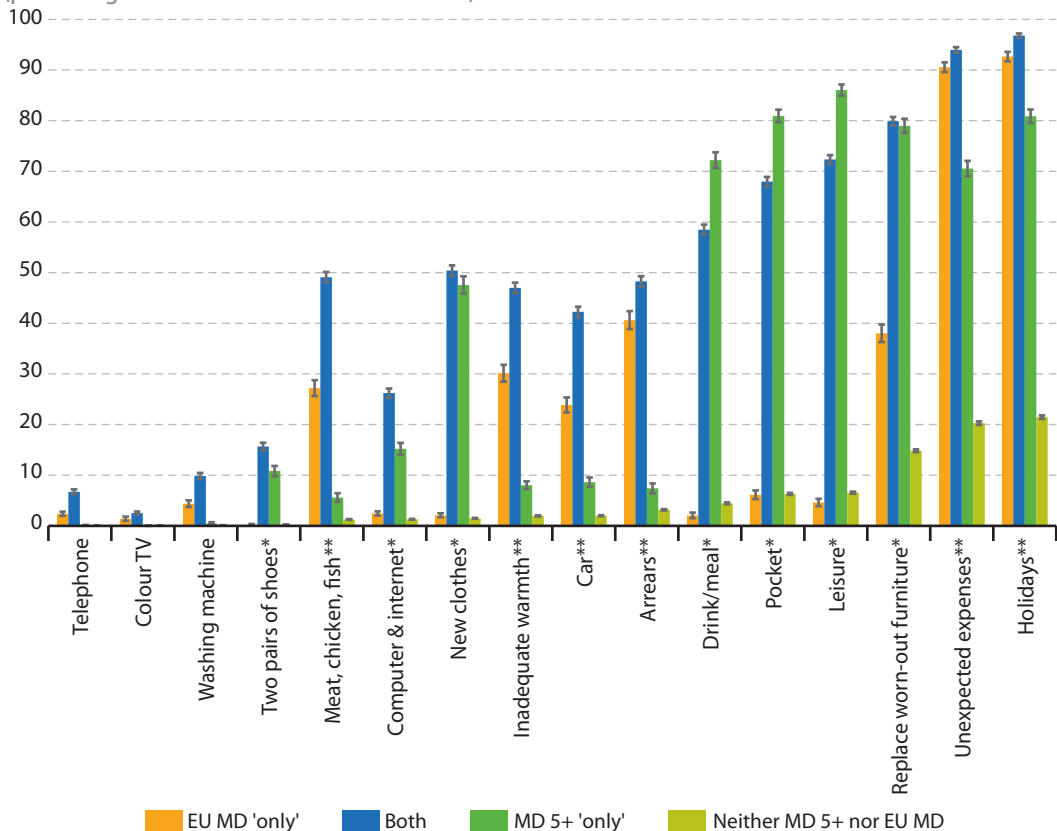
Additional analysis shows that among those currently identified as severely deprived, the proportion of those not included in the MD 5+ indicator is negligible: less than 0.5 % at EU level and less than 1 % in all countries, except in Poland (1.4 %).

A crucial question that we need to explore now is whether or not those identified by the current and alternative indicators share the same characteristics. This is what we do in the next section.

## 10.5 Impact of the definition change on the characteristics of people deprived

This section compares the composition of those who are 'added' to the population currently identified by the standard indicator (those MD 5+ 'only')

**Figure 10.9:** Proportion of people lacking each of the 16 items comprised in the current 9-item scale and/or in the alternative 13-item scale, for those suffering from MD 5+ 'only', EU MD 'only' or from both MD 5+ and EU MD, and for those who are not deprived on both, 2009 (percentages with 95 % confidence intervals)



NB: The MD 5+ 'only' category refers to those who suffer from 5+ lacks according to the alternative indicator but are not deprived according to the current EU MD indicator. The EU MD 'only' category refers to those who suffer from EU MD but are not deprived according to the alternative (5+) indicator. Finally, the 'Both' category consists of those who are deprived according to both MD indicators (EU MD and 5+ MD according to the alternative scale). Items with one star are those that are included only in the alternative scale, those with two stars are common to the two scales and those without a star are only in the 9-item scale.

Source: Authors' computation, UDB August 2011.

with those who are 'dropped' (the EU MD 'only') and those who are 'kept' because they suffer from both forms of deprivation. Here, we only look at the standard deprivation indicators (MD 5+ and EU MD) in order to have a sufficiently large sample size in each group.

The explanatory variables we use in this section contain a set of individual and household socio-economic characteristics often identified in the literature as having an impact on the risk of deprivation

(see for example Fusco, Guio, Marlier (2010)), i.e. variables that can affect the resources or needs of the individual — such as their income, their age, their household type, the presence of individuals in bad health in their household, the work attachment of their household members, their educational level or their country of birth.

We have applied a multinomial logistic regression to analyse (at EU level) the marginal impact of these factors on the probability of belonging

to one of the four groups, namely 'being both MD 5+ and EU MD', 'being only MD 5+', 'being only EU MD' and 'being neither MD 5+ nor EU MD'. The modality 'being only EU MD' is used as the reference category so that all the results are expressed in relation to it. Table 10.2 shows the results in terms of relative risk ratios. These ratios are computed as the exponentiated considered coefficient. They measure the probability of belonging to one group relative to the probability of belonging to the group of reference for a unit change in the independent variable considered. For example, the relative risk ratio for people living in single parent households is the ratio between the following two relative risks:

- the relative risk for people in single parent households;
- the relative risk of the related 'reference' that has been chosen — i.e., in our case: the rest of the population.

Each of these two relative risks measures the probability of belonging to the group of interest (one of the three risks modelled in this chapter: MD 5+ 'only', both forms of deprivation (EU MD and MD 5+) and neither MD 5+ nor EU MD), relatively to the reference group EU MD 'only'. So, the fact that the relative risk ratio of suffering from both forms of deprivation is 1.45 for single parents means that the risk for people living in single parent households of being in the 'both' category, relatively to being EU MD 'only', is 1.45 times higher than for other households.

Table 10.2 shows that once the effect of the other explanatory variables is controlled for the following:

- Most variables have no significant impact on the risk of being in the MD 5+ 'only' group, which shows that EU MD 'only' and MD 5+ 'only' people broadly share the same socioeconomic characteristics. Nevertheless, some variables (having a low income, a bad health or living alone) do increase significantly the risk of being

**Table 10.2: Multinomial regression, estimation of the relative risk ratio of being MD according to the EU 9-item MD indicator (EU MD) and/or MD according to the alternative 13-item MD indicator (MD 5+), people aged 0-59, EU-27, 2009**

Exponentiated coefficients	EU MD 'only'	Both	MD 5+ 'only'	None
Single parent households	1.00	1.45***	1.03	0.44***
One-person households	1.00	1.06	0.53***	0.49***
Log equalised income	1.00	0.61***	0.84***	2.71***
Primary education or less	1.00	1.21**	0.91	0.46***
Lower secondary	1.00	1.43***	1.04	0.50***
Upper secondary	1.00	1.09***	1.09	0.64***
Born in a non-EU country	1.00	1.35***	0.99	0.50***
(Quasi-)joblessness	1.00	1.71***	1.12	0.56***
Bad health	1.00	1.47***	1.19**	0.64***
N	444 655			
pseudo R <sup>2</sup>	0.193			
LI	-268 432.9			
chi2	32 339.1			

NB: Unweighted, exponentiated coefficient (relative risk ratios); \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; reference category of the dependent variable: EU MD 'only' (3+ items lacked in the current 9-item indicator). The maximal level of education attained by the person is divided into four categories: lower educational level (i.e. those who have reached primary level or less), lower secondary level, upper secondary level, and the rest of the population. People in bad health are people having 'limitations' or 'strong limitations' in daily activities because of health problems. People living in (quasi-)jobless households are people aged 0-59 living in households where, on average, adult members aged 18-59 have worked less than 20 % of their total work potential during the income reference period.

Source: Authors' computation, UDB August 2011.

MD 5+ 'only' relatively to being EU MD 'only', which is an interesting *ex post* validation of the alternative indicator. These results also show that for single-adult households the relative risk of being MD 5+ 'only', relatively to being 'EU MD only', is lower than for other households.

- Most of the variables do have a statistically significant impact on the risk of suffering from both forms of deprivation (relatively to being EU MD 'only'). Having a low income, a bad health, living in a single parent household, in a (quasi-) jobless household or being a migrant increase the risk of cumulating both forms of deprivation.
- As expected, all these characteristics decrease the probability to be in the category who manages to avoid any form of deprivation (the 'none' category), relatively to those EU MD 'only'.

## 10.6 Conclusions

Guio, Gordon and Marlier (2012) have proposed a theory-based analytical framework for developing robust (i.e. suitable, reliable, valid and additive) aggregate indicators that could be used for analytical and monitoring purposes at national and EU levels. They have applied this framework to EU-SILC data collected in 2009, and as a result of their systematic item by item analysis carried out at both EU and country levels, they have suggested an alternative MD indicator for the whole population. This alternative indicator consists of 13 items — six are common to the current 9-item MD indicator and seven are new. Using a broad range of statistical techniques, they have demonstrated that their proposed 13-item MD indicator produces a (much) more robust measurement of deprivation than the current EU MD indicator.

The analysis presented in this chapter shows that this alternative 13-item indicator:

- 'adds' to the population identified by the current standard EU MD indicator a group of people who cumulate a large number of deprivations, encompassing 'basic' and 'social' items;
- 'drops' from the population identified by the current standard indicator a group of people

who have a high probability to suffer from a small number of deprivations and who are not severely deprived;

- 'keeps' the more vulnerable population, either in terms of the number of items lacked (whatever the scale used) or in terms of the probability to lack each individual item in the list.

In terms of the characteristics and exposure to other risks, those 'added' and those 'dropped' are quite similar, except for a few differences which offer an interesting *ex post* validation of the alternative indicator (especially, the closer link of the alternative indicator with low income and with bad health compared with the current indicator). All in all, those identified by both the current and alternative indicators are the most vulnerable, i.e. they are more likely to suffer from other risks (low income, bad health, (quasi-)joblessness, etc.) and are proportionally more numerous among single parents, migrants and low educated people.

The impact of the definition change on the proportion of people deprived (standard definition) or severely deprived is small at the EU level, but it varies across countries. As six items are common to both indicators, the incidence of the seven new items, the probability of cumulating them and also the way they interact with the 'old' six items explain the differences between the two aggregated indicators.

Finally, the total proportion of people targeted at EU level is 23.1 % according to the current EU severe MD indicator and 23.7 % according to the alternative (MD 7+) indicator. At the country level, using the alternative (MD 7+) indicator instead of the current EU severe MD indicator increases the proportion of people targeted by more than 2 % in Portugal, Hungary and Romania.

So, whereas the move from the current EU MD definition to the alternative one results in a more robust indicator, the impact of this improved statistical robustness on the size and socioeconomic composition of the deprived population is limited in most countries and for the EU as a whole.

This analysis could only be performed at one point in time (2009). The seven additional items needed for calculating the alternative indicator were col-



lected again in the 2013 Wave of EU-SILC in most countries, on the basis of a gentlemen's agreement between Eurostat and the Member States, and on a compulsory basis in the 2014 Wave in all countries. These new data are currently being analysed, which will allow for change over time analysis (including longitudinal analysis for those countries that have collected these data in both 2013 and 2014 <sup>(109)</sup>) and additional tests of the robustness of the indicator proposed by Guio et al.

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<sup>(109)</sup> For an example of longitudinal analysis based on the current EU MD indicator, see Chapter 20 in this book.



# 11

## Measuring child material deprivation in the EU

Anne-Catherine Guio, David Gordon and Eric Marlier <sup>(110)</sup>

### 11.1 Introduction

The fight against child poverty and the importance of investing in children's well-being has been high on the EU political agenda for many years. In February 2013, a major step forward was taken when the European Commission published a Recommendation on 'Investing in children, breaking the cycle of disadvantage' (European Commission, 2013). The recommendation follows a series of steps taken by some EU Presidencies, the EU Social Protection Committee (SPC) and the Commission.

In 2007, an EU Task-Force on Child Poverty and Child Well-Being was established by the SPC. Its report (Social Protection Committee, 2008) spelled out a number of recommendations for developing and monitoring indicators and for the use of a common framework in the analysis of child poverty and well-being. Following these guidelines, Tárki and Applica (2010) prepared a report on Child poverty and Child Well-being in the EU for the European Commission.

This political commitment was taken forward during the 2010 Belgian Presidency of the EU, which highlighted three important policy areas for future action: income support, active inclusion and a children's rights approach. Subsequently, the 2011 Hungarian

Presidency proposed a set of possible EU indicators of child well-being and improved monitoring instruments to track changes in child poverty (Tárki, 2011). This was followed by a second EU Task-Force and the SPC report on 'Tackling and preventing child poverty, promoting child well-being' (2012), with the aim of contributing to the aforementioned 2013 Commission Recommendation. An important element of this Commission Recommendation is a call on Member States to 'reinforce statistical capacity [...] where needed and feasible, particularly concerning child deprivation'.

Children's needs change as they grow older and their needs are often different from those of adults (e.g. educational needs). Therefore, material deprivation (MD) indicators are required which are age and gender appropriate and which are specific to children's needs. The 2009 ad hoc EU-SILC module on MD (see Chapter 10 in this book) included child-specific MD items, allowing the development of specific child MD indicators.

This chapter provides the main results of the in-depth analysis of the 2009 EU-SILC data on child MD carried out by Guio, Gordon and Marlier (2012). A key purpose of the study by Guio and her colleagues was to identify an optimal set of children MD items among those collected in 2009 in order to recommend a child MD indicator for use by EU Member States and the European Commission. Detailed analyses, including all underlying national and EU figures can be found in this report.

The structure of the chapter is as follows. Section 11.2 presents the data, Section 11.3 discusses the need for a holistic approach to measuring child deprivation, Section 11.4 presents the methodological framework

<sup>(110)</sup> Anne-Catherine Guio and Eric Marlier are from LISER (Luxembourg) and David Gordon from Bristol University (UK). This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat and the ESRC Grant RES-060-25-0052. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. We would like to thank Eldin Fahmy, Viljami Fifta, Shailen Nandy and Marco Pomati (Bristol University) who, through providing us with in-depth data analyses, contributed significantly to this chapter. Email for correspondence: [anne-catherine.guio@liser.lu](mailto:anne-catherine.guio@liser.lu).

and the results of the analysis, Section 11.5 presents the aggregated indicator and its value added, Section 11.6 concludes.

## 11.2 Data on child deprivation in EU-SILC

Data relating to the living conditions of children are not collected from the children themselves but from the adult answering the 'household questionnaire' (referred to as the 'household respondent'). According to the survey protocol, if, in a given household, at least one child does not have an item, it is then assumed that all the children in that household also lack the item (see Eurostat, 2011). This assumption has been made for pragmatic reasons. Ideally, it would be preferable to know the deprivation levels of each child in a household separately as it would then be possible to study differences in child deprivation within each household as well as between each household (e.g. if girls suffer more deprivation than boys, or teenagers more than younger children living in the same household).

In addition to the MD information collected about households and adults, the following list of children's MD items was collected in the 2009 EU-SILC module on MD: The household cannot afford for at least one child...

1. some new (not second-hand) clothes (*enforced lack*; see chapter 10 in this book);
2. two pairs of properly fitting shoes, including a pair of all-weather shoes (*enforced lack*);
3. fresh fruits and vegetables daily (*enforced lack*);
4. three meals a day (*enforced lack*);
5. one meal with meat, chicken, fish or vegetarian equivalent daily (*enforced lack*);
6. books at home suitable for the children's age (*enforced lack*);
7. outdoor leisure equipment (*enforced lack*);
8. indoor games (*enforced lack*);
9. a suitable place to do homework;
10. to consult a dentist when needed ('optional', i.e. countries were allowed not to collect this item);
11. to consult a general practitioner (gp) when needed (*optional*);
12. regular leisure activities (sports, youth organisations, etc.) (*enforced lack*);
13. celebrations on special occasions (*enforced lack*);
14. to invite friends round to play and eat from time to time (*enforced lack*);
15. to participate in school trips and school events that costs money (*enforced lack*);
16. outdoor space in the neighbourhood to play safely;
17. 1 week annual holiday away from home (*optional*) (*enforced lack*).

The majority of these children's items were adapted from the 1999 Poverty and Social Exclusion survey of Britain (Gordon et al., 2000; Pantazis et al., 2006). For most items, the information was gathered for children aged between 1 and 15 (i.e. they were collected in households with at least one child in this age bracket). Therefore, our suggested child-specific MD indicator covers only children aged between 1 and 15. For reasons of consistency, we had to exclude all children aged less than one from our calculations related to the child-specific indicator, even though information was available for some of them (where they have brothers/sisters aged between 1 and 15). Due to inconsistencies with the way some countries coded the children's MD data, we have also chosen to drop from our calculations all children aged one or two who were flagged as 'not applicable' (because their households were erroneously considered as not having any children aged between 1 and 15). It is important to highlight that, as a result of the way data were collected in the 2009 EU-SILC module, 'children' here do not refer to the same population as the one covered by the existing EU social protection and social inclusion indicators: 1-15 as opposed to 0-17 (in EU-SILC, teenagers aged 16 and 17 are interviewed individually on the basis of the adult questionnaire).

Two children's MD items were collected only in households with at least one child attending school (school trips and place to do homework)

and are therefore less relevant for younger children. We have considered that children living in households where no child is attending school, by definition, do not lack these two items.

The child holiday question was optional and we have therefore used the household 'holiday item' (used in the EU indicator on MD; see Chapter 10 in this book) as a proxy in the nine Member States that did not collect this child deprivation item, despite the fact that, in countries where both variables are available, the correlation is not necessarily high.

### 11.3 Need for a holistic and life-cycle approach

In our suggested MD child indicator, we have tested the children's items collected in the 2009 module, as well as the MD items collected at household level <sup>(11)</sup>. Our choice is motivated by the fact that we believe (in line with scientific evidence, see below) that, in order to adequately measure children's MD, it is necessary to look not only at MD that solely affects children but also at the MD that affects the households in which they live and that is likely to impact on the children's living conditions. The whole set of items affecting children's living conditions should therefore be included in a child MD indicator (Gordon et al., 2003), regardless of the statistical unit it refers to (which, in many cases, primarily reflects a choice made on the basis of data collection rather than conceptual considerations).

As highlighted by Atkinson and Marlier (2011), close links are required between the design of social indicators and the questions they are intended to answer. If the aim of a child MD indicator is to measure intra-household transfers or within-household differences in living standards, then all household level items would need to be removed from the MD indicator. By contrast, if the aim of a child MD indicator is to measure and compare the living standards of children in different households (as we want to do here),

then the relevant household level MD items that have a direct effect on children's living conditions need to be included in the child MD indicator. This is particularly true where there is scientific evidence that these deprivations have worse or different effects on children than on adults (Marsh et al., 2000).

The inclusion of household items in a child indicator has to be interpreted from a holistic and life-cycle point of view: we include items that directly impact on children's well-being (e.g. inadequate warmth in home, enforced lack of a car/van, etc.) and also items which may have an indirect or future impact on their well-being. For example, the inability to face unexpected expenses may have an impact on children's living conditions in the near future (in the case of an accident, an illness, an inability to replace a car in a remote area, etc.). Qualitative studies have also shown that children in households suffering from financial strain often do not ask their parents for the things they need which cost money in order to try to protect their parents from stress and feelings of guilt (Ridge, 2002 and 2011; Observatoire de l'Enfance, de la Jeunesse et de l'Aide à la jeunesse and Sonecom, 2010).

### 11.4 Methodological framework

As with the development of a new EU MD indicator for the whole population (see Chapter 10 in this book), the conceptual approach we followed for measuring child MD was inspired by Peter Townsend's research during the 1950s and 1960s on poverty and deprivation and succinctly described in 1979:

*Poverty can be defined objectively and applied consistently only in terms of the concept of relative deprivation. [...] Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the type of diet, participate in the activities and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong. Their resources are so seriously below those commanded by the average individual or family that they are, in effect,*

<sup>(11)</sup> See also de Neubourg et al. (2012) for a similar choice of including household items in a child deprivation measure. In contrast, the choice of limiting the set of items to child-specific items was done in some other analyses of the 2009 EU-SILC MD module — see Gábor et al. (2011), Watson et al. (2012), Whelan (2012).

*excluded from ordinary living patterns, customs or activities.* (Townsend, 1979, p. 31)

The analytical framework used in this chapter draws extensively on the 1999 Poverty and Social Exclusion Survey deprivation indicator construction methodology. An important aspect of this methodology is that it facilitates the identification and selection of an optimal sub-set of MD items from the initial list of available items. We have ensured a robust selection of items, by considering the four following aspects to identify the final optimal list of MD items: 1) suitability of the items; 2) validity of the items; 3) reliability of the items; and 4) additivity.

### 11.4.1 Suitability of the items

The suitability of each MD item was examined, in order to check that citizens in the different Member States (as well as the different population sub-groups within each Member State) consider them necessary to have an ‘acceptable’ standard of living in the country where they live. Here, ‘suitability’ is understood as a measure of face validity amongst the EU population. A high proportion of people having and/or wanting an item provides a measure of the ordinary living patterns, customs or activities which is a key criteria in Townsend’s sociological definition of poverty (Townsend, 1979). As Perry (2002) suggested, we defined the degree of ‘importance’ of each item, at EU and country levels, as the proportion of people ‘wanting’ an item (which encompasses both people who have the item AND people who would like it but cannot afford it). Our analysis shows that, for children’s MD items, the proportion of ‘wanting’ is very high (for detailed results, see Guio, Gordon and Marlier, 2012). This is true not only for basic items (food, clothes and shoes) but also for other items such as the availability of games, celebration, books or outdoor equipment. See Table 11.1 for a summary of the results of our tests. No items failed the suitability test.

### 11.4.2 Validity of the items

All items in a MD index/indicator need to be valid measures of MD. An individual MD item can be considered to be valid if it exhibits positive statistically significant relative risk ratios with a set of in-

dependent variables known to be correlated with the latent construct of deprivation. We tested this by running binary logistic regressions for each MD item (dependent variable) against independent variables known to be correlated with MD: income poverty <sup>(12)</sup> and subjective poverty, i.e. (great) difficulties in making ends meet.

An item showing non-statistically significant relation with both income and subjective poverty in more than two Member States was rejected as non-valid. See Table 11.1 for a summary of the results to our tests (Sweden was excluded from this criterion because of the large proportion of missing data for all MD module items (around 40 %)).

### 11.4.3 Reliability of the items

Reliability was tested using Classical Test Theory and Item Response Theory models. Classical Test Theory provides information on the reliability of a MD scale as a whole. This can usefully be complemented with Item Response Theory that provides additional information on the reliability of each individual item in the scale.

#### Classical test theory

The Cronbach’s Alpha statistic measures the internal consistency of a scale, i.e. how closely related a set of items are as a group. A ‘high’ value of Alpha is often used as evidence that the set of items measure an underlying (or ‘latent’) construct. An Alpha of 0.70 or higher is considered as ‘satisfactory’ in most social science research situations (Nunnally, 1978). We identified which items if omitted (one by one) would increase the reliability of the deprivation index (i.e. increase Cronbach’s Alpha — analysis performed at both country and EU levels). In line with our validity tests, the criterion we applied is that an item is considered unreliable if it is unreliable in three countries or more. The Cronbach alpha of the final list of items which passed all our tests attained 0.90 at the EU level, i.e. far more than the usual 0.70 criterion (see Figure 11.1).

<sup>(12)</sup> Both Peter Townsend (1979) and Mack and Lansley (1985) used the size of the correlation between income and MD to select their items.

## Item Response Theory

Item Response Theory, also known as Latent Trait Analysis, is a set of statistical models which describe the relationship between a person's response to questionnaire items and an unobserved latent trait such as knowledge of biology, level of happiness or amount of material deprivation. Item Response Theory is often used for the selection of questions in educational assessment and for psychological testing. It has also been used for developing measures of poverty.

Table 11.1 shows the items which did not pass the reliability tests.

### 11.4.4 Additivity of the items

Additivity tests aim to ensure that the MD indicator's components add up, i.e. to check that, say, someone with a MD indicator score of '2' is in reality suffering from more severe MD than someone with a score of '1' or a score of '0'. This was checked using an ANOVA model (second order interactions of MD items by level of equivalised disposable household income). These models assume that children who suffer from two deprivations (e.g. those who cannot afford both clothes and shoes) should live in households with (on average) significantly lower net equivalised incomes than those who only suffer from one deprivation (clothes or shoes deprivation 'only') or no deprivations. Similarly, those children suffering from one deprivation should have lower incomes than those with no deprivations. This should hold for all possible combinations of MD items. See Table 11.1 for a summary of our results.

The MD items that successfully passed these four steps can thus be considered to be suitable, valid, reliable and additive candidates for being aggregated into a child-specific MD indicator.

## 11.5 Final list of children MD items

The final list of items retained in the MD indicator related to the children (aged 1-15 years) population consists therefore of the following 13 'children' and 5 'household' items:

1. child: some new clothes (enforced lack);
2. child: two pairs of properly fitting shoes (enforced lack);
3. child: fresh fruits and vegetables daily (enforced lack);
4. child: meat, chicken, fish or vegetarian equivalent daily (enforced lack);
5. child: suitable books (enforced lack);
6. child: outdoor leisure equipment (enforced lack);
7. child: indoor games (enforced lack);
8. child: place to do homework;
9. child: leisure activities (enforced lack);
10. child: celebrations (enforced lack);
11. child: invite friends (enforced lack);
12. child: school trips (enforced lack);
13. child: holiday (enforced lack);
14. household: replace worn-out furniture (enforced lack);
15. household: arrears;
16. household: computer and internet (enforced lack);
17. household: home adequately warm;
18. household: car/van (enforced lack).

The Cronbach's alpha for the 18 items retained for our suggested child MD indicator is 0.90 for the pooled EU-27 dataset. The national Alphas range from 0.68 in Finland to 0.93 in Bulgaria (see Figure 11.1).

**Table 11.1: Outcomes of suitability, validity, reliability and additivity tests, child population, 2009**

<b>The household cannot afford for at least one child:</b>	<b>Problems</b>
Some new clothes (enforced lack)	√
Two pairs of properly fitting shoes (enforced lack)	√
Fresh fruits and vegetables daily (enforced lack)	√
Three meals a day (enforced lack)	Validity and Reliability
Meat, chicken, fish or vegetarian equivalent daily (enforced lack)	√
Suitable books (enforced lack)	√
Outdoor leisure equipment (enforced lack)	√
Indoor games (enforced lack)	√
Place to do homework	√
To consult a dentist (optional)	Validity and Reliability
To consult a GP (optional)	Validity and Reliability
Leisure activities (enforced lack)	√ (Suitability)
Celebrations (enforced lack)	√
To invite friends (enforced lack)	√
School trips (enforced lack)	√
Outdoor space to play	Reliability
Holiday (enforced lack) (optional)	√
<b>The household's dwelling suffers from:</b>	
Lack of basic amenities	Validity and Reliability
Shortage of space	Reliability
Darkness	Reliability
Noise	Validity and Reliability
Pollution	Validity and Reliability
Crime	Validity and Reliability
Leaky roof, damp, etc.	Reliability
Inadequate warmth in home	√
High housing costs (>40 % of total household income)	Reliability
Overcrowding	Reliability
Litter lying around	Validity and Reliability
Vandalism	Reliability
<b>The household cannot afford:</b>	
To replace worn-out furniture (enforced lack)	√
To face unexpected expenses	Additivity
To avoid arrears	√
A telephone (enforced lack)	Validity and Reliability
A colour TV (enforced lack)	Validity and Reliability
A computer and Internet (enforced lack)	√
A washing machine (enforced lack)	Validity and Reliability
A car/van (enforced lack)	√
<b>The household has a (very) difficult access to:</b>	
Public transport	Validity and Reliability
Postal/banking services	Validity and Reliability

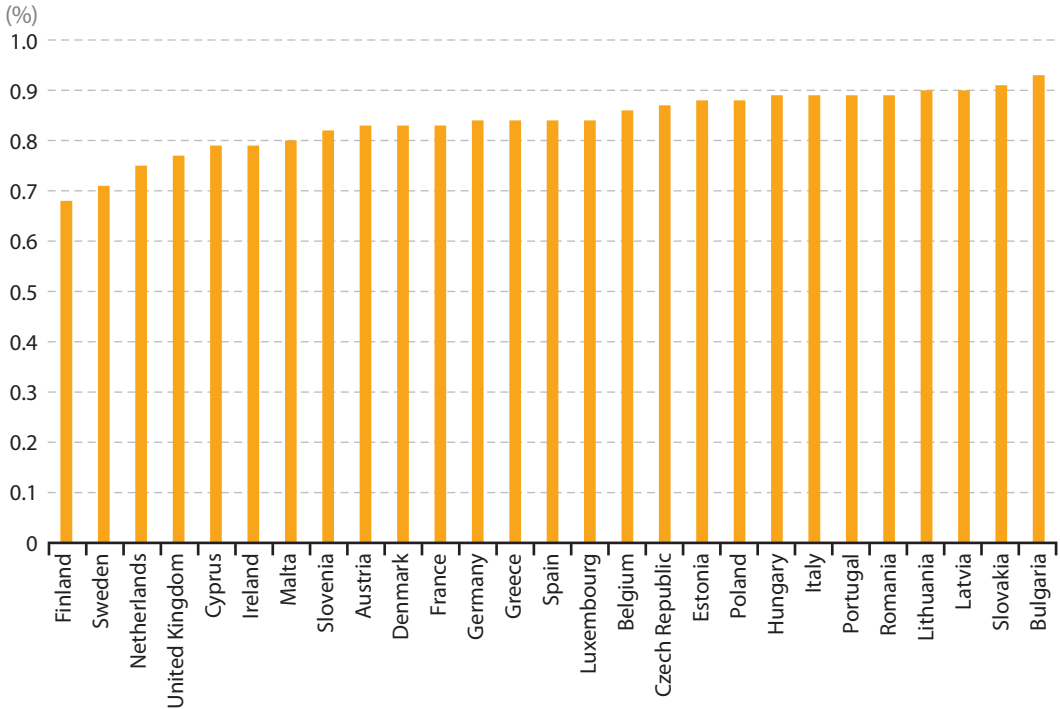
*NB:* An item has validity problems if the results of the logistic regressions are not statistically significant in both validity tests. It is 'invalid' if it has validity problems in more than 2 out of 27 Member States. Due to the huge proportion of missing cases for all module items in Sweden (around 40 %), this country is not taken into account in the count. For reliability tests, the same logic is followed. The reliability/ additivity tests are considered successful if reliability/ additivity problems are observed in no more than two countries. An item is kept in the proposed indicator if it does not violate any of the five criteria we have retained in our analytical framework (suitability, validity, reliability (Classical Test Theory), reliability (Item Response Theory) and additivity). √=successful on all criteria.

*Reading note:* The child item related to the affordability of having three meals a day did not pass both the Validity and Reliability tests.

*Source:* Authors' computation, UDB August 2011.



**Figure 11.1: Cronbach's alpha by country, child population, 2009**



*NB:* The Cronbach's Alpha statistic measures the internal consistency of a scale, i.e. how closely related a set of items are as a group. A 'high' value of Alpha is often used as evidence that the set of items measure a 'latent' construct. An Alpha of 0.70 or higher is considered as 'satisfactory' in most social science research situations.

*Source:* Authors' computation, UDB August 2011.

A heat map highlights the national patterns in Table 11.2. The incidence of each individual MD item retained in our proposed final child MD list is compared with the EU-27 average. A ratio higher than one indicates that the national proportion of people deprived for a particular item is higher than the EU-27 average.

Some countries (Denmark, Luxembourg, Netherlands, Finland and Sweden) have consistently low rates of child deprivation (40 % of the EU-27 weighted average or less for at least 14 out of the 18 MD items). However, it should be noted that, in Luxembourg, the proportion of children lacking a place to do homework is 1.9 times that observed

for the EU as a whole. By contrast, in Romania and Bulgaria, child MD levels are all at least twice the EU average; for more than 11 items, they are more than four times higher than the EU-27 average.

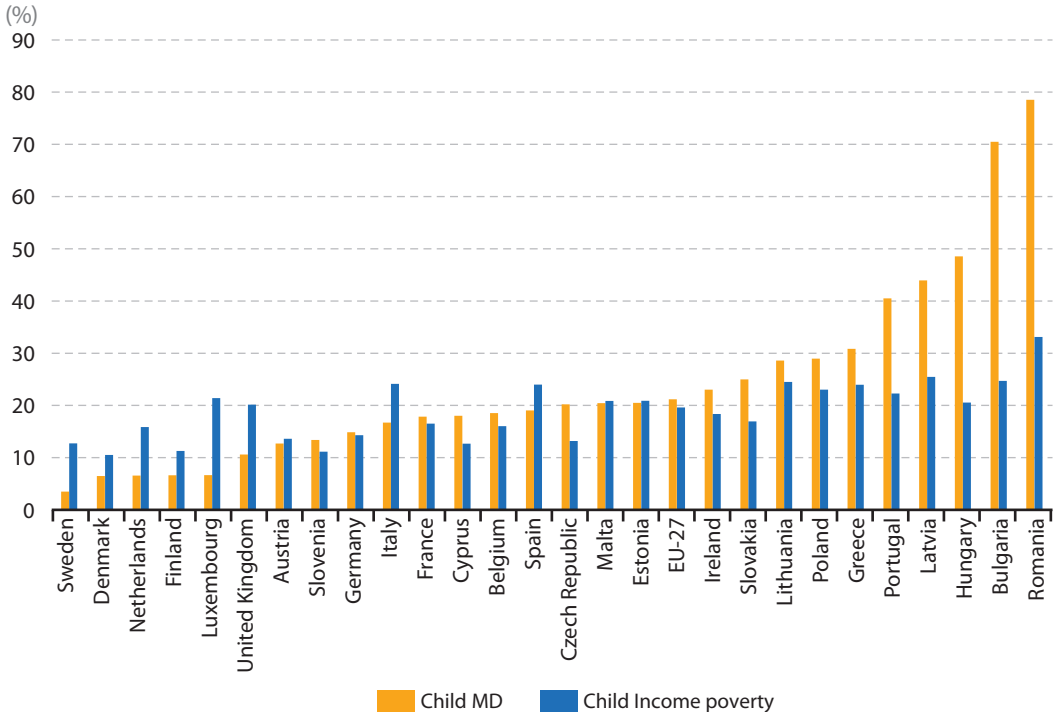
We tested different thresholds for our child-specific MD indicator. A threshold of 3+ items lacked (out of 18) leads to an EU-27 child MD rate of 21 %, which is the figure that is closest to the 2009 EU MD rate (20 %). A threshold of 6+ items lacked (out of 18) leads to an EU-27 child MD rate of 9 %. This figure is effectively identical to the current EU severe MD indicator computed on the population aged 1-15 in 2009.

**Table 11.2:** 'Heat map' providing for each item and country the ratio between the proportion of people lacking the item in the country and the proportion of people lacking the same item at the EU-27 level, child population, 2009

Children (1-15)	RO	BG	LV	HU	PT	PL	LT	SK	EE	EL	IT	CZ	BE	CY	ES	MT	AT	FR	IE	SI	DE	UK	LU	DK	FI	SE	NL
Children: indoor games	10.3	7.2	2.7	2.6	2.4	2.0	1.6	1.5	0.9	0.9	0.7	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.0	0.0
Children: Outdoor equipment	8.4	7.4	3.3	2.9	1.3	1.7	1.7	2.1	1.5	1.0	0.5	1.0	0.6	0.4	0.5	0.8	0.3	0.2	0.3	0.1	0.3	0.2	0.4	0.1	0.1	0.1	0.0
Children: School trips	7.8	4.9	2.2	1.3	2.4	1.9	1.3	1.7	1.1	1.4	0.8	0.5	0.4	0.2	1.0	0.2	0.4	0.7	0.7	0.3	0.3	0.4	0.6	0.0	0.1	0.1	0.0
Household: Car	6.2	3.4	3.4	2.9	1.3	1.7	1.8	2.2	1.7	0.7	0.2	1.4	0.8	0.1	0.6	0.2	0.6	0.4	1.0	0.3	0.5	0.8	0.4	0.3	0.3	0.2	0.2
Children: Suitable books	6.0	6.6	2.7	2.6	2.6	2.1	1.6	2.3	1.5	1.3	1.0	0.4	0.6	0.5	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.1	0.2	0.2	0.0	0.1	0.0
Children: Leisure activities	5.8	4.8	2.3	2.3	2.6	2.1	1.8	0.8	0.8	1.2	0.9	0.4	0.7	0.7	0.5	0.4	0.9	0.6	0.5	0.8	0.6	0.6	0.3	0.1	0.1	0.1	0.2
Children: Celebrations	5.6	4.9	2.7	1.6	2.4	2.2	2.2	1.6	0.8	2.2	0.9	0.4	0.6	0.9	1.1	0.9	0.5	0.5	0.3	0.4	0.4	0.2	0.4	0.0	0.0	0.1	0.0
Children: Meat, chicken, fish	5.5	7.1	2.6	2.6	1.2	1.3	1.9	3.3	2.1	1.0	0.7	0.9	0.6	0.1	0.2	1.1	0.4	0.5	0.4	0.4	0.9	0.2	0.2	0.2	0.1	0.0	0.1
Children: Invite friends	5.0	7.1	3.4	4.3	3.2	1.3	1.7	2.0	0.9	0.8	0.8	0.4	0.5	0.4	0.8	0.6	0.7	0.4	0.2	0.3	0.3	0.2	0.4	0.1	0.0	0.1	0.1
Household: Computer & Internet	4.8	4.9	1.8	2.1	1.5	1.7	1.7	2.1	0.9	2.5	0.9	1.3	0.8	0.5	1.2	0.2	0.5	0.6	0.9	0.4	0.2	0.5	0.2	0.0	0.1	0.0	0.0
Children: Fresh fruits	4.4	7.7	3.6	3.6	0.8	1.7	1.9	2.4	3.4	0.3	0.4	0.4	0.4	0.1	0.2	0.5	0.2	1.0	0.2	0.3	0.5	0.2	0.2	0.1	0.1	0.0	0.1
Children: Two pairs of shoes	4.2	11.9	3.2	1.3	1.1	0.9	0.4	2.1	1.2	0.2	0.5	0.6	0.9	0.1	0.5	0.7	0.2	1.4	1.0	0.6	0.9	0.7	0.3	0.2	0.2	0.2	0.3
Children: Some new clothes	3.5	5.7	3.9	3.2	2.5	0.6	2.3	2.3	1.1	0.1	0.8	0.8	0.9	0.1	0.6	1.0	0.4	0.7	0.4	1.5	0.5	0.3	0.5	0.2	0.4	0.0	0.1
Children: Place to do homework	3.3	2.8	0.9	0.8	2.2	0.9	1.2	1.2	1.1	2.4	1.8	0.9	1.2	0.8	0.7	0.7	0.5	0.6	0.2	0.8	1.1	0.4	1.9	0.2	0.3	0.5	0.7
Children: Holiday	2.4	2.3	1.3	2.5	1.9	1.4	1.4	0.8	0.7	1.2	1.0	1.6	1.1	0.7	1.6	1.7	0.7	0.6	1.7	0.4	0.8	0.7	0.4	0.4	0.2	0.4	0.3
Household: Inadequate warmth	2.4	7.7	2.3	1.1	3.4	1.9	2.7	0.5	0.3	2.3	1.0	0.5	0.7	2.2	0.8	1.3	0.2	0.6	0.7	0.4	0.8	0.7	0.1	0.1	0.1	0.1	0.1
Household: Worn-out furniture	2.3	2.6	2.1	2.1	2.0	1.3	1.5	1.5	1.4	1.5	0.1	1.5	0.7	1.5	1.3	1.7	0.4	1.1	0.6	1.1	0.7	0.6	0.7	0.3	0.4	0.2	0.5
Household: Arrears	1.9	2.6	2.0	2.1	0.8	1.2	0.7	1.1	1.3	2.1	1.0	0.6	0.8	1.5	0.9	0.8	0.6	1.0	1.4	1.4	0.5	0.5	0.4	0.3	0.9	0.5	0.2

NB: The table is sorted horizontally according to the national mean MD level and vertically according to the national ratios of the country with the highest mean MD level (i.e. RO in this case), with the most materially deprived countries on the left and with the items sorted highest to lowest. '0' refers to values that are below 0.05.

Source: Authors' computation, UDB August 2011.

**Figure 11.2: Children lacking at least 3 out of 18 MD items and children at risk of poverty, 2009**

NB: For a definition of the EU 'at risk of poverty' indicator, see Chapter 3 in this book. Countries are ranked by their national child specific MD rate. *Reading note:* At EU level, 21.2 % of children aged between 1 and 15 years lack at least 3 out of the 18 items retained in the MD child-specific indicator; the proportion of income-poor children is 19.6 %.

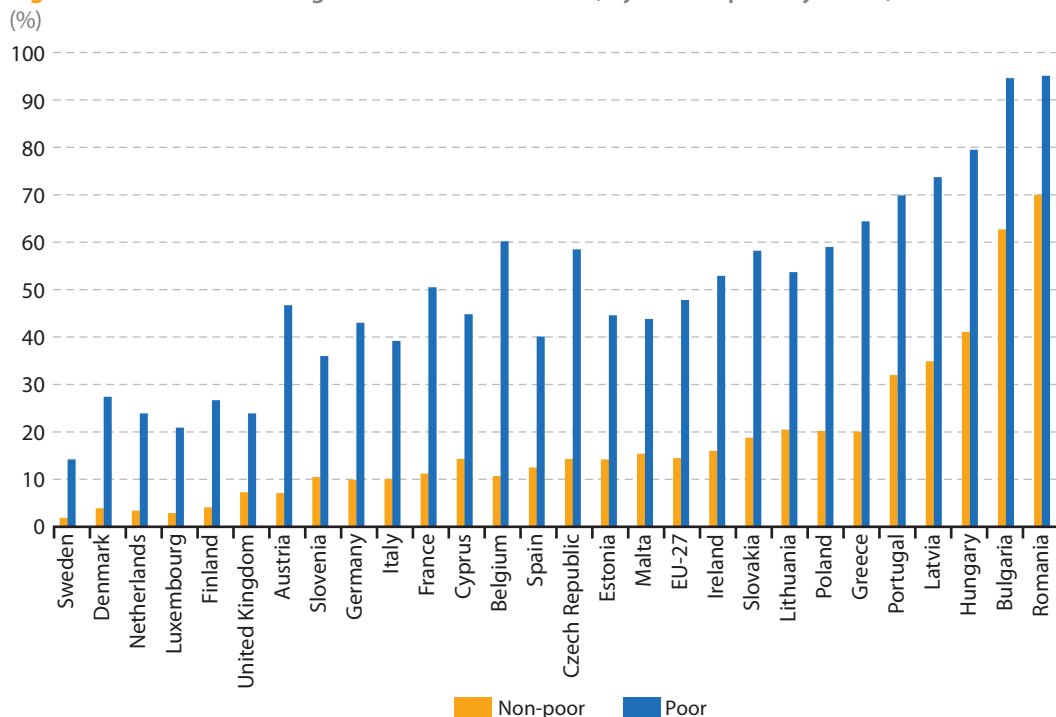
Source: Authors' computation, UDB August 2011.

Figure 11.2 provides the distribution of national MD rates calculated on the basis of the indicator with a threshold set at three deprivations as well as the distribution of national income poverty rate (EU definition; see Chapter 3 in this book). The proportion of deprived children varies hugely across EU countries, from 3-7 % in Sweden, Denmark, the Netherlands, Luxembourg and Finland to more than 70 % in Bulgaria and Romania. The range for national income poverty rates is much smaller — from 11 % (Denmark, Finland and Slovenia) to 33 % (Romania) <sup>(113)</sup>.

<sup>(113)</sup> It is important to highlight that in most Member States the income poverty rate for children (aged 1-15) is higher than the income poverty rate for the total population. In 2009, it is in fact lower only in four EU-27 countries (Denmark, Germany, Cyprus and Finland). It is equal or almost equal (i.e. the difference between both rates is less than one percentage point) in three countries (Latvia, Slovenia and Sweden). In all other countries, it is higher and often much higher.

National MD rates hide large variations by socio-economic groups within countries. Figures 11.3 to 11.5 present the breakdown of the child MD rate according to a set of risk factors, such as living in an income-poor household, living in a (quasi-)jobless household (EU definition; see Chapter 16 in this book) compared with a very high work intensity household, and living in lone parent families or in large households (compared with the total population of children).

Figure 11.3 shows that living in income poverty increases the risk of child deprivation, in all countries. The degree of overlap is far from perfect, as already highlighted in many studies (see, among others, Fusco et al., 2010). In countries where MD is widespread (see the right-hand side of Figure 11.3), the difference in deprivation is smaller between (income) poor and non-poor children. This is partly due to the use of

**Figure 11.3: Children lacking at least 3 out of 18 items, by income poverty status, 2009**

NB: Countries are ranked according to the MD level of *all* children.

Reading note: At the EU level, 48 % of income-poor children aged between 1 and 15 years also suffer from deprivation.

Source: Authors' computation, UDB August 2011.

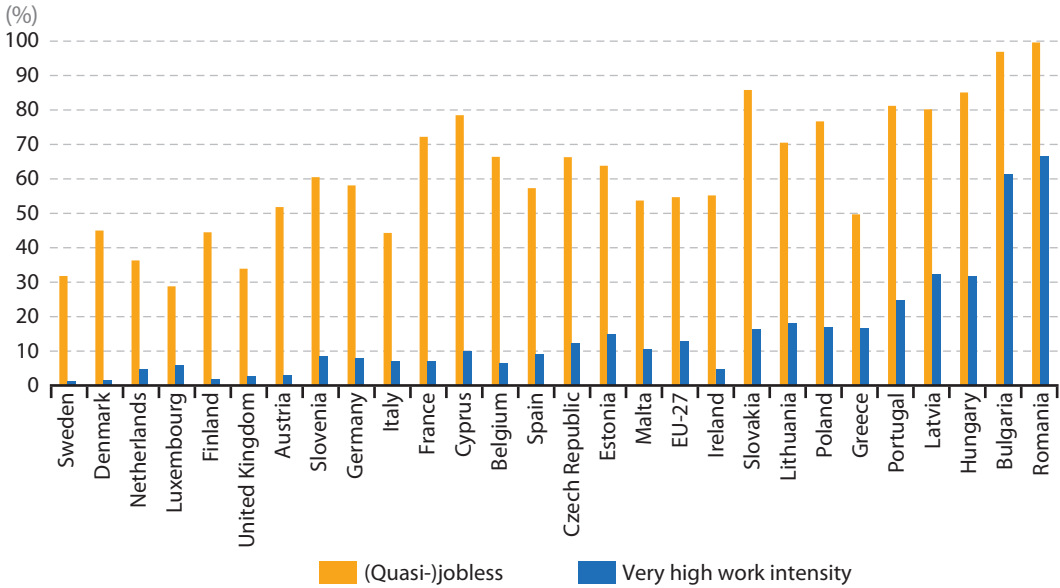
both a relative measure of income poverty (the income poverty threshold defined on the basis on the national median income) and a more 'absolute' concept of deprivation which captures differences in living standard both between and within countries. At the other extreme, even the best performing countries (with the exception of Sweden) do not manage to protect income-poor children from MD: in Denmark, the Netherlands, Luxembourg, Finland and the UK between 21 and 27 % of income-poor children are materially deprived. The situation is even more serious in Austria, France and Belgium, where this proportion varies between 47 % and 60 % whereas the total child MD rate is lower than the EU average (much lower in the case of Austria; see Figure 11.2).

Figure 11.4 compares the child MD rate between QJ households and very high work intensity households and illustrates the impact of par-

ents' employment on child deprivation. The child MD rate of QJ households is high, even in countries where the total child MD is low. Looking at the composition of child deprivation, additional analysis shows that the proportion of deprived children who live in a QJ household is more than 40 % in Belgium, Ireland and the UK. These are the countries where the share of QJ households is the highest in the EU.

The impact of family composition on the level of MD is also considerable. As shown by Figure 11.5, living in a lone parent household is a very important risk factor. This is especially true in Denmark, Germany, Luxembourg, the Netherlands and Sweden, where children living in a single parent family have an MD risk that is at least three times higher than that of the total population, although the total child MD rate is much lower than the EU average.

**Figure 11.4:** Children lacking at least 3 out of 18 items, by work intensity status, 2009

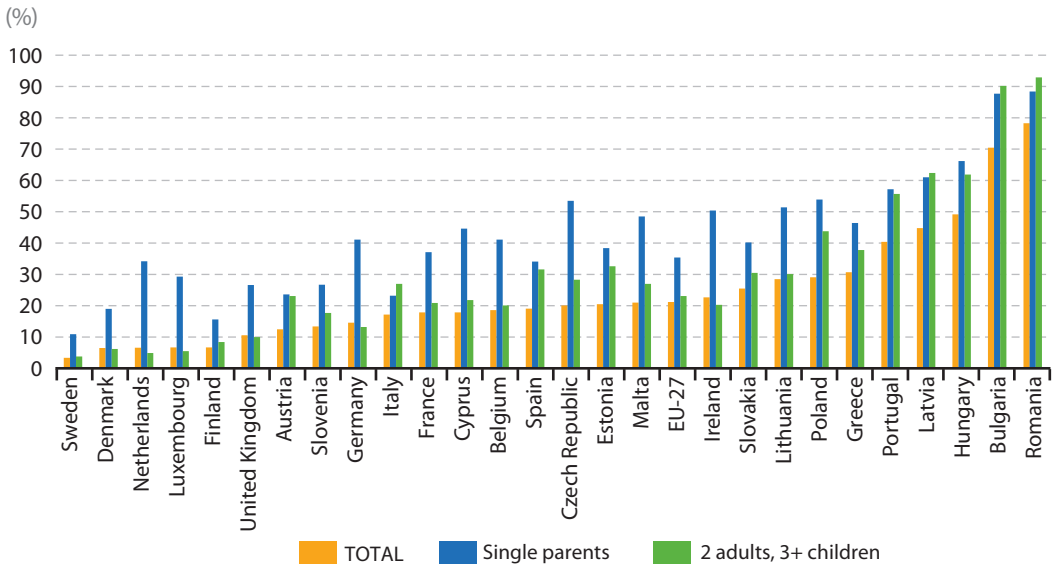


NB: Children in QJ households are those living in households where, on average, adult members aged 18-59 have worked less than 20% of their total work potential during the income reference period (see Chapter 16 in this book). Children in very high household work intensity are those living in households with a work intensity higher than 0.85. Countries are ranked according to the MD level of *all* children.

Reading note: At EU level, 55% of children aged between 1 and 15 years living in QJ households also suffer from deprivation.

Source: Authors' computation, UDB August 2011.

**Figure 11.5:** Children lacking at least 3 out of 18 items, total, single parents and large families, 2009



NB: Countries are ranked according to the MD level of *all* children.

Reading note: At EU level, 35% of children aged between 1 and 15 years living in a single parent family suffer from deprivation.

Source: Authors' computation, UDB August 2011.

**Table 11.3:** Comparison of the composition of the proposed child-specific MD indicator and the proposed MD indicator for the whole population, 2009

Child-specific indicator (CH-MD)	Whole population indicator (MD)
<b>The household cannot afford for at least one child</b>	
Some new clothes	
Two pairs of properly fitting shoes	
Fresh fruits and vegetables daily	
Meat, chicken, fish or vegetarian equivalent daily	
Suitable books	
Outdoor leisure equipment	
Indoor games	
Place to do homework	
Leisure activities	
Celebrations	
To invite friends	
School trips	
Holiday	
<b>The household cannot afford</b>	
To keep home adequately warm	To keep home adequately warm
To replace worn-out furniture	To replace worn-out furniture
A car/van	A car/van
To avoid arrears	To avoid arrears
A computer and Internet	A computer and Internet
	A meal with meat, fish, vegetarian equivalent every second day
	1 week annual holiday
	To face unexpected expenses
<b>At least half of the adults living in the household cannot afford</b>	
	Some new clothes
	Two pairs of properly fitting shoes
	Some money for oneself
	Drink/meal monthly
	Leisure activities

*NB:* For the alternative scale proposed to be used for the whole population, see Chapter 10 in this book.

*Source:* Guio, Gordon and Marlier (2012).

An important question is whether our proposed child-specific deprivation scale (CH-MD) identifies children that have the same characteristics as those identified by the scale proposed to be used for the whole population (MD) (see Chapter 10 in this book). Table 11.3 compares the items included in the two indicators.

At EU level, when the threshold is set at 3+ items for the child MD indicator (CH-MD 3+) and at 5+ items

for the whole population MD indicator (MD 5+), the proportion of children deprived is effectively identical: 21 % in both cases. Table 11.4 illustrates the degree of overlap between the two populations identified by these indicators. The proportion of children deprived according to both indicators is 16 %. A substantial proportion of children are identified as deprived by only one measure.

**Table 11.4:** Overlap between the proposed child-specific MD indicator (CH-MD 3+) and the proposed whole population MD indicator (MD 5+), EU-27, child population, 2009 (%)

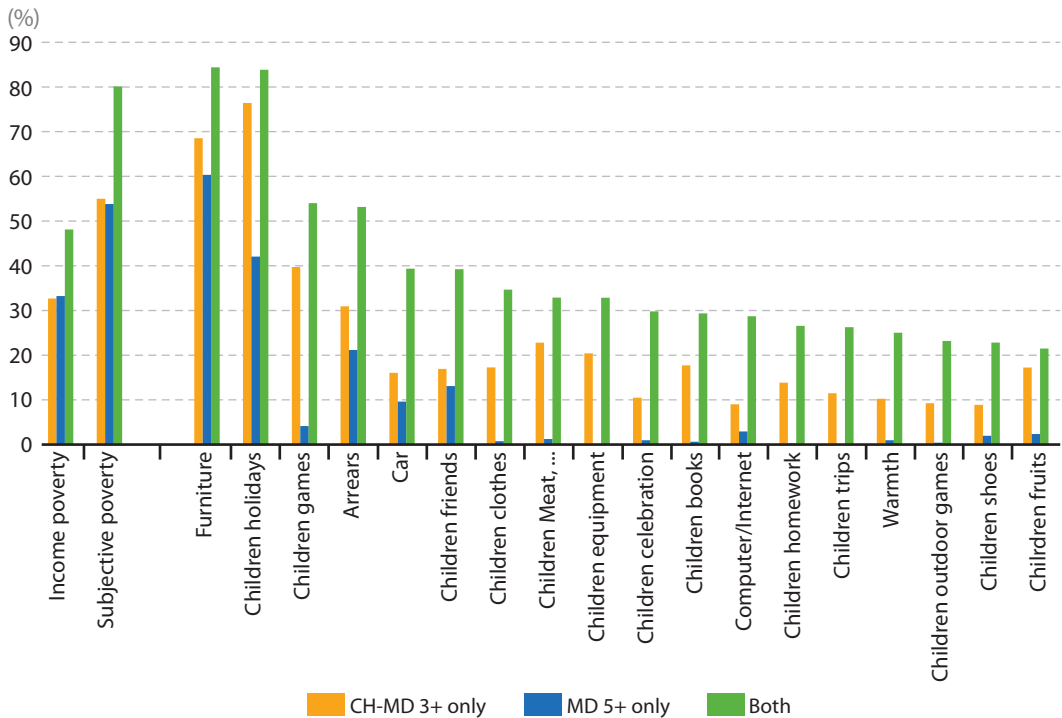
Both CH-MD 3+ and MD 5+ (1)	None (2)	CH-MD 3+ 'only' (3)	MD 5+ 'only' (4)
16	74	5	5

NB: CH-MD: child-specific scale (see Table 11.3 first column); MD: scale defined for the whole population (see Table 11.3 second column).

Reading note: 16 % of the children aged between 1 and 15 years suffer from both forms of deprivation (i.e. according to the child MD indicator (CH-MD 3+) and the whole population MD indicator (MD 5+)).

Source: Authors' computation, UDB August 2011.

**Figure 11.6:** Living conditions of children suffering from CH-MD 3+ 'only', MD 5+ 'only' or both CH-MD 3+ and MD 5+, EU-27, child population, 2009 (%)



NB: CH-MD: child-specific scale (see Table 11.3 first column); MD: scale defined for the whole population (see Table 11.3 second column). The 'MD 5+ only' category encompasses the children suffering from deprivation according to the whole population MD indicators (lack at least 5 items) but not from CH-MD 3+. The 'CH-MD 3+ only' category includes those who suffer from CH-MD 3+ but not from MD 5+. The 'Both' category encompasses those who suffer from both MD. Results related to children holidays need to be interpreted with caution given the large amount of missing data and the fact that this item was not collected for children in nine countries (Belgium, Czech Republic, Denmark, Ireland, Spain, Lithuania, Hungary, Netherlands, Sweden); in these countries, we have used the 'holiday item' collected at the household level.

Reading note: Among the children (aged between 1 and 15 years) identified by both indicators, 80 % live in a household who declares having (great) difficulties in making ends meet. This proportion is around 55 % for those suffering from 'only' one form of deprivation.

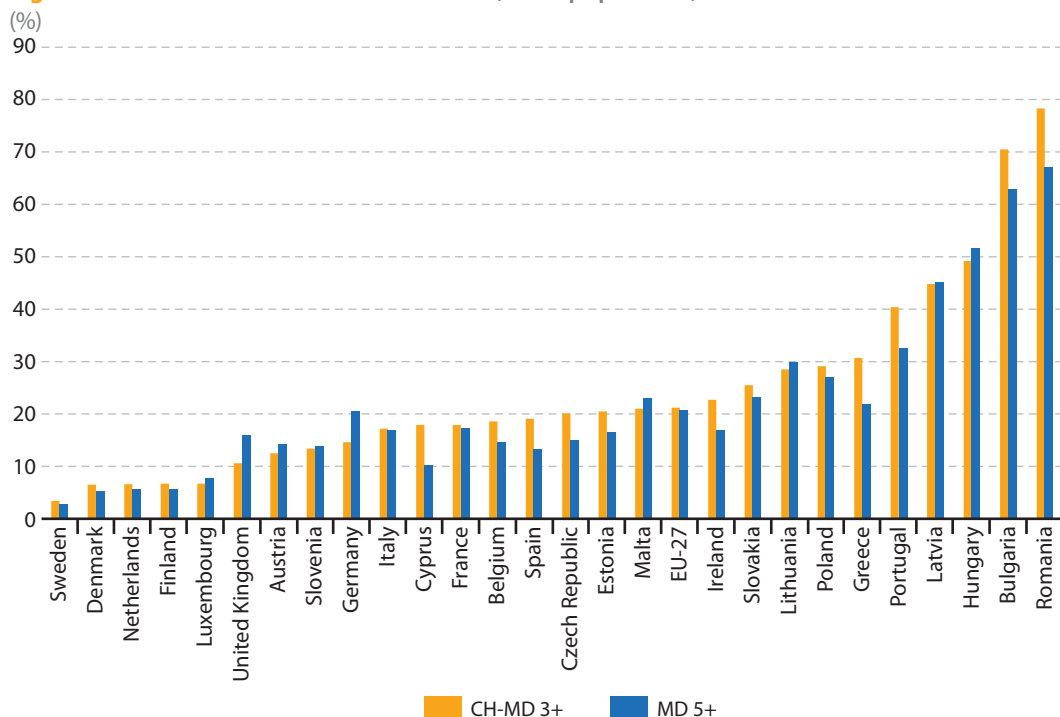
Source: Authors' computation, UDB August 2011.

In order to highlight the differences between the children identified as deprived by the two different scales, Figure 11.6 compares the living conditions of those lacking 3+ items from our proposed child-specific MD indicator and 5+ items from the proposed whole population scale discussed in Chapter 10 in this book (applied to the population aged between 1 and 15 years). Contrarily to the children identified by the two indicators, the two groups of deprived children suffering from 'only' one form of deprivation have very similar levels of income poverty and subjective poverty but differ a lot on almost all the other aspects of living conditions considered in the figure. The children identified by the child-specific MD indicator who were not identified by the whole population MD indicator are more likely to lack the children

items than those identified 'only' by the whole population indicator. Despite the deprivations they suffer from, these children were not captured through the whole population deprivation index.

The impact of using the child-specific indicator (CH-MD 3+) rather than the whole population indicator (MD 5+) varies a lot between countries (see Figure 11.7). In Belgium, Bulgaria, the Czech Republic, Estonia, Ireland, Greece, Spain, Cyprus, Portugal and Romania the situation of children is far more problematic once their specific situation is taken into account (the differences between the two rates vary between +4 and +11 percentage points). The reverse is true in the UK and Germany, with differences between 5 and 6 percentage points.

**Figure 11.7: CH-MD 3+ and MD 5+ indicators, child population, 2009**



NB: CH-MD: child-specific scale (see Table 11.3 first column); MD: scale defined for the whole population (see Table 11.3 second column, lack at least 5 items). Countries are ranked according to the deprivation level of *all* children.

Reading note: In Greece, 31 % of children aged between 1 and 15 years are considered as deprived according to the child-specific MD indicator as opposed to 22 % according to the whole population MD indicator.

Source: Authors' computation, UDB August 2011.



## 11.6 Conclusions

As a result of our various tests, the 18 items retained for our proposed child-specific material deprivation indicator can be said to be suitable, valid, reliable and additive measures of MD in all EU countries. The very high level of reliability of the final list needs to be highlighted.

In view of the careful and systematic analytical framework used to identify these items, we are confident that these items (and the related aggregate indicator) are robust and statistically validated and that they capture the essence of the problem — a requirement for EU social indicators used for monitoring purposes at EU and national levels in the context of EU cooperation in the field of social protection and social inclusion.

Our analysis shows that a non-negligible proportion of children identified as deprived according to our proposed child-specific indicator are not captured by the whole population deprivation indexes, which highlights the importance of complementing the EU portfolio of social indicators with indicators focusing on the specific living conditions of children.

This analysis could only be performed at one point in time (2009). The items needed for calculating the proposed child-specific indicator were collected again in the 2014 Wave of EU-SILC. These new data are currently being analysed, which will allow for change over time analysis and additional tests of the robustness of the indicator proposed by Guio, Gordon and Marlier (2012).

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# 12

## Multidimensional poverty in Europe 2006-2012: illustrating a methodology

Sabina Alkire and Mauricio Apablaza <sup>(114)</sup>

### 12.1 Introduction

Methodologies of multidimensional poverty measurement that draw on the ‘counting’ approach have been used in policy applications since the 1970s, and are gaining greater momentum (Townsend, 1979; Erikson, 1993; Atkinson, 2003; Nolan and Whelan, 2011; and Alkire et al., 2015, Chapter 4 for reviews). To date many studies have focused on understanding the structure among deprivations, and on identifying the normative, policy, and statistical tools that can best justify the collection of data on distinct indicators (Atkinson et al., 2002; Marlier et al., 2007; Atkinson and Marlier, 2010a and the references therein). Others have used statistical methods to address a different but related issue: why indicators might be aggregated into a single indicator covering one relevant dimension such as material deprivation (OECD, 2008 and Guio et al., 2012). But how do we measure and analyse the interrelationships among explicitly diverse dimensions, each of which contributes to poverty? Drawing upon previous studies, this chapter presents a set of experimental indices of multidimensional poverty which use an adjusted headcount ratio  $M_0$  that builds on

a counting-based dual-cut-off methodology (Alkire and Foster, 2011, 2011a). We show how these measures can be used to provide diverse and specific descriptive analyses, and why they may complement existing measurement approaches.

The methodology is flexible in that different indicators, cut-offs and weights can be used, including binary, ordinal and ordered categorical variables as well as those that are cardinal or ratio-scale. Unlike the headcount ratio which has been traditionally used with counting-based measures in both Europe and Latin America, the Alkire-Foster (AF) family of measures incorporate the joint distribution of deprivation and include a new feature of intensity — which shows the percentage of weighted indicators in which the average poor person is deprived. Incorporating intensity into the measure itself enables the multidimensional poverty measure to be broken down by indicator (after identification), to show the levels and composition of deprivations poor people experience. This is not possible with counting-based headcount ratios but is important for designing policies to reduce multidimensional poverty. Measured poverty also changes if intensity changes, which creates policy incentives to address those that are not near-poor only. Where data permit, the measure and each of its consistent indicators can be further broken down by subgroups such as gender, age, social groups or regions. The global Multidimensional Poverty Index (MPI) which is released by UNDP’s Human Development Reports and covers 110 countries in 2015 is based on this methodology (Alkire and Santos, 2010, 2014; UNDP, 2010), as are official national MPIs, such as those of Colombia, Chile, Mexico, the Philippines, Bhutan, Pakistan and Armenia.

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Among OECD countries, there have been academic efforts and in some cases political interest to estimate a multidimensional poverty index. Mexico and Chile have official multidimensional poverty indices using the AF method. One of the first applications of the AF method in Europe was implemented using the 2009 EU-SILC dataset by Whelan, Nolan and Maître (2014). This chapter extends Whelan et al.'s work by constructing AF poverty measures across time periods 2006-2012, using, necessarily, a more limited set of indicators. In doing so, we demonstrate the analysis of the multidimensional poverty indicator in one period and across time, and report its associated partial indices: headcount ratio, intensity, and indicator-specific indices. This chapter thus illustrates the kinds of analyses that could be done using this methodology. It does of course require that a set of dimensions and indicators be agreed upon by a legitimate process, and that fully consistent and comparable variable definitions and data sources be used.

The chapter proceeds as follows. Section 12.2 briefly situates this topic in the literature and Section 12.3 introduces the AF methodology. Section 12.4 introduces the data then presents an experimental index of multidimensional poverty, using cross-sectional EU-SILC data and the individual as unit of analysis to construct and describe a set of deprivations. Section 12.5 presents the AF results, first showing a series of poverty cut-offs across time to illustrate the likely robustness of analyses. On the basis of a particular cut-off, it then presents the overall results across all countries having data in all periods as well as component partial indices: the headcount ratio or percentage of the population identified as multi-dimensionally poor ( $H$ ), and the intensity, or average percentage of weighted deprivations experienced by poor people ( $A$ ), and censored headcount ratios for each component indicator<sup>(115)</sup>. Section 12.6 concludes.

## 12.2 Brief literature review

Multidimensional approaches to poverty and deprivation have a long and distinguished history in conceptual and philosophical work (Sen, 1992). The

late 1960s and early 1970s saw the entrance of policy applications, with the 1968 Swedish Level of Living Study (Allardt and Uusitalo, 1972 and Johannsson, 1973); Jacques Delors' 1971 *Les indicateurs sociaux* and P.Ch. Ludz's *Materialien zum Bericht zur Lage der Nation* (1971), each providing independent impetus in different countries and across Europe for this effort.

In more recent literature, significant attention has been paid to the relationship among deprivations, and to methodologies to validate indicators used in multidimensional indices (Nolan and Whelan, 1996, 2010, 2011; Layte et al., 2001; Atkinson et al., 2002; Gordon et al., 2003; Saunders and Adelman, 2006; Whelan, 2007; Marlier et al., 2007; OECD, 2008 and Alkire et al., 2015). Drawing on the 2004 EU-SILC data, Guio (2005) proposed a multidimensional indicator of material deprivation (MD), which reflected deprivations such as poor housing, lack of durable assets, and economic strain. Based on Guio et al. (2009), MD indicators were adopted in the EU portfolio of social indicators in 2009. Two indicators were adopted: the first indicator provided the proportion of people lacking at least three items out of nine items covering different aspects of economic strain and lack of durables (housing deprivation was included in the EU portfolio as a separate indicator). The second indicator reflected the intensity of deprivation (i.e. the average number of items lacked by deprived people). At the EU level, MD indicators gained in importance in 2010 when EU leaders launched the Europe 2020 strategy and set in this context an EU social inclusion target: to lift at least 20 million people out of the risk of poverty or social exclusion in the EU by 2020 (see Chapter 1 in this book). The Europe 2020 indicator of 'at risk of poverty or social exclusion' on which the target is based includes a 'severe' MD indicator which is built using a threshold set at four rather than three items. These MD indicators at EU level were based on the limited information available in the core EU-SILC. To enlarge the available information, a thematic module on MD was collected in 2009. Using this module, Guio et al. (2012) propose a revised version of the official EU MD indicators, with a view to enlarge the set of items and their reliability (see Chapter 10 in this book). The revised set includes 13 deprivation items, i.e. six items included in the current EU MD indicator and seven items covering new aspects. A set of parallel papers explored the 2009 themat-

<sup>(115)</sup> Censored headcount ratios show the percentage of people who are identified as poor and are deprived in each particular indicator.

ic module with respect to child deprivation (Bradshaw, 2009; Gábos et al., 2011, Guio et al., 2012, and Adamson, 2012; see also Chapter 11 in this book).

Whelan (2007) used the Irish component of the 2004 EU-SILC dataset to develop an 11-item 'consistent poverty' index (combining MD and income poverty); and Whelan and Maître (2009) use a range of statistical methods such as correlation and factor analysis; goodness of fit tests like root mean square error of approximation; and reliability tests like Cronbach's Alpha, to identify three dimensions of MD (consumption, household facilities, and neighbourhood environment) and examine their relationship to income poverty. Coromaldi and Zoli (2012) clarify the added value of nonlinear principal component analysis, NLPKA, to these techniques. Naturally, this deep analysis of the structure of deprivations resulted in a set of empirical and policy studies on the relationship between income and other deprivations (Verbist and Lefebure, 2008; Whelan and Maître, 2009; Jana et al., 2012) and also gave rise to applied AF multidimensional measures (Whelan et al., 2014).

The EU-SILC dataset has also been used to illustrate other multidimensional poverty measurement methodologies (Chakravarty and D'Ambrosio, 2006; Bossert et al., 2013, among others). Brandolini (2007) explored Atkinson's (2003) counting approach using data for France, Germany and Italy and a head-count ratio associated with the minimum proportion of deprivations a person has, and compared the various deprivation measures with income poverty measures. He drew attention to the sensitivity of cross-national comparisons to weights, and to the deprivation cut-off. This chapter adds to this already substantial recent literature by illustrating the rich variety of analyses that can be accomplished using one particular methodology able to capture the multiple dimensions of poverty.

## 12.3 The Alkire Foster (AF) methodology

This section briefly introduces the  $M_\infty$  class of measures  $M_0$  developed by Alkire and Foster (AF) that build on the Foster Greer Thorbecke (FGT) index (Alkire and Foster, 2011). There are a total of  $n$  per-

sons (rows) and the well-being of each is measured in a total of  $d$  dimensions (columns). When referring to a particular person we call them  $i$ , and a particular dimension  $j$ . The whole dataset is collected in a matrix where each cell represents the achievement level of individual  $i$  (from 1 to  $n$ ) in dimension  $j$  (from 1 to  $d$ ). So looking across a row of the matrix gives the full picture of achievements for one person, and looking down a column gives the full picture for a given dimension.

To focus on deprivations, at the top of each column of the matrix, we set a cut-off  $z_j$  for that dimension of deprivation. For each dimension, an individual  $i$  is deprived in dimension  $j$  if her achievement level is lower than the dimension cut-off ( $z_j$ ). A deprivation matrix ( $g^0$ ) compiles this information, assigning a 1 if individual is deprived in dimension and a 0 if the individual is not deprived. So looking across a row of the matrix gives the full deprivation profile for one person, and looking down a column gives the deprivations for a given dimension. For each person we now look at the row and add up the positive entries weighting each dimension by its value ( $w_j$ ) where values sum to 1. The weighted sum ( $c_i$ ) shows the deprivation score, or percentage of weighted deprivations suffered by person  $i$ .

Next, we identify who is multi-dimensionally poor. A person is identified as poor if their weighted deprivation score  $c_i$  is higher than the poverty cut-off  $k$ . For example, if a person is deprived in 40 % of the dimensions (that is their weighted deprivation score is 40 %) and the poverty cut-off is 20 %, that person is identified as poor because 40 % > 20 %. This has been called an intermediate or dual cut-off identification method, because it uses the deprivation cut-offs  $z_j$  to determine whether a person is deprived or not in each dimension, and the poverty cut-off  $k$  to determine who is to be considered multidimensionally poor <sup>(16)</sup>.

Having identified the poor, we construct a *censored* deprivation matrix  $g^0(k)$  that contains solely the weighted deprivations of those persons who have been identified as poor, and replaces depri-

<sup>(16)</sup> This identification strategy can also be represented, following Bourguignon and Chakravarty (2003), by an *identification function*  $p: R_+^d \times R_+^d \rightarrow \{0,1\}$ , which maps from person  $i$ 's achievement vector  $y_i \in R_+^d$  and cut-off vector  $z$  in  $R_+^d$  to an indicator variable in such a way that  $p(y_i; z) = 1$  if person  $i$  is poor and  $p(y_i; z) = 0$  if person  $i$  is not poor.

vations of non-poor people with zeros. The censored deprivation matrix is the basis of the AF multidimensional poverty measure and its associated dimensional partial indices. For example, the censored headcount ratios are simply the mean of its columns. The measure  $M_0$  is the mean of the matrix times  $d$ , or equivalently, the mean of the censored vector of deprivation scores ( $c_i(k)$ ).  $M_0$  — which in other studies is called MPI to signify it is a multidimensional poverty index — can also be expressed as the product of the (multidimensional) headcount ratio ( $H$ ) and the average deprivation share among the poor ( $A$ ).  $H$  is simply the proportion of people that are poor, or  $q/n$  where  $q$  is the number of poor people.  $A$  is the average share of weighted deprivations poor people experience ( $A = \sum_{i=1}^n c_i(k)/q$ ) and reflects the intensity of multidimensional poverty<sup>(117)</sup>.

For tracking changes across time, the number, level and significance of changes in multidimensional poverty measures and their associated partial indices can be directly compared, and absolute and relative rates of change can be analysed. Alkire et al. (2015, Chapter 9) provides a systematic presentation of different methodologies for assessing poverty dynamics (see also Apablaza and Yalonetzky, 2013).

## 12.4 Data and measurement design

This chapter uses EU-SILC data to generate and compare a multidimensional poverty measure made from 12 indicators across time and space. It is important to note that this illustrative measure is limited by variable definition (comparable variables must be present across time periods and must be accurate at the unit level rather than only on average) as well as by data availability (missing values in any variable must be low).

The indicators of these measures are data constrained. EU-SILC indicators tend to be defined in the

space of resources, in the case of at-risk-of-poverty indicator ('AROP'; relative income (see Chapters 1 and 3 in this book for definitions)), severe material deprivation or housing — or common proxies for functionings, such as levels of schooling and employment status. Particular challenges are evident in the educational indicator, because the years of schooling that correspond to primary education vary across EU-SILC countries as may educational quality. Some indicators draw upon self-assessments — for example, evaluations of noise and safety and health — which may not reflect the objective risk of violence or noise vibrations in a neighbourhood or objective health status. If a measure is intended to reflect deprivations in the functionings or capabilities that poor people experience (Sen, 1992), then it would be necessary to examine in what way each indicator could be interpreted to proxy functionings and the anticipated accuracy of such proxies for diverse individuals. Rather than doing so, in this case we draw upon the rich existing literature justifying the EU-SILC indicators (Atkinson and Marlier, 2010).

Where aggregate figures are reported, these include information only from countries with data available across all years. The aggregate figures include (population-weighted) data of Austria, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom. On grounds of incomplete information across years<sup>(118)</sup>, we excluded from the aggregate results information of Belgium (2012), Bulgaria (2006), Croatia (2006-2010), Ireland (2012), Malta (2006-2007), Romania (2006) and Switzerland (2006-2007). Additionally, due to irregularities in the education variable PE040 (Highest ISCED level attained), Finland (2007) was also excluded. Finland shows that all individuals have primary education across all years except in 2007. In 2007, 18 % of the population did not have primary education. For national results, we include all countries<sup>(119)</sup>.

<sup>(117)</sup>  $M_0$  satisfies a number of useful axioms, specifically: replication invariance, symmetry, poverty focus, deprivation focus, weak monotonicity, non-triviality, normalisation, dimensional monotonicity, subgroup decomposability, dimensional breakdown, ordinality and weak re-arrangement (Alkire and Foster, 2011, 2013).

<sup>(118)</sup> In cases of incomplete information, missing years by country are presented next to each country in parenthesis.

<sup>(119)</sup> We also observed uncommon changes in housing in Hungary (2008) and Bulgaria (2007-2008) and unmet Medical Needs in Portugal (2007) but numbers were contrasted and corroborated with official statistics.

In this analysis, we have adopted a rigorous approach to the treatment of missing values. At the country level, we excluded countries with unavailable or inconsistent data across periods from aggregate results. At the individual level, we drop respondents having a missing value in any indicator. For a subset of register countries (Denmark, Finland, Iceland, Netherlands, Norway, Slovenia and Sweden), which only collect individual information for one adult in the household (i.e. 'the selected respondent'), the measure is constructed only from respondents with information in all indicators and using the specific sampling weight for this subgroup of selected respondents (PB060). EU-SILC data for the retained sample are then adjusted for missing observations using sampling weights. By reweighting the retained sample, we maintain the original population of each country. Regarding the analysis of standard errors, we followed Goedemé (2010, 2013).

### 12.4.1 Unit of analysis

Different units of analysis are possible using the EU-SILC dataset: individual adults, adults, or children by household, and households. Here we use the individual as a unit of analysis, i.e. persons aged 16 years or more, for which the individual questionnaire was collected. That is, the individual's achievements in health and education are used to identify their own deprivations. Household level variables are used to identify individuals as deprived or non-deprived in terms of at risk of income poverty, severe MD, (quasi-)joblessness, housing, noise, crime and pollution. This way of proceeding is useful because the resulting measures can be disaggregated by gender and age. However normatively using the individual adult as a unit of identification overlooks (and does not foster) intra-household sharing and caring in the individually measured dimensions. For example having a chronic disability in a household which can effectively care for such a person is very different than having the same health condition and living alone. Some policy aims support a household focus, but we have chosen an individual focus for several reasons. In the EU-SILC dataset, a household approach generates a larger sample drop because of missing variables, particularly in register countries. Furthermore, household structures vary across Europe (Iacovou

and Skew, 2010). Also, the appropriate 'cut-off' for household level indicators built with individual education and health data would require separate analysis <sup>(120)</sup>. Finally, in the EU-context, social rights tend to be individually based. For that reason, in this experimental measure the individual is taken as a unit of identification, with the consequence of not including child poverty.

It would be possible to use the household as a unit of analysis with EU-SILC data in non-register countries. In this case, all household members would be deprived in education and health indicators, depending upon the joint deprivations of those household members (which might include children) for whom data were available. This method — which was used for example in the global MPI (Alkire and Santos, 2014) — can reflect intra-household sharing and child deprivations. In this case, the results still can be aggregated using individual sampling weights such that the unit of analysis (individual) reflects the proportion of people who are poor.

### 12.4.2 Dimensions, indicators and weights

The dimensions and indicators of deprivation in this chapter draw upon three earlier papers in which we implemented more than seven experimental measures, each having three to six dimensions and a variety of differently defined indicators (Alkire, Apablaza and Jung, 2012, 2014, 2014a). The experimental index presented in this chapter has six equally weighted dimensions, and each indicator within a dimension is likewise equally weighted. Dimensions of health and education and some form of economic welfare are present in most descriptions of multidimensional poverty (Alkire, 2002). Drawing on the arguments provided in Whelan et al. (2014) and Guio and Maquet (2006), our measure adds to these a dimension of the living environment, which includes housing and neighbourhood considerations: noise, pollution and safety. In this measure, each indicator related to the Europe 2020 social inclusion target becomes its own separate

<sup>(120)</sup> The aggregation of intra-household data and the setting of deprivation cut-offs require normative, policy, and empirical exploration to justify. Assumptions of intra-household sharing must be considered (Alkire and Santos, 2014).

dimension and education, health, and the living environment each enter as separate dimensions making a total of six dimensions, with 50 % of the weight on Europe 2020-related indicators.

Terminologically, dimensions are organising concepts that in this case govern the weights attached to indicators. They may also be used to communicate the results in public. Once again, the discussion of the appropriate dimensions to organise the measurement of deprivation has a long history, which can inform present discussions. Because the index is experimental we do not provide an extensive normative justification of the dimensions drawing on people's own values, the theoretical literature, the policy purpose of the measure, and other considerations. Such an extensive justification is provided in the case of official multidimensional poverty measures. Alkire, Apablaza and Jung (2012) provide a set of dimensions and in some cases indicators that have been used in the European context (see also Atkinson et al., 2002).

Table 12.1 describes each component indicator of the experimental measure, its deprivation cut-off and evolution over time. Several notes may be in order. First, other studies have not necessarily included education, perhaps due to country differences in the definition of levels of education. These measures retain education because of its importance, and consider a person to be deprived if they have not completed primary school. But the indicator is not necessarily comparable, because the same levels of education may correspond to differing number of years in different countries. As for the Europe 2020 severe MD indicator, because of data limitations we are not able to implement the 2009 severe MD index with improved indicators proposed in (Guio et al. 2012). In our indicator, people severely deprived are those living in a household that experiences at least four out of the nine following deprivation items — the household cannot afford (i) to pay rent or utility bills, (ii) to keep home adequately warm, (iii) to face unexpected expenses, (iv) to eat meat, fish or a vegetarian equivalent every second day, (v) to have a week holiday away from home during the year, (vi) to have access to a car/van for personal use, (vii) to have a washing machine, (viii) to have a colour TV, or (ix) to have a telephone. For income poverty and MD our indicators are constructed following the Eu-

rope 2020 multidimensional poverty measure component indicators. The at-risk-of-poverty indicator follows the Europe 2020 standards, and considers a person at risk of poverty (AROP) if their household income is less than 60 % of the national median equivalised disposable income. The lack of detailed information regarding part-time jobs before 2009 renders impossible the precise replication of the Europe 2020 (quasi-)joblessness indicator, but does provide comparability across years for a similar indicator. In our (quasi-)joblessness indicator, we extend the (quasi-)joblessness condition to all members of the household. Households that exclusively contain persons out of the reference group are considered non-deprived. In other words, we identify all individuals in jobless households as deprived; and identify households with only elderly people, or only students as non-deprived.

### 12.4.3 Uncensored headcount ratios of deprivations in each indicator

The deprivation rates in all indicators in the years 2006 and 2012 are reported in Table 12.1. The table includes all deprivations of all individuals for whom no data on any indicator is missing, and covers EU countries with consistent data between 2006 and 2012. There are several points to note. First, the AROP percentages roughly match those published in other sources (e.g. Eurostat website and Nolan et al., 2010).

Second, in the aggregate data, of the three indicators used in the Europe 2020 poverty and social exclusion measure, deprivations in income tend to be the highest although this varies by country. The indicators that tend to have the highest incidence overall are perceptual data of chronic health status, and the self-reported incidence of noise. However incidence varies considerably across countries. The challenges inherent in interpreting the subjective indicator levels and trends are that these may be affected by biases from personality, and adaptive preferences or knowledge asymmetries and such biases may evolve over time. The fact that these indicators carry a lighter weight may ease interpretation of the trends somewhat.



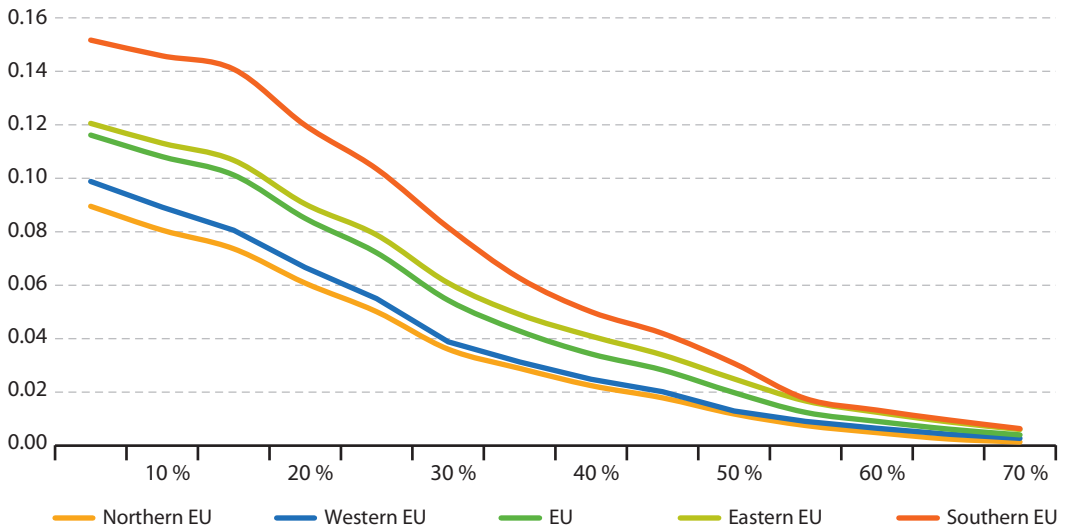
**Table 12.1: Dimensions, Indicators, Weights and Uncensored Headcount per dimension between 2006 and 2012**  
(percentage of individuals in EU countries with consistent data in all years as discussed in Section 12.4)

Dimension	Variable	Respondent is not deprived if:	2006	2007	2008	2009	2010	2011	2012
<b>Income</b>	AROP (1/6)	He/she lives in a hhd whose equivalised disposable income is above 60 % of the national median	15.1	15.3	14.9	14.9	15.1	15.5	15.5
<b>Employment</b>	(Quasi-)joblessness (1/6)	He/she lives in a hhd where the ratio of the total number of months that all hhd members aged 16-59 have worked during the income reference year and the total number of months the same hhd members theoretically could have worked in the same period is higher than 0.2	10.1	9.5	9.0	9.3	9.6	9.5	9.5
<b>Material Deprivation</b>	Severe MD (1/6)	He/she has at least six of the following achievements: ability to avoid arrears; to afford 1 week annual holiday; a meal with meat, chicken, fish or vegetarian equivalent; to face unexpected expenses; to keep home adequately warm; have access to a car/van for personal use; owns a colour TV; a washing machine; a telephone.	7.7	6.9	6.6	6.2	6.4	7.0	8.0
<b>Education</b>	Education (1/6)	He/she has completed primary education	15.8	14.4	14.5	13.9	14.0	13.0	12.3
<b>Environment</b>	Noise (1/24)	He/she lives in a hhd that experiences low noise from neighbourhood or from the street	23.0	22.7	21.6	22.0	20.2	19.6	18.6
	Pollution (1/24)	He/she lives in a hhd that experiences low pollution, grime or other environmental problems	17.4	17.1	16.2	16.4	14.7	15.1	13.9
	Crime (1/24)	He/she lives in a hhd that experiences low crime, violence or vandalism in the area	15.5	15.5	14.2	15.2	13.5	13.4	13.2
	Housing (1/24)	He/she lives in a dwelling with no leaking roof, damp walls, rot in window frames or floor	17.9	17.2	16.0	15.1	15.3	14.7	14.4
	Health (1/24)	He/she considers his/her health as fair or above	10.4	10.0	9.3	9.4	9.1	9.3	9.5
	Chronic Illness (1/24)	He/she has no chronic illness or long-term health condition	31.2	30.5	31.4	31.8	31.9	32.2	31.7
<b>Health</b>	Morbidity (1/24)	He/she reports no limitations due to health problems	7.6	7.6	8.0	8.1	7.9	8.0	8.6
	Unmet Medical Needs (1/24)	He/she reports no unmet medical needs	7.7	6.4	6.1	6.7	6.4	6.4	6.2

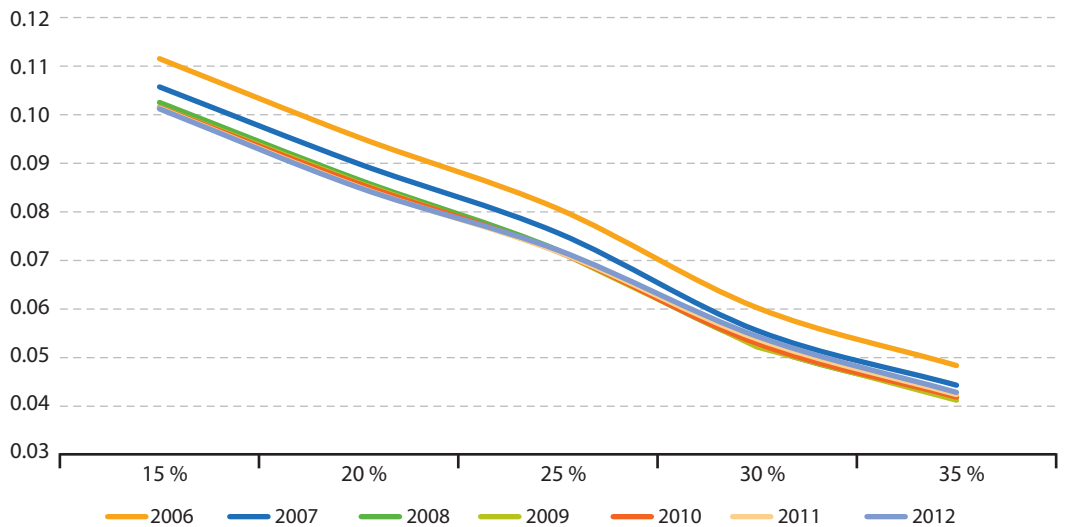
NB: Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland not included. Hhd=household.  
Source: Authors' computation, UDB March 2014.

**Figure 12.1: Multidimensional Poverty by UN regions (2012) and years (2006-2012)**  
(level of multidimensional poverty)

**a) Multidimensional poverty  $M_0$  by regions and poverty cut-offs (2012)**



**b) Multidimensional poverty  $M_0$  by years and poverty cut-offs**



*NB:* Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland are not included.

*Reading note:* Graph a) compares levels of multidimensional poverty across European geographic areas. Graph b) shows the evolution of multidimensional poverty for all possible poverty cut-offs across years for countries with available and consistent data.

*Source:* Authors' computation, UDB March 2014.

In education we merely remind the reader that educational deprivations depend in part upon the definition of primary school, and the duration thereof varies across the included countries.

Several empirical techniques that are useful to understand the interrelationships between indicators have been explored in the longer papers but are not detailed here (Alkire Apablaza and Jung, 2014, 2014a). It may only be worth mentioning headline results from a measure of redundancy represented by the percentage of the population experiencing both deprivations, divided by the lower of the two marginal headcount ratios of deprivation (Alkire et al., 2015). For example: in the case of (quasi-)joblessness and at-risk-of-poverty, only 27 % of the people who are (quasi-)jobless are also at-risk-of-poverty. The highest redundancy value of 55 % is found between morbidity and health — that is, 55 % of those who are deprived in terms of morbidity have low self-reported health, but in 45 % of cases, persons who report deprivations in morbidity do *not* experience low self-reported health, and for this reason, both variables are retained.

## 12.5 Results

Before identifying who is poor and constructing a poverty measure, we first describe some regional trends for multiple poverty cut-offs. Figure 12.1a compares the level of multidimensional poverty in 2012 of four geographic regions according to United Nations' definitions across a range of poverty cut-offs<sup>(121)</sup>. Clearly, Northern and Western Europe are significantly the two least poor regions (respectively) regardless the year and cut-off. Southern Europe is the poorest region up to the 50 % cut-off. At 50 % and more, differences between Eastern and Southern Europe are not significant.

Figure 12.1b analyses the pooled information of EU countries with consistent and available information for multiple poverty cut-offs. We display results for a range of plausible poverty cut-offs 15 % to 35 %. It can be useful to consider trends in two periods:

2006-2009, and 2009-2012. As expected multidimensional poverty was reduced in the pre-crisis period, with significant reductions in 2006 and 2007. The beneficial trend was brought to an end by the crisis. After 2008, dominance is not clear and the reduction of multidimensional poverty is almost insignificant 2009-2012, with significant change only in 2012. For poverty cut-offs above 40 %, there is no clear dominance in any pair of consecutive years. Aggregate results hide significant differences in regional trends (Figure 12.1a). In Eastern Europe poverty reduction is faster during the first years. Southern Europe shows a parsimonious reduction only until 2010 and an insignificant increase in multidimensional poverty from 2010 onwards. Western Europe does not show any significant change in any period except 2010-2012. Northern Europe presents slight ups and downs 2006-2008 and no significant changes subsequently (Alkire, Apablaza and Jung, 2014 present full results).

In what follows we have selected a poverty cut-off of 34 % which require a person to be poor in strictly greater than two dimensions or the equivalent sum of weighted deprivations drawn from several dimensions. This definition coheres with popular understandings of 'multidimensional' poverty<sup>(122)</sup>.

Between 2006 and 2009, the level of multidimensional poverty drops from 0.048 to 0.041 mainly based on reductions in the share of poor individuals and not necessarily in the intensity of poverty. From 2009 onwards, there are no significant changes (2010-2011) or there are significant increments (2011-2012). Across consecutive years, the intensity only shows insignificant changes. As before, results seem to follow two different trends. From 2006 to 2009, there is a reduction in multidimensional poverty based on a lower percentage of poor individuals and the intensity of poverty. From 2009 to 2012, on the other hand, there are significant increments in the level of multidimensional poverty. In particular, the intensity of that poverty is statistically higher in 2012 compared to 2009, showing that each poor person experiences more simultaneous disadvantages. Regarding the percentage contribution of each dimension, the Europe 2020 indicators

<sup>(121)</sup> <http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm>. United Nations classify Cyprus as Western Asia; however, we included it into Southern Europe as otherwise Cyprus would have been excluded.

<sup>(122)</sup> We are grateful to Anthony B. Atkinson for suggesting that this conceptual issue needs to be addressed and, when the purpose of the measure permits, satisfied.

**Table 12.2: Multidimensional Poverty in Europe 2006-2012,  $k=34$  %**

(level and percentage of individuals in EU countries with consistent data — linearised std. errors in brackets)

	2006	2007	2008	2009	2010	2011	2012
Multidimensional Poverty ( $M_0$ )	0.0484 (0.0012)	0.0443 (0.0011)	0.0418 (0.0012)	0.0413 (0.0012)	0.0419 (0.0011)	0.0424 (0.0011)	0.0429 (0.0011)
Headcount Ratio (H)	10.04 % (0.0012)	9.24 % (0.0012)	8.77 % (0.0013)	8.63 % (0.0013)	8.67 % (0.0013)	8.75 % (0.0012)	8.81 % (0.0013)
Intensity of Poverty (A)	48.18 % (0.0006)	47.99 % (0.0006)	47.73 % (0.0006)	47.80 % (0.0006)	48.30 % (0.0006)	48.45 % (0.0005)	48.62 % (0.0006)
<b>Contribution of each dimension to total multidimensional poverty</b>							
Income	24.23 %	24.58 %	25.23 %	25.67 %	25.36 %	25.25 %	25.33 %
Employment	18.40 %	18.69 %	18.31 %	18.69 %	19.88 %	19.63 %	19.45 %
Material Deprivation	16.13 %	15.83 %	15.56 %	14.97 %	15.31 %	16.43 %	17.92 %
Education	17.94 %	17.46 %	17.90 %	17.38 %	16.86 %	16.22 %	15.44 %
Environment	11.80 %	12.07 %	11.34 %	11.58 %	11.16 %	10.77 %	10.39 %
Health	11.50 %	11.38 %	11.66 %	11.72 %	11.42 %	11.70 %	11.48 %

NB: Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland not included.

Source: Authors' computation, UDB March 2014.

contribute more than 50 % to multidimensional poverty with the income poverty (AROP) indicator contributing most. Education contributes — on average — around 15 %, environment 10 % and health, 12 % to overall poverty in 2012 (for detailed results see Table 12.2). It is this indicator-specific analysis that provides information for policy design.

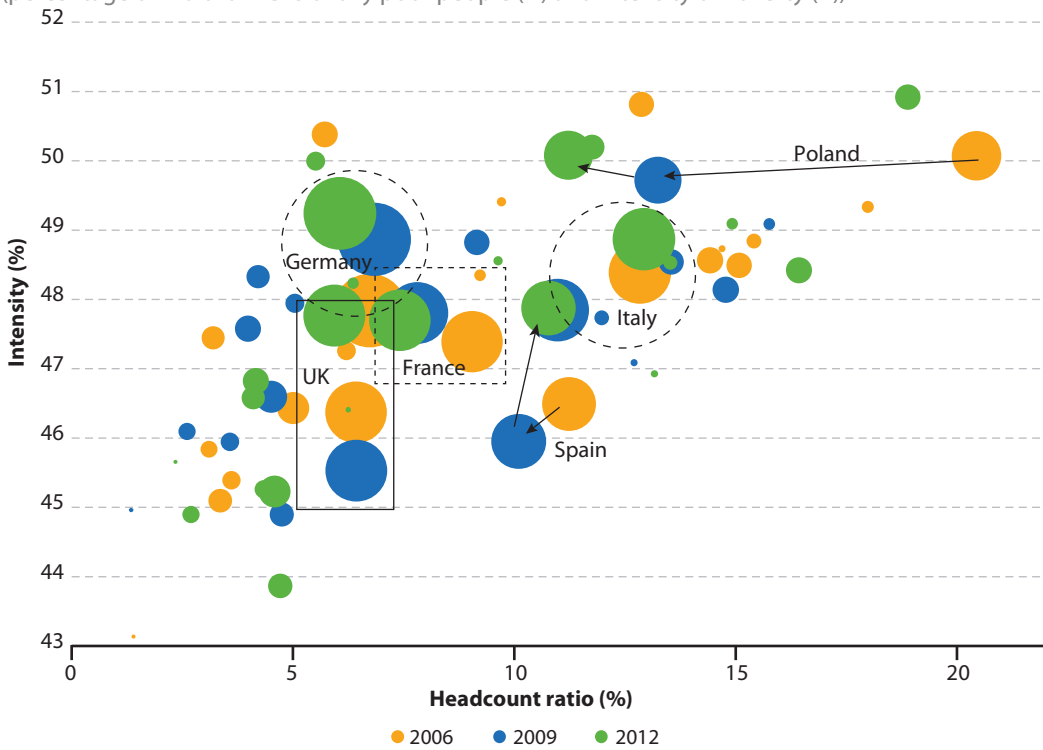
### 12.5.1 Results per country

This section presents and discusses national results. For each measure, we present the level of Multidimensional Poverty  $M_0$  as well as its associated partial indices ( $H$ ) and ( $A$ ). Results show a significant dispersion across countries. Bulgaria and Greece consistently are the poorest and Iceland the least poor according to the level of multidimensional poverty. However, intensity is not necessarily highest in the countries with highest poverty, a finding that contrasts with other studies.

As highlighted in Table 12.3, Poland, Latvia, Slovenia, the Czech Republic and France — had the largest

absolute reduction in poverty ( $M_0$ ) between 2006 and 2012, followed by Cyprus. Lithuania, Hungary and Luxemburg had insignificant reductions. Germany, Estonia, Spain, Italy, Netherlands, Slovakia, Finland, UK, Iceland, Denmark, Austria and Norway, on the other hand, remained stable without significant changes. Greece showed the highest increase in poverty. Portugal and Sweden, also, presented significant poverty increments. As before we see different trends in two clear periods. Between 2006 and 2009, sixteen of the countries experienced significant reductions in their poverty levels but six (Belgium, Germany, Ireland, Austria, Portugal and Sweden) have higher multidimensional poverty levels. During the period between 2009 and 2012, only twelve countries reduced their poverty levels, eight did not have significant changes and other four increased marginally poverty. Some of this apparent decrease may be due to drops in the relative income poverty rates (AROP) due to the financial crisis, illustrating the need for care in interpreting relative indicators, or a switch to (more) absolute indicators. Patterns vary considerably by country.

**Figure 12.2: Evolution of Multidimensional Poverty in EU countries (2006-2009-2012),  $k=34\%$**   
 (percentage of multi-dimensionally poor people ( $H$ ) and Intensity of Poverty ( $A$ ))



*Reading note:* This figure shows the percentage of poor people ( $H$ ) in the x-axis and the intensity of the poverty ( $A$ ) in the y-axis. The size of each circle represents the population of the country. For full details, see Table 12.3.

*Source:* Authors' computation, UDB March 2014.

**Table 12.3: Multidimensional Poverty in Europe by country 2006-2012, k=34 %**  
(level and percentage of individuals in EU countries)

	2006			2007			2008			2009			2010			2011			2012				
	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A	M <sub>0</sub>	H	A		
Belgium	0.044	9.0%	48.9%	0.044	8.9%	48.7%	0.042	8.5%	48.7%	0.047	9.6%	49.2%	0.047	9.4%	50.2%	0.05	10.0%	49.9%	0.083	16.3%	51.1%	0.083	16.3%
Bulgaria	0.029	5.7%	50.4%	0.022	4.6%	48.8%	0.019	4.0%	48.1%	0.019	4.0%	47.6%	0.018	3.8%	47.3%	0.019	4.0%	47.7%	0.019	4.2%	46.8%	0.019	4.2%
Czech Republic	0.016	3.6%	45.4%	0.018	3.8%	46.3%	0.013	2.9%	44.5%	0.016	3.6%	45.9%	0.018	3.8%	47.2%	0.018	4.1%	44.2%	0.02	4.3%	45.3%	0.02	4.3%
Denmark	0.032	6.7%	47.8%	0.034	7.0%	47.9%	0.033	6.9%	48.1%	0.033	6.8%	48.9%	0.032	6.6%	48.8%	0.032	6.5%	49.3%	0.03	6.1%	49.2%	0.03	6.1%
Germany	0.048	9.7%	49.4%	0.046	9.4%	48.6%	0.042	8.8%	47.9%	0.037	7.7%	47.9%	0.042	8.6%	48.3%	0.045	9.2%	49.0%	0.047	9.6%	48.6%	0.047	9.6%
Estonia	0.052	10.6%	49.2%	0.054	11.3%	47.6%	0.048	9.9%	47.9%	0.055	11.8%	46.7%	0.045	9.6%	46.9%	0.05	10.7%	47.2%					
Ireland	0.073	15.1%	48.5%	0.071	14.5%	48.7%	0.067	13.6%	49.2%	0.066	13.5%	48.5%	0.068	13.9%	48.3%	0.085	16.9%	50.1%	0.096	18.9%	50.9%	0.096	18.9%
Greece	0.052	11.2%	46.5%	0.048	10.3%	46.2%	0.046	10.1%	45.2%	0.046	10.1%	46.0%	0.05	10.8%	46.3%	0.05	10.5%	47.6%	0.052	10.8%	47.9%	0.052	10.8%
Spain	0.043	9.0%	47.4%	0.037	7.9%	46.9%	0.038	8.1%	47.4%	0.037	7.8%	47.8%	0.044	9.0%	48.8%	0.038	7.9%	48.3%	0.035	7.4%	47.7%	0.035	7.4%
France	0.062	12.8%	48.4%	0.059	12.2%	48.3%	0.056	11.6%	48.7%	0.053	11.0%	47.8%	0.05	10.3%	48.2%	0.062	12.7%	48.6%	0.063	12.9%	48.9%	0.063	12.9%
Croatia	0.072	14.7%	48.7%	0.073	14.8%	49.6%	0.059	12.1%	48.3%	0.06	12.7%	47.1%	0.065	13.9%	46.9%	0.061	12.9%	47.3%	0.062	13.2%	46.9%	0.062	13.2%
Italy	0.089	18.0%	49.3%	0.079	15.8%	49.7%	0.077	15.4%	50.1%	0.077	15.8%	49.1%	0.083	16.7%	49.9%	0.081	16.4%	49.3%	0.073	14.9%	49.1%	0.073	14.9%
Cyprus	0.075	15.4%	48.8%	0.057	11.5%	49.4%	0.048	10.1%	47.7%	0.057	12.0%	47.7%	0.056	11.7%	47.9%	0.064	13.3%	48.4%	0.066	13.5%	48.5%	0.066	13.5%
Latvia	0.032	6.9%	45.7%	0.028	6.3%	45.0%	0.028	6.2%	45.9%	0.032	7.0%	45.3%	0.027	5.9%	45.5%	0.029	6.2%	46.5%	0.029	6.2%	46.4%	0.029	6.2%
Lithuania	0.065	12.9%	50.8%	0.051	10.3%	49.2%	0.051	10.5%	49.0%	0.045	9.2%	48.8%	0.05	10.1%	49.1%	0.055	11.1%	50.0%	0.059	11.8%	50.2%	0.059	11.8%
Luxembourg																							
Hungary	0.023	5.0%	46.4%	0.024	5.2%	45.7%	0.021	4.4%	47.2%	0.021	4.5%	46.6%	0.02	4.3%	46.6%	0.02	4.2%	46.6%	0.021	4.6%	45.2%	0.021	4.6%
Malta	0.015	3.2%	47.4%	0.017	3.5%	48.7%	0.024	5.0%	47.9%	0.02	4.2%	48.3%	0.024	4.9%	48.1%	0.021	4.6%	47.0%	0.019	4.1%	46.6%	0.019	4.1%
Netherlands	0.102	20.4%	50.1%	0.083	16.7%	49.7%	0.069	13.9%	49.4%	0.066	13.2%	49.7%	0.063	12.5%	50.0%	0.057	11.6%	49.5%	0.056	11.2%	50.1%	0.056	11.2%
Austria	0.07	14.4%	48.6%	0.081	16.4%	49.3%	0.068	14.1%	48.4%	0.071	14.8%	48.1%	0.075	15.3%	49.3%	0.068	14.0%	48.8%	0.08	16.4%	48.4%	0.08	16.4%
Poland																							
Portugal																							
Romania	0.045	9.2%	48.4%	0.027	5.6%	48.1%	0.031	6.3%	48.4%	0.026	5.5%	47.9%	0.031	6.5%	47.7%	0.032	6.7%	47.8%	0.031	6.4%	48.2%	0.031	6.4%
Slovenia	0.029	6.2%	47.3%	0.026	5.4%	47.7%	0.022	4.7%	46.3%	0.024	5.0%	47.9%	0.028	5.8%	48.7%	0.026	5.4%	48.6%	0.028	5.5%	50.0%	0.028	5.5%
Slovakia	0.02	4.3%	46.3%	0.041	9.0%	45.9%	0.018	4.0%	45.5%	0.02	4.3%	46.4%	0.019	4.1%	46.1%	0.019	4.3%	45.4%	0.019	4.3%	45.0%	0.019	4.3%
Finland	0.015	3.4%	45.1%	0.014	3.2%	45.0%	0.017	3.9%	43.7%	0.021	4.7%	44.9%	0.016	3.7%	44.5%	0.018	4.2%	44.4%	0.021	4.7%	43.9%	0.021	4.7%
Sweden																							
United Kingdom	0.03	6.4%	46.4%	0.027	5.7%	46.9%	0.026	5.7%	45.3%	0.029	6.4%	45.5%	0.028	5.9%	47.5%	0.025	5.4%	46.4%	0.028	5.9%	47.8%	0.028	5.9%
Iceland	0.006	1.4%	43.1%	0.006	1.3%	45.2%	0.007	1.7%	42.4%	0.006	1.3%	45.0%	0.01	2.2%	44.2%	0.01	2.2%	44.0%	0.011	2.3%	45.7%	0.011	2.3%
Norway	0.014	3.1%	45.8%	0.012	2.7%	46.0%	0.011	2.4%	46.5%	0.012	2.6%	46.1%	0.013	2.9%	45.9%	0.012	2.5%	49.1%	0.012	2.7%	44.9%	0.012	2.7%
Switzerland							0.024	5.4%	44.8%	0.025	5.6%	44.9%	0.023	5.1%	45.4%	0.025	5.4%	45.1%	0.024	5.5%	44.4%	0.024	5.5%

Source: Authors' computation, UDB March 2014.

Normally the poverty analyses are undertaken at the country level to facilitate national policy design. However it can be quite interesting to look across countries, and see where the people who are identified as poor live, and what proportion of poverty each country contributes to the whole. Due to their size, Italy, France, Spain, Poland and Germany dominate multidimensional poverty trends in Europe. The proportion of European poverty for which Italy is responsible falls during the whole period except 2011. France's and Spain's contribution consistently falls only from 2010.

The percentage contribution of education varies greatly across countries and is strikingly higher in the poorer countries. This reflects differences in achievements, but also in definitions of primary school, so unfortunately is not strictly comparable. The relative contribution of (quasi-)joblessness declines as overall multidimensional poverty in a country increases, as do the relative contributions of the health variables. In general, in the least poor countries the relative contribution of educational deprivations is lower and of Europe 2020 indicators (with some exceptions) is higher. This interesting finding draws attention to the need to consider non-Europe 2020 indicators, particularly in the countries that are poorest by the Europe 2020 measures themselves. Their double-burden of economic and social deprivations can be more accurately depicted and addressed using such a multidimensional poverty measure.

## 12.6 Concluding remarks

This chapter has presented an experimental AF multidimensional poverty index, which has been implemented with the EU-SILC datasets for seven waves from 2006-2012. The aggregate data across Europe show that multidimensional poverty decreased between 2006 and 2009 which resulted from a fall in the percentage of multi-dimensionally poor people. This trend then came to an end, and from 2009 to 2012, there were marginal increases in poverty due to an increase in the intensity of poverty among poor people. Results show that the poorest region is Southern Europe followed by Eastern Europe. Results also show that Northern Eu-

rope is consistently the least poor region regardless of the cut-off. Evidence coincides with the aggregate results. There is a stronger reduction in poverty during the first triennium. Regional subgroup decompositions show that the variability of the aggregate measure is mainly explained by changes in East Europe and South Europe, and country specific trends provide a more detailed analysis.

Across countries, results show the heterogeneous behaviour of the countries. Across the entire period, sixteen countries reduce poverty and six show an increase. However, reductions are statistically significant (95 % of confidence) in only five countries (Czech Republic, France, Latvia, Poland and Slovenia) and increments in three countries (Greece, Portugal and Sweden).

Results suggest two patterns of poverty alleviation before and after 2009. Between 2006 and 2009 the average reduction reached 14.6 %. On the other hand, between 2009 and 2012, there is an average increment of 4.9 %. Only Poland shows a consistent and substantive improvement across most years. On the extremes, Portugal, Greece and Bulgaria vie for the position of the poorest country in the included datasets. Norway and Iceland are the least poor countries. Regarding the composition of poverty, we explored the relevance of the construction and the implication for the analysis. The relative contribution of education increases as overall poverty in a country increases, pointing out the need for multidimensional analyses to consider the indicator composition of poverty, as well as its levels (for detailed tables see Alkire, Apablaza and Jung, 2014b).

This study also drew attention to incomparabilities in definitions of the educational variables, and subjective issues in health and environment indicators. It would be desirable for EU-SILC to include comparable indicators for non-economic dimensions of poverty that cohere with poor people's understandings of social exclusion as well as with policy priorities. Such measures could be used for policy design as well as for monitoring, analysis, and evaluation. The analysis contained in this chapter has sought to provide a very brief overview of how a multidimensional poverty measure, and its consistent partial indices, could contribute to reducing poverty and social exclusion in its many dimensions.

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# 13

## Comparing poverty estimates using income, expenditure and material deprivation

Paola Serafino and Richard Tonkin <sup>(123)</sup>

### 13.1 Introduction

Most evidence-based policy initiatives aimed at improving living standards tend to measure poverty relatively within the society, using income as a yardstick. However, there is an argument that income is not sufficient as a sole measure of poverty, particularly if poverty is seen in terms of achieved standards of living <sup>(124)</sup>. Ultimately, a household satisfies its wants through the consumption of goods and services over time. Because of this, consumption is arguably a more important determinant of economic well-being than income alone. Indeed, Brewer and O'Dea (2012) and others (see Noll, 2007, for a review) argue that it is preferable to consider the distribution of consumption rather than income on both theoretical and pragmatic grounds.

On a theoretical ground, income can be subject to fluctuations, due to such events as short-term unemployment. However, these fluctuations in income are not likely to be matched by corresponding downturns in living standards and often those on the lowest incomes do not have the lowest levels of consumption (Brewer and O'Dea, 2012). In fact, the capacity of a household to meet its consumption

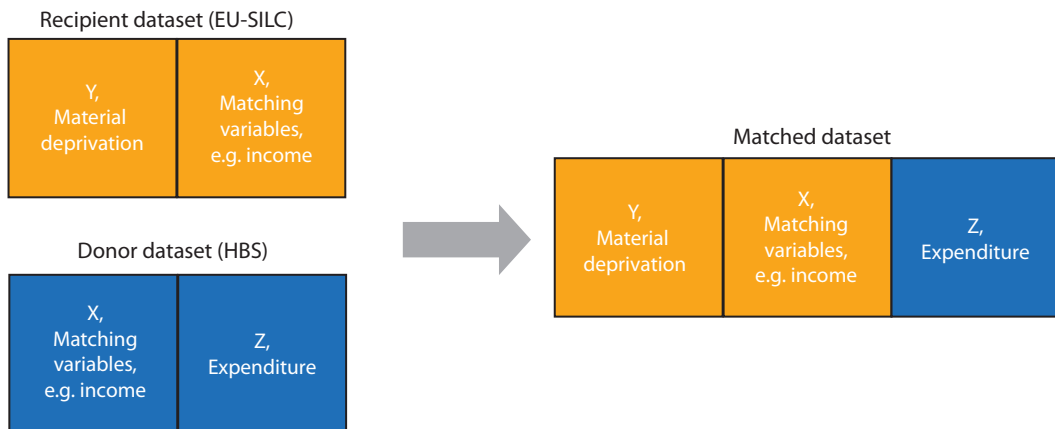
needs does not depend only on its short-term or current income, but also on any accumulated wealth, as well as the ability to access financial support either informally from family or friends or more formally through loans. This finding leads to Friedman's 'permanent income hypothesis', which suggests that decisions made by consumers are based on long-term income expectations rather than their current income. Furthermore, it has been argued that consumption is a better indicator of permanent income than is current income (Cutler and Katz, 1991). This view is supported in a number of studies (e.g. Jorgenson and Slesnick, 1987 and Meyer and Sullivan, 2011) which find stronger relationships between consumption and subjective well-being than between income and subjective well-being measures.

Beyond these conceptual arguments, there is also the practical consideration that evidence from a range of countries suggests a general tendency for income to be under-reported by households with low levels of resources, whilst reporting of expenditure by this group is relatively accurate (e.g. Meyer and Sullivan, 2011 and Brewer and O'Dea, 2012), though other evidence suggests that expenditure of higher income households may be under-reported (Sabelhaus et al., 2011).

In economic and social research, data on household expenditure are typically used as a proxy for consumption. These data are often collected through the use of diary studies. However, it should be noted that expenditure is an imperfect measure of consumption as the amount spent by a household in a given period may differ from consumption, due to households making use of goods purchased previously or the purchase of consumer durables. In addition, consumption also includes

<sup>(123)</sup> Richard Tonkin and Paola Serafino are from the UK Office for National Statistics (ONS). This work has been supported by the second network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission and ONS bear no responsibility for the analyses and conclusions, which are solely those of the authors. The authors would like to thank Rolf Aaberge, Anthony B. Atkinson, David Gordon, Anne-Catherine Guio, Eric Marlier and Marco Pomati for their helpful comments and discussions. Email address for correspondence: [hie@ons.gsi.gov.uk](mailto:hie@ons.gsi.gov.uk).

<sup>(124)</sup> As well as considering poverty in terms of an individual's standard of living, other approaches are possible, such as considering poverty in terms of a right to a minimum level of resources (see Atkinson et al. (2002) for a discussion).

**Chart 13.1: Recipient, donor and matched datasets**

inter-household in-kind transfers of gifts and services and social transfers in kind. However, these aspects of consumption are generally excluded from data due to the challenges of collecting this type of information.

Overall the evidence indicates that while income can be a good proxy for material living standards, it is better when supplemented with a wider range of measures. This is consistent with the recommendations of the Report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen, and Fitoussi, 2009) as well as the OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth (2013).

The aim of this chapter is to compare people's exposure to poverty in a range of countries using three different measures: income, expenditure and material deprivation (MD). However, there is currently no data source which provides joint information on all of these variables for households or individuals. As a result, it was necessary to first statistically match expenditure from the 2010 round of the Household Budget Survey (HBS) with income and MD contained within EU-SILC <sup>(125)</sup>. Matched datasets for Belgium, Germany, Spain, Austria, Finland and the

United Kingdom <sup>(126)</sup> were produced and used for the joint analysis of income and expenditure based poverty and other measures of disadvantage, including MD presented below.

## 13.2 Statistical matching

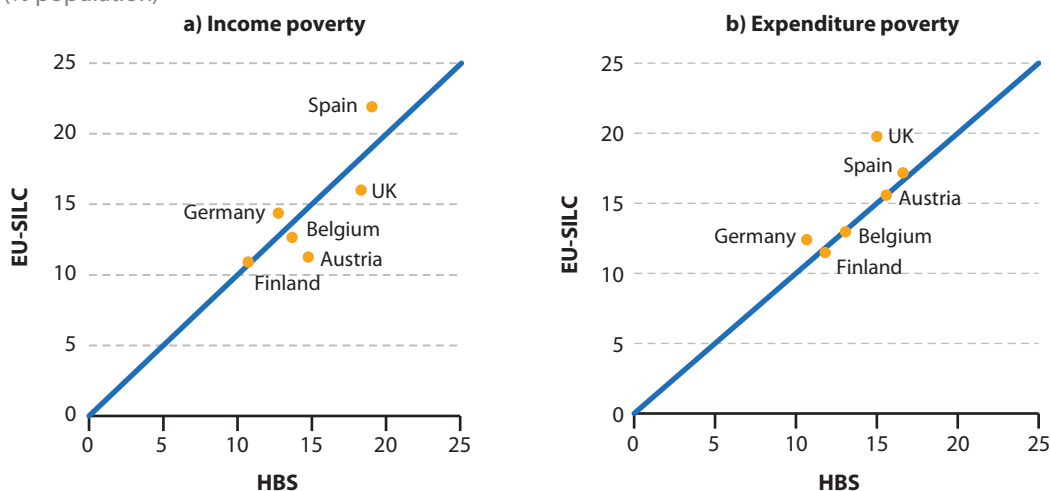
Statistical (or synthetic) matching is a broad term used to describe the fusing of two datasets. In this context, the datasets are of households sampled from the same population. The usual approach is to define one data set as the recipient, in this case EU-SILC, and one as the donor, HBS. The recipient data contains a variable *Y*, in this case MD, which is not found in the donor, while variable *Z*, expenditure, is only contained within the donor. The aim is to use information contained within the set of variables common to both datasets, *X*, for example, age, gender and income, to link records from the donor to the recipient. Therefore, expenditure is linked to EU-SILC, which contains information on income, MD and work intensity (see Chart 13.1).

The countries chosen for inclusion were limited by the ability to sufficiently reconcile the EU-SILC and HBS datasets to make matching viable. Three approaches to statistical matching were used:

<sup>(125)</sup> The 2010 HBS round for Austria was conducted predominantly in 2009. As a result, the analysis for Austria was conducted using 2009 EU-SILC data. The 2010 HBS round in Finland was conducted in 2012, so the analysis for Finland was conducted using the 2012 EU-SILC data.

<sup>(126)</sup> The selection of countries was constrained by both restrictions on access to HBS microdata and the suitability of the two data sources for statistical matching.

**Figure 13.1: Income poverty and expenditure poverty in matched EU-SILC and HBS, 2010**  
(% population)



*Reading note:* The figures compare the percentage of the total population of each country in a) income poverty and b) expenditure poverty on the HBS with those on the matched EU-SILC dataset. The solid lines indicate where the points should lie if both surveys produced identical estimates for these measures.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland): EU-SILC UDB; HBS 2010: Eurostat/ONS.

hotdeck (non-parametric), parametric and mixed methods. These methods and the other steps involved in statistical matching are described in Webber and Tonkin (2013). For the six countries for which statistical matching was completed, analysis of the joint distributions of the matching variables with imputed and actual expenditure indicated that the statistical matching was effective across all the methods, with the mixed approach marginally more effective overall. (Serafino and Tonkin (2017) provide full details of the methods and results of the statistical matching of the data used in this chapter.)

### 13.3 Headline poverty indicators

The expenditure poverty measure used is defined in comparable terms to the standard income pov-

erty indicator: the share of people with an equivalised household expenditure less than 60 % of the national median equivalised household expenditure.

Figure 13.1 shows how the estimates of income and expenditure poverty compare between the HBS and the matched EU-SILC datasets. In general there is a relatively close correspondence between estimates of expenditure poverty in the two datasets. The country with the largest divergence is the UK, where the HBS produces lower estimates of expenditure poverty than EU-SILC (15.0 % and 19.8 % respectively). The estimates of income poverty on the two datasets are less consistent, with the UK, Spain and Austria showing the largest divergences. While EU-SILC is the main source of income data for many EU countries, the HBS is primarily focussed on expenditure data. As a result, income variables are not necessarily collected to the same level of detail in the HBS, which may account for these differences.

**Table 13.1: Sample sizes, poverty estimates and standard errors for matched EU-SILC datasets**

	Sample size (number of individuals)	Income poverty		Expenditure poverty		Material deprivation	
		Estimate (%)	SE (pp)	Estimate (%)	SE (pp)	Estimate (%)	SE (pp)
Belgium	14 592	12.6	0.7	13.0	0.3	9.9	0.8
Germany	27 684	14.4	0.4	12.4	0.1	11.1	0.3
Spain	34 807	21.9	0.6	17.2	0.2	14.4	0.6
Austria	13 596	11.3	0.5	15.6	0.1	8.8	0.5
Finland	25 370	10.9	0.4	11.5	0.2	6.3	0.3
United Kingdom	18 275	16.0	0.6	19.8	0.5	13.5	0.6

*NB:* Standard errors of the EU-SILC variables in this table and throughout were calculated using the method presented in Chapter 26 of this volume. In the absence of details on the stratification of the German EU-SILC sample, standard errors were calculated assuming a simple random sample, which will affect the accuracy of these estimates. The standard errors presented for expenditure poverty reflect the variation in the estimates produced by each iteration of the mixed methods approach. 'pp' means 'percentage point'.

Table 13.1 shows the number of individuals in each of the matched EU-SILC datasets and the estimates of income poverty, expenditure poverty and MD for each of the countries, with their associated standard errors. Individuals are classed as being materially deprived if they have an *enforced* lack of at least three out of the list of nine MD items (see Chapter 10 of this volume). The table shows that, of the countries examined, the highest levels of expenditure poverty were found in the UK, with Spain having the highest levels of both income poverty and MD. Finland had the lowest levels of poverty across all three measures.

## 13.4 Overlap of income and expenditure poverty and material deprivation

Figure 13.2 shows the percentage of the population experiencing poverty on one or more of the measures and the overlap between them.

This figure shows that the degree of overlap between the three measures varies across the countries examined, with the difference between the UK and Germany particularly prominent. In the UK, 35 % of people experienced poverty on at least one of the three measures, while 12 % were in poverty on two or more of the measures and just over 2 % were in poverty on all three. In Germany, the degree of overlap between the measures was higher: despite the proportion of people in pov-

erty on at least one of the three measures being lower, at 24 %, a similar proportion were in poverty on two or more of the measures (11 %) and almost double the proportion were in poverty on all three (almost 4 %).

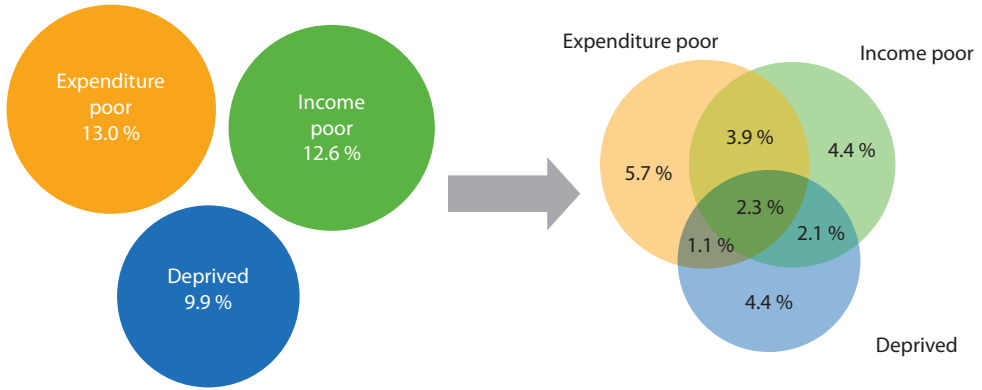
Looking more closely at the degree of overlap between income and expenditure poverty, Figure 13.3, shows again how this varies across the countries examined. In Finland and Austria, only around 40 % of those in income poverty are also expenditure-poor, whereas the overlap between the two measures is slightly higher in the UK (43 %), Spain (46 %) and Belgium (49 %), and higher still in Germany (55 %).

A very similar pattern across countries is observed when looking at the proportion of expenditure-poor individuals who were also income-poor (Figure 13.4). The lowest levels of overlap are evident in Austria where only 29 % of expenditure-poor individuals are also income-poor, with slightly higher levels for the UK (35 %) and Finland (38 %). The highest levels of overlap are evident for Belgium (48 %), Spain (58 %) and Germany, where 64 % of those who are expenditure-poor are also income-poor.

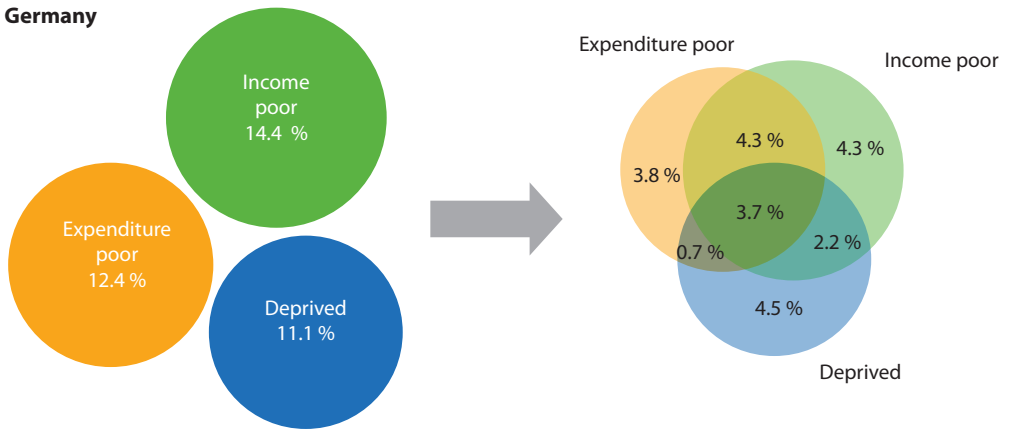
In all countries, there is a greater overlap between MD and income poverty than MD and expenditure poverty, with a higher proportion of those who are materially deprived also being in income poverty (see Figure 13.5). However, the degree to which this is the case varies considerably. For the UK this difference is negligible, while for Germany and Spain it is considerable.

**Figure 13.2: Breakdown of population by poverty status, 2010**  
(% population)

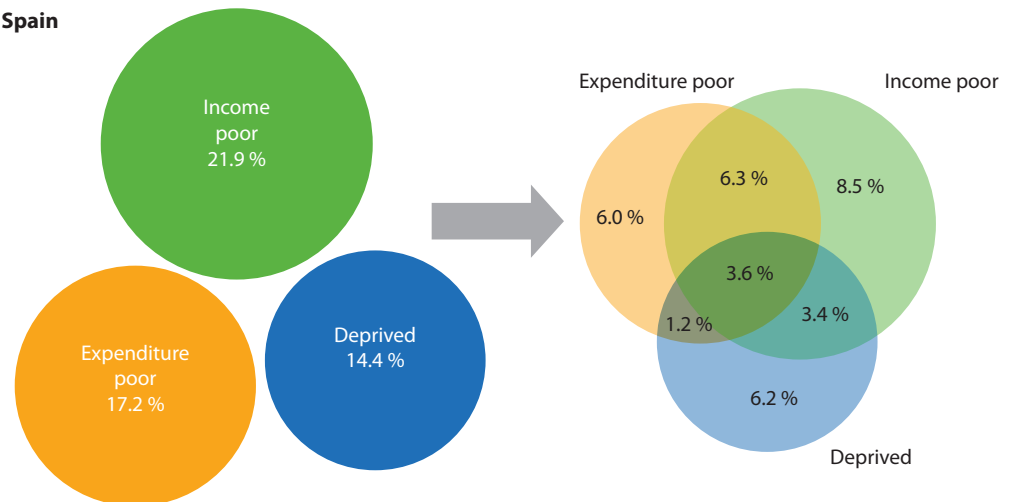
**a) Belgium**



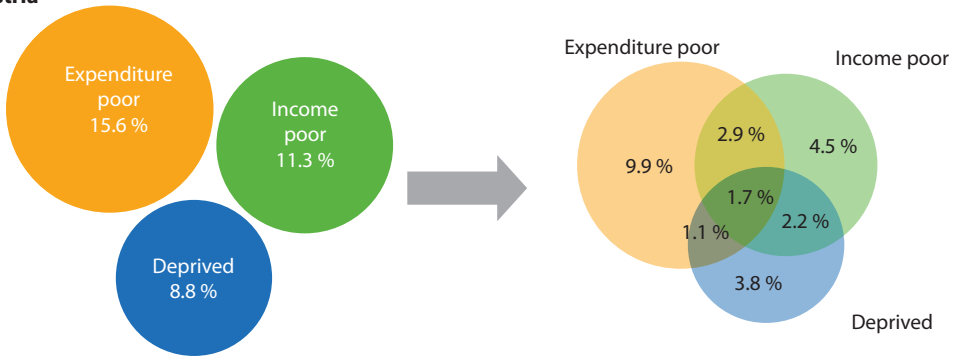
**b) Germany**



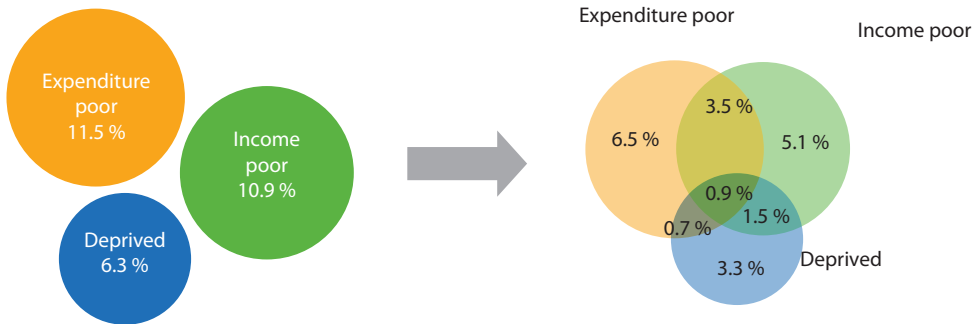
**c) Spain**



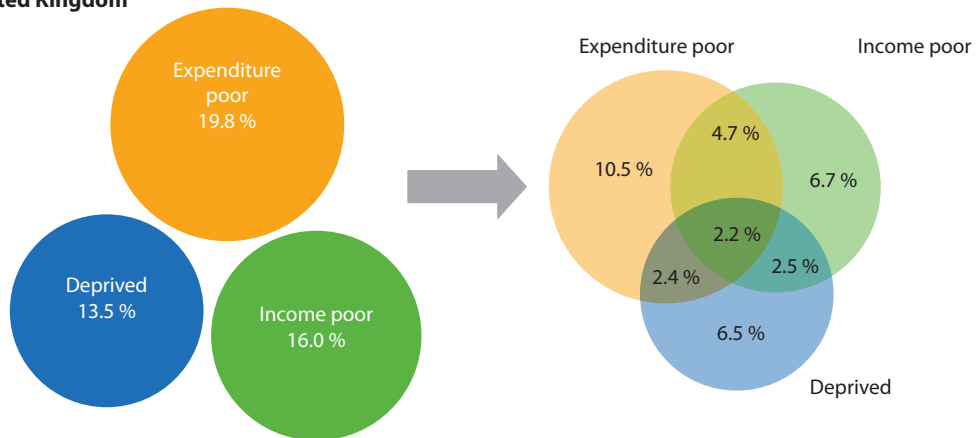
**d) Austria**



**e) Finland**



**f) United Kingdom**

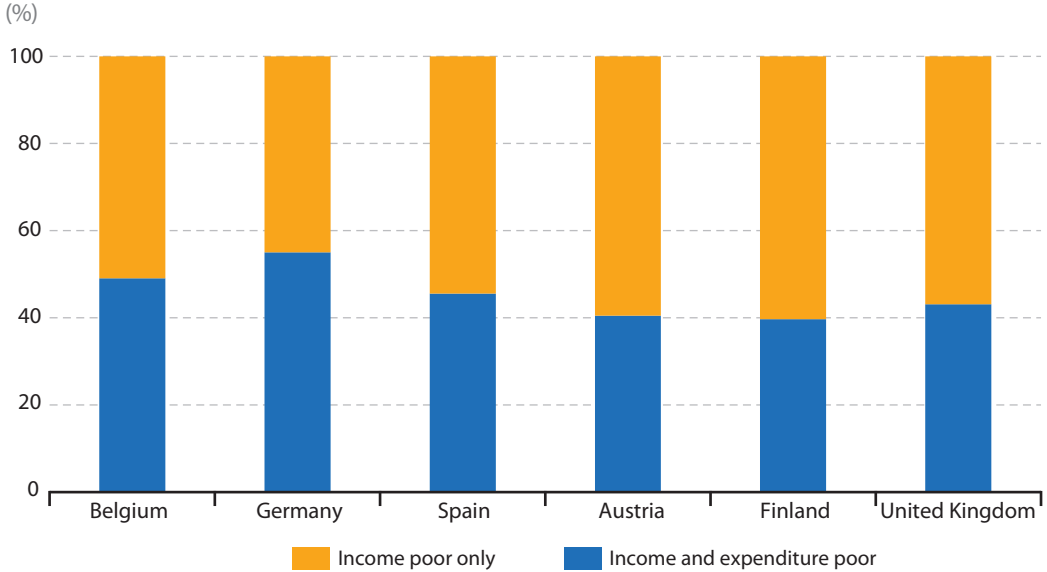


*Reading note:* The figures show the percentages of the population experiencing each form of poverty and MD for each of the countries and how these overlap with one another. 'Deprived' refers to 'materially deprived'.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.



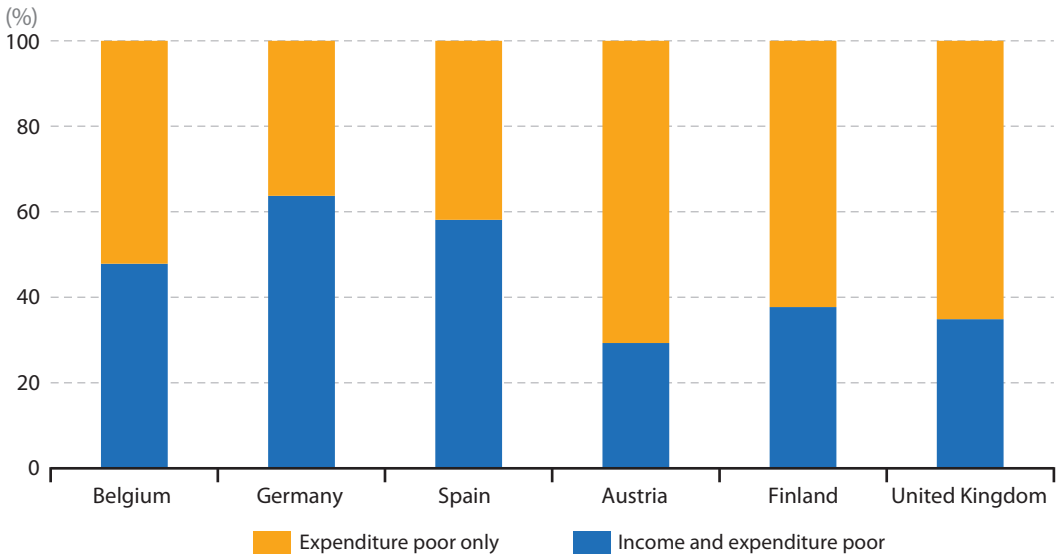
**Figure 13.3: Percentage of income-poor individuals experiencing expenditure poverty, 2010**



*Reading note:* The figure shows the relative proportion of income-poor individuals that also experience expenditure poverty.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010: Eurostat/ONS.

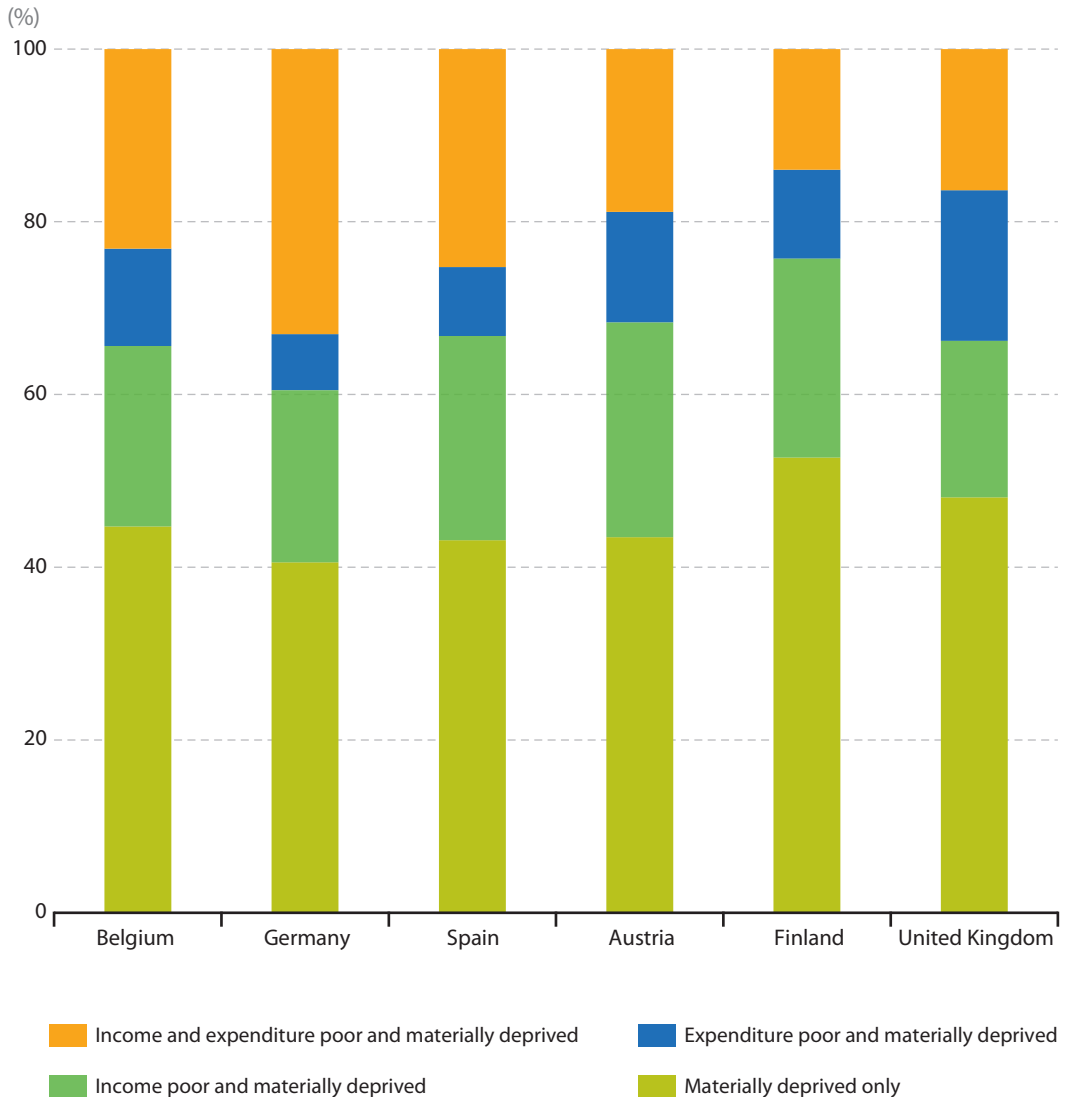
**Figure 13.4: Percentage of expenditure-poor individuals experiencing income poverty, 2010**



*Reading note:* The figure shows the relative proportion of expenditure-poor individuals that also experience income poverty.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010: Eurostat/ONS.

**Figure 13.5: Percentage of materially deprived individuals experiencing income and expenditure poverty, 2010**

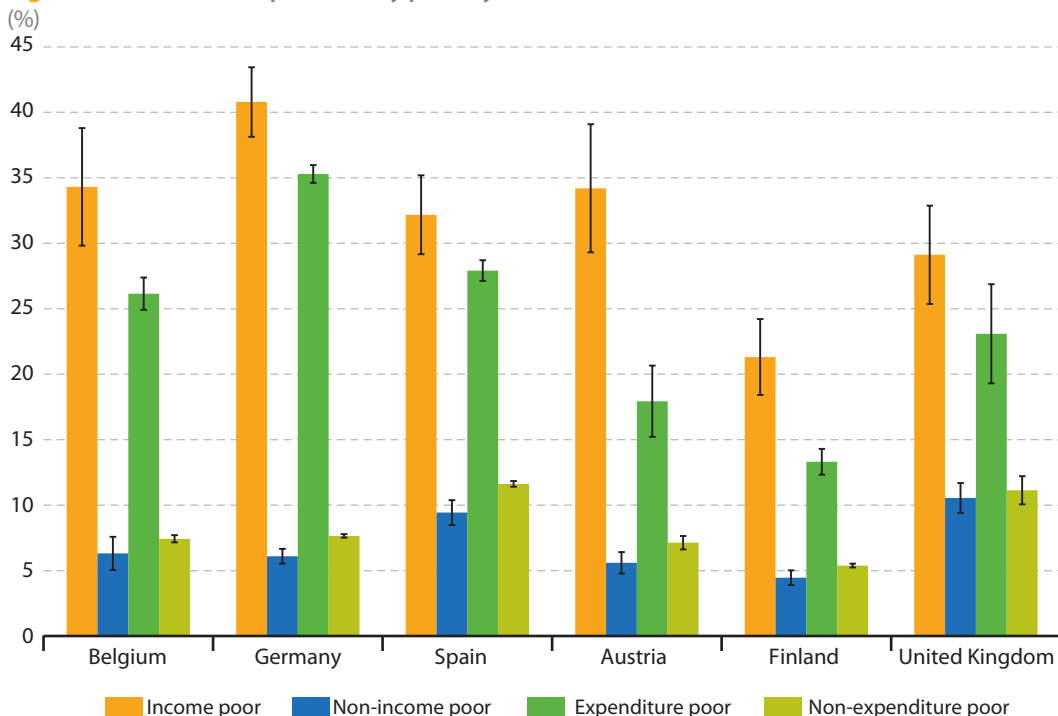


*Reading note:* The figure shows the relative proportion of materially deprived individuals that also experience income and/or expenditure poverty.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.

If expenditure does provide a better measure of material living standards than income, it might be expected that the relationship between expenditure poverty and measures such as MD would be stronger than that between income poverty and

such measures. To begin to examine this point, Figure 13.6 shows for each poverty measure, the percentage of people in poverty and not in poverty who are experiencing MD.

**Figure 13.6: Material deprivation by poverty status, 2010**

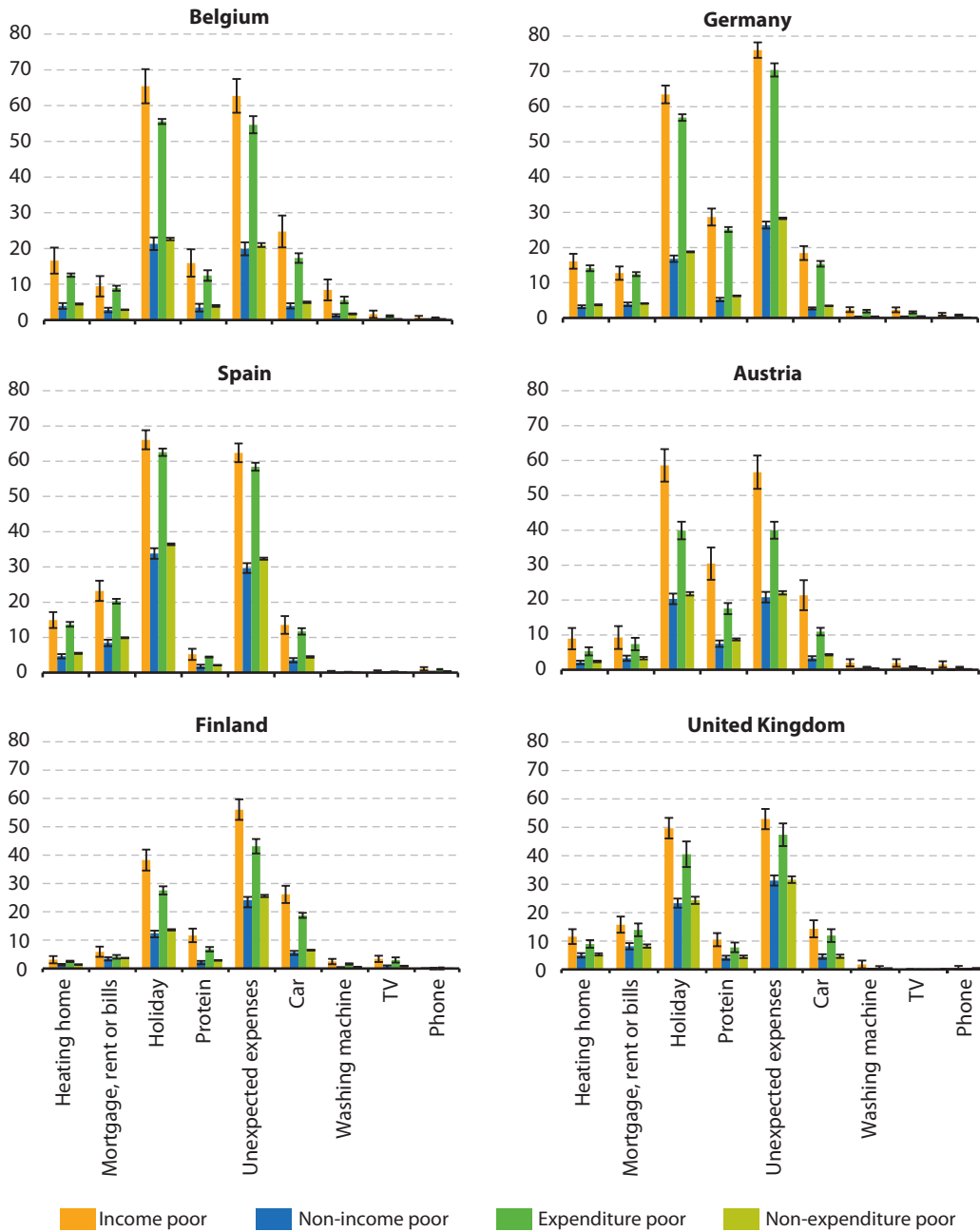
*Reading note:* The figure shows the percentage of those in income and expenditure poverty and those not in income or expenditure poverty that are materially deprived; for example, for the UK the yellow bar shows that almost 30% of the income-poor population in the UK are materially deprived.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.

For all countries studied, there appears to be a stronger relationship between income poverty and MD than expenditure poverty and MD, though to varying degrees. For Austria, the relationship between income poverty and MD would appear to be much stronger than the relationship between expenditure poverty and MD. This also seems to be the case for Finland, though to a lesser degree. In contrast, for Germany and Spain, the relationship between expenditure poverty and MD is almost as strong as that between income poverty and MD. However, in both countries the MD rate is still slightly higher for those who are income-poor than for those who are expenditure-poor.

Figure 13.7 shows the percentage of those with different experiences of poverty that are unable to afford each of the individual items that are used to measure MD across the EU. The patterns seen in this figure are similar to those seen for MD as a whole (see Figure 13.6). As with MD overall, across all the key items, there is a stronger relationship between inability to afford most of the items and income poverty than there is with expenditure poverty. Similarly, there appears to be a stronger relationship between expenditure poverty and inability to afford these items in Germany and Spain than in some of the other countries, particularly Austria and Finland.

**Figure 13.7: Population unable to afford key material deprivation items by poverty status, 2010**  
(% population)



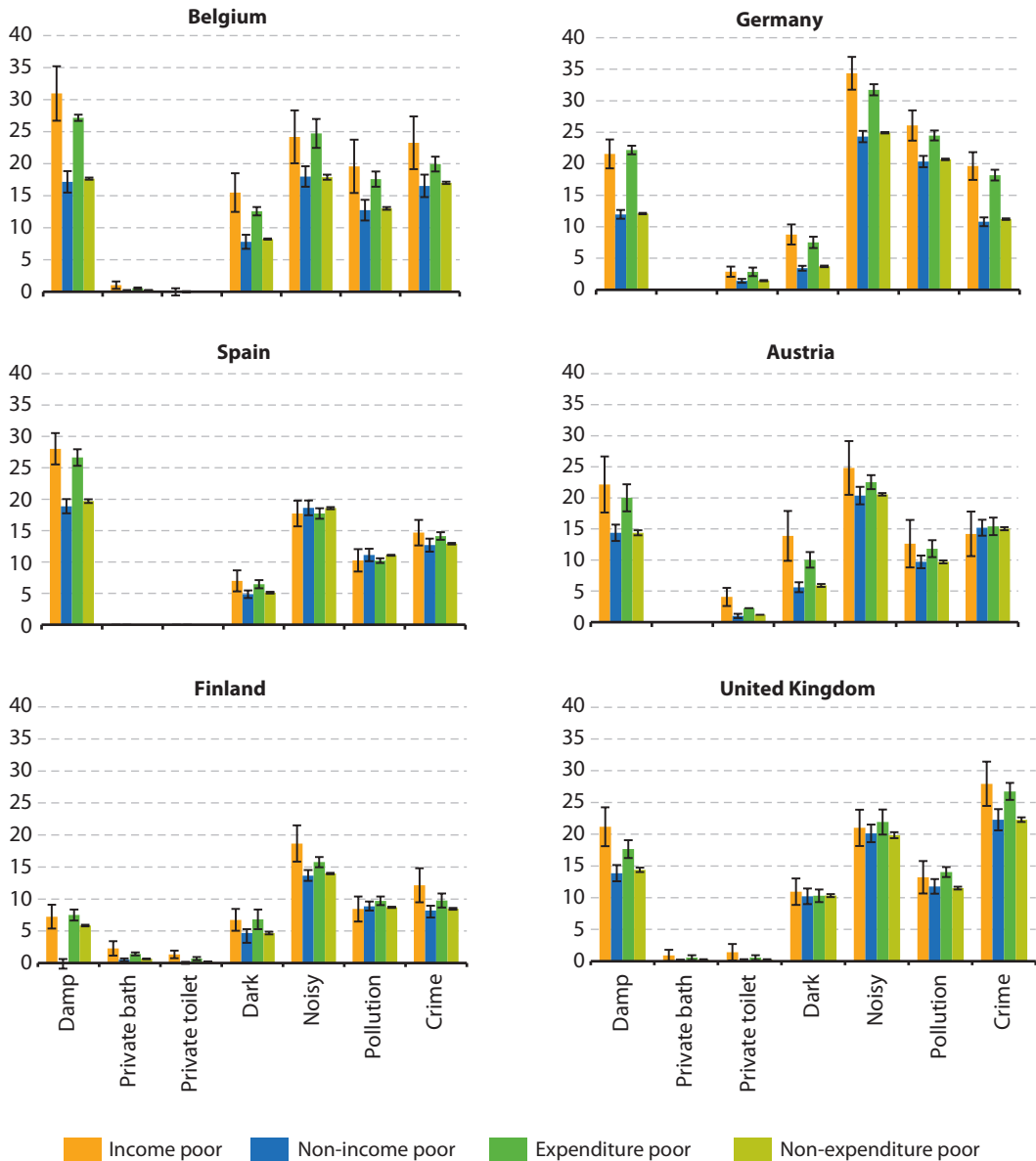
*Reading note:* These figures compare the percentage of those in income and expenditure poverty with those not in income or expenditure poverty that are unable to afford the 9 items used to measure MD. For example, for the UK the yellow bar shows that just over 10 % of the income-poor population in the UK cannot afford to keep their homes adequately warm.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010: Eurostat/ONS.

### 13.5 Housing-related deprivation

**Figure 13.8:** Population experiencing additional poor living conditions (housing, local environment) by poverty status, 2010

(%)



*Reading note:* These figures compare the percentage of those in income and expenditure poverty with those not in income or expenditure poverty that experience poor housing conditions. For example, for the UK the yellow bar shows that just over 20 % of the income-poor population in the UK live in a house that is damp or has a leaking roof.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010: Eurostat/ONS.

In addition to the items that are used in the main MD measure, EU-SILC also includes a number of variables that are indicative of poor housing conditions. These include living in a home that is subject to damp or a leaking roof, that is dark or excessively noisy, that is in an area that suffers environmental problems or high levels of crime, or without sole use of bathing facilities or an indoor flushing toilet.

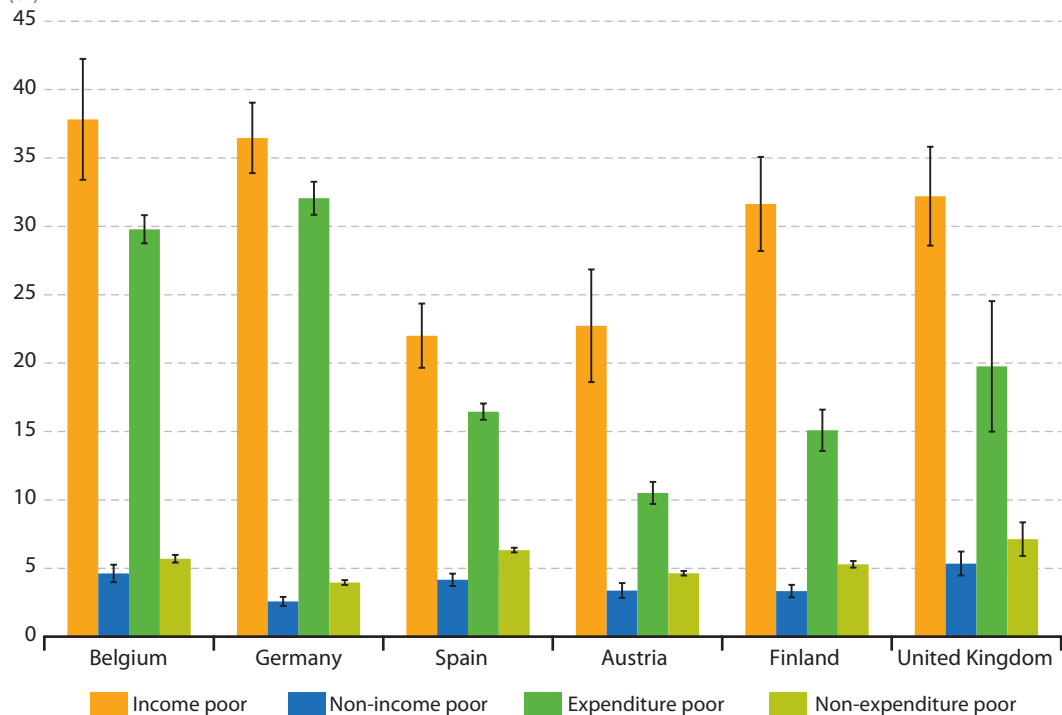
Figure 13.8 shows the relationship of these variables with income and expenditure poverty. The results are more variable. While for Belgium and Germany there is evidence of a relationship with both measures of poverty, it is generally weaker compared with the MD indicators presented above; for the remaining countries there is less evidence of a strong relationship between these indicators of housing related deprivation and either measure of

poverty. In general, where there is evidence of a relationship between poverty and one of these conditions, it generally appears slightly stronger for the income-poor than the expenditure-poor; though when taking into account the precision of the estimates, this difference is not always statistically significant. Furthermore, there are instances where the expenditure-poor are more affected by one of these measures, for example living in a home that is subject to damp or a leaking roof in Germany and living in an excessively noisy house in the UK.

The analysis also suggests that some issues around poor housing conditions are not directly related to relative low income or expenditure poverty in a number of these countries. For example, there is no evidence of a direct relationship between poverty and living in an excessively noisy home or

**Figure 13.9: (Quasi-)joblessness by poverty status, 2010**

(%)



*Reading note:* The figure shows the percentage of those in income and expenditure poverty and those not in income or expenditure poverty that have (quasi-)joblessness status. For example, for the UK the yellow bar shows that 33 % of the income-poor population in the UK have (quasi-)joblessness status.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.

one subject to environmental problems for those in Spain, or living in an area afflicted by crime in Austria.

## 13.6 (Quasi-)joblessness

The third component of the EU social inclusion target is (quasi-)joblessness. Figure 13.9 shows for income and expenditure poverty, the percentage of those in poverty and not in poverty that are living in (quasi-)jobless households. The figure shows a strong relationship between (quasi-)joblessness and income poverty in all the countries. Additionally, a relationship between expenditure poverty and (quasi-)joblessness is also evident for all the countries although the relative strength of the relationship appears to vary across the countries. Rates of (quasi-)joblessness are in excess of 30 % for both the income- and expenditure-poor in Germany, whilst the relationship between (quasi-)joblessness and relative low expenditure appears to be weaker in Finland and Austria.

## 13.7 Characteristics of those in expenditure poverty

Figure 13.10 compares the activity status of the household reference person <sup>(127)</sup> of the expenditure-poor with the non-expenditure poor for the countries examined. Figure 13.11, shows a similar comparison of household type. (For comparisons of other characteristics of the expenditure-poor and the non-expenditure poor, see Table A.13.1).

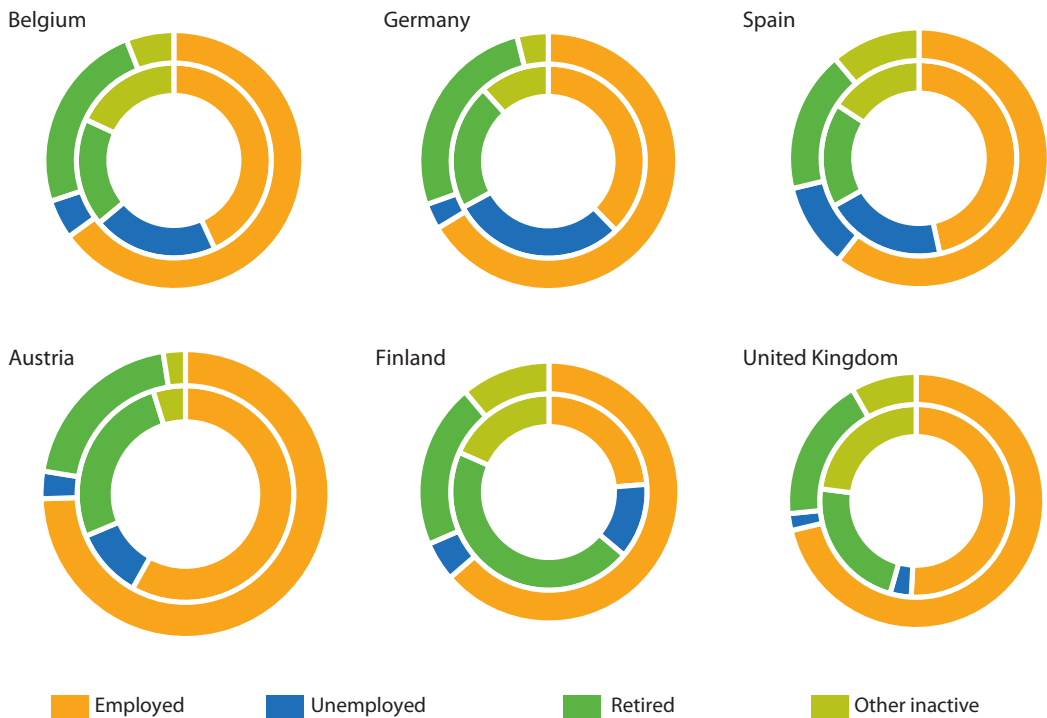
In all countries, perhaps unsurprisingly, expenditure-poor households are characterised by a higher proportion of unemployed heads of household. Across the board, a lower percentage of the expenditure-poor are headed by householders in employment than non-expenditure poor households, though in Austria and the UK, over half of the expenditure-poor are in households headed by someone in work.

In Finland, retired household heads account for a large proportion of the expenditure-poor households (46 %), in contrast with the other countries where retired householders are more characteristic of non-expenditure poor households. Expenditure-poor households in Finland also show slightly different characteristics to the other countries when considering the household composition; single adult households (without children) make up a considerably larger proportion of expenditure-poor households (42 %) than non-expenditure poor (17 %), a finding also observed in Germany, though to a lesser degree (30 % of expenditure-poor households compared with 18 % of non-expenditure poor).

The analysis by household type also revealed that single parent households make up a larger proportion of the expenditure-poor than the non-expenditure poor in all the countries examined, except Finland. This was particularly the case in Belgium (16 % of the expenditure-poor and 5 % of the non-expenditure poor), Germany (14 % of the expenditure-poor and 4 % of the non-expenditure poor) and the UK (12 % of the expenditure-poor and 6 % of the non-expenditure poor). This contrasts with households with two adults which make up a lower proportion of the expenditure-poor than the non-expenditure poor across all the countries studied.

<sup>(127)</sup> For all countries except Finland, the household reference person, also referred to as the head of the household, is the person with responsibility for the accommodation; for Finland, the household reference person is the person with the highest income, or where two or more people have the same income, it is the eldest.

**Figure 13.10:** Comparison of those in expenditure poverty (inner ring) with those not in expenditure poverty (outer ring) by activity status of the household reference person, 2010

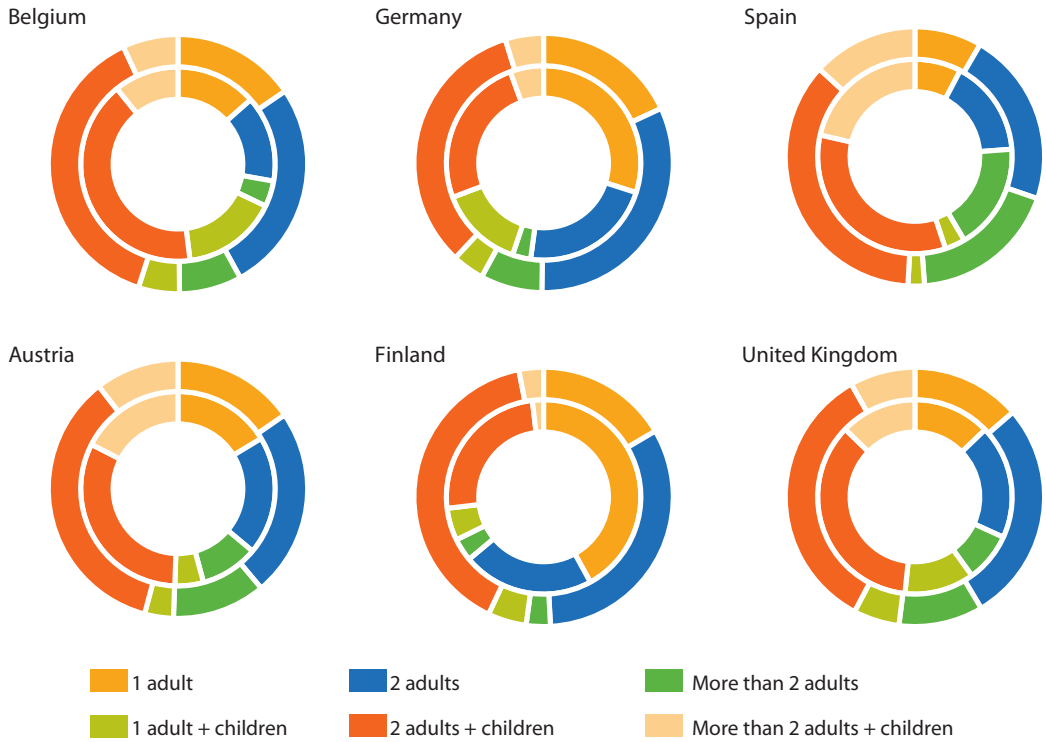


*Reading note:* The figure compares the repartition of people in expenditure poverty (inner ring) with those not in expenditure poverty (outer ring) by activity status. In all countries, expenditure-poor households are characterised by a higher proportion of unemployed heads of household.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.



**Figure 13.11: Comparison of those in expenditure poverty (inner ring) with those not in expenditure poverty (outer ring) by household type, 2010**



*Reading note:* The figure compares the repartition of people in expenditure poverty (inner ring) with those not in expenditure poverty (outer ring) by household type. In all countries, expenditure-poor households are characterised by a lower proportion of households with 2 adults.

*Source:* Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland): EU-SILC UDB; HBS 2010: Eurostat/ONS.

## 13.8 Conclusions and recommendations

On one level, the results of this analysis do not appear to directly support the assertion that expenditure provides a better measure of material living standards than income, at least for the countries examined. Comparisons with MD and a number of other related measures of living conditions in general suggest a slightly stronger relationship between these measures and income poverty than expenditure poverty <sup>(128)</sup>.

Nevertheless, there is still evidence of a clear relationship between expenditure and other measures of living standards; in many cases this relationship is a strong one, particularly for certain countries. Furthermore, the fact that these measures do not entirely overlap with one another in terms of the people they include highlights the importance of each in identifying different groups that are vulnerable to poverty and disadvantage.

There are a number of reasons that the measures may not overlap. These include the difficulty in measuring them, particularly for certain groups. Income can be difficult to measure for households where it varies, for example among the self-employed. In addition evidence suggests that the quality of income data may be lower for low income households. While expenditure data are arguably of better quality, the expense of data collection results in smaller, more irregular samples. Furthermore, expenditure is not the same as consumption. Finally, MD is measured using relatively subjective questions and is subject to individual preferences.

However, there are other explanations for the lack of overlap between these measures. Where a household is income-poor but is maintaining expenditure and is not materially deprived (those in income poverty only), this may indicate that the household is able to draw on savings or access loans either informally or formally to maintain living standards.

In some cases, such behaviour may be driven by knowledge or expectation that household income will increase in the near future, for example, those starting a new job soon or students. However, many households of this type will remain vulnerable to poverty as the resources they are relying on are finite and the situation cannot continue indefinitely.

Expenditure poverty in the absence of either income poverty or MD can be seen as an indicator of uncertainty over future income levels and a lack of accumulated wealth or assets which could be used to maintain living standards if income does drop. This may occur in employment that has no guaranteed future income, for example those in short-term employment and the self-employed. The analysis has shown considerable differences in the proportion of those experiencing just expenditure poverty in the different countries which could reflect differences in national labour market policies in these countries. A 2010 study into self-employment across the EU (European Commission, 2010) found that, while many countries had adopted measures to encourage self-employment in response to the economic crisis, the exact nature of these measures varied; these are likely to provide differing levels of employment security to the self-employed in different countries. Additionally, an important phenomenon in the labour market, at least in the UK, are so-called 'zero hours' contracts; under such arrangements the employer is not obliged to provide the worker with any minimum working hours, and the worker is not obliged to accept any of the hours offered. These provide flexibility for both parties, but also provide no guarantee of levels of future income, which could result in people adjusting their expenditure to account for such uncertainty. Unfortunately, the information available from EU-SILC is not currently sufficient to identify individuals with this type of contract, limiting the opportunities to examine further the relationship between them and expenditure poverty.

Material deprivation may be high in the absence of a low income and low consumption because the household is able to afford consumption of day-to-day goods but is in debt and cannot afford the additional material goods key to social inclusion. Conversely, a household may not be materially deprived, despite having a low income and low consumption, because they have low needs, either be-

<sup>(128)</sup> It is possible that the apparently weaker relationship between MD and expenditure poverty may be an artefact of carrying out statistical matching with a relatively limited pool of harmonised variables (see Serafino and Tonkin, 2017). Repeating this exercise with datasets designed for *ex ante* matching may provide slightly different results.

cause they already own the items used to measure MD, or because they choose not to have these items.

The analysis has highlighted the unique importance of each of these measures in capturing the entirety of poverty and disadvantage. Each of the specific indicators currently used by the EU as part of the overall AROPE measure (income poverty, severe MD and (quasi-)joblessness; see Chapter 1 of this volume) already provide distinct information about the extent and nature of social exclusion. However, this work has clearly demonstrated the additional value in these measures being supplemented with a measure of expenditure poverty. While expenditure variables are not currently included in the EU-SILC data collection, precluding the routine estimation of expenditure poverty, the proposed 6-yearly module on consumption and wealth may provide new opportunities. As Stiglitz et al. (2009), OECD (2013) and others have recommended, only by using multiple measures can all aspects of poverty and disadvantage be adequately captured.

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**Table A.13.1:** Comparison of the characteristics of the expenditure-poor with the non-expenditure poor (% population)

Characteristics	Belgium		Germany		Spain		Austria		Finland		UK	
	Expend. poor	Non-ex-pend. poor	Expend. poor	Non-ex-pend. poor	Expend. poor	Non-ex-pend. poor	Expend. poor	Non-ex-pend. poor	Expend. poor	Non-ex-pend. poor	Expend. poor	Non-ex-pend. poor
Gender of household reference person												
Male	64.5	75.3	52.6	69.0	59.5	63.3	65.9	69.7	52.3	64.4	56.7	66.2
Female	35.5	24.7	47.4	31.0	40.5	36.7	34.1	30.3	47.7	35.6	43.3	33.8
Age group												
16-25	3.5	1.7	7.3	2.0	3.0	1.2	13.3	6.3	8.1	4.7	4.5	4.1
26-35	20.7	15.4	18.7	13.4	14.5	15.3	17.8	15.8	10.8	16.2	18.9	15.6
36-45	27.6	25.2	22.8	25.0	29.7	26.9	26.4	27.3	15.2	22.7	26.1	28.6
46-55	22.4	24.9	21.9	23.6	22.0	24.5	12.6	24.7	12.5	22.3	19.3	21.4
56-65	12.1	15.3	12.0	14.8	11.6	16.3	7.4	11.2	10.4	17.5	10.5	15.1
66-75	6.2	9.6	12.1	15.4	9.3	9.7	8.8	8.8	11.2	10.7	8.4	9.6
76+	7.5	8.1	5.2	5.9	9.8	6.2	13.6	5.8	31.8	5.8	12.3	5.6
Marital status												
Never married	22.2	18.4	29.7	16.3	18.6	14.9	29.0	24.1	29.4	24.4	22.4	19.7
Married	52.0	62.9	41.9	67.2	66.2	71.8	52.1	59.7	36.4	57.5	58.3	65.2
Widowed	7.1	6.4	4.2	6.1	8.0	7.1	8.0	5.8	16.7	4.4	9.2	5.8
Divorced	18.6	12.3	24.2	10.5	7.2	6.3	10.9	10.4	17.4	13.7	10.1	9.3
Household size												
1 person	13.5	15.5	29.9	18.0	7.7	8.4	16.4	15.4	42.1	16.5	12.8	13.6
2 people	19.6	29.0	29.5	34.4	17.2	22.9	21.9	25.5	23.4	34.7	21.5	30.2
3 people	19.6	19.5	14.6	19.3	21.9	25.7	16.1	21.8	11.4	16.1	17.0	19.9
4 people	16.2	20.0	13.5	19.7	27.0	30.4	15.7	23.6	9.9	19.3	23.5	23.9
5 people	12.6	11.7	7.4	6.5	14.3	9.1	15.5	9.7	6.5	8.7	14.6	8.6
> 5 people	18.6	4.2	5.2	2.0	11.8	3.4	14.4	4.0	6.7	4.7	10.6	3.7

NB: Expend. = Expenditure.

Source: Authors' computation, EU-SILC 2009 (Austria), 2010 and 2012 (Finland); EU-SILC UDB; HBS 2010; Eurostat/ONS.

# Employment and (quasi-) joblessness, income poverty and the Europe 2020 'at-risk-of-poverty-or-social-exclusion' (ARPE) indicators





# 14

## Extensive versus intensive margin: changing perspective on the employment rate

Andrea Brandolini and Eliana Viviano <sup>(129)</sup>

### 14.1 Introduction

During the 1990s, the European economic policy discourse saw a significant shift of emphasis from the ‘unemployment rate’ toward the ‘employment rate’. The shift can be probably traced back to the ‘White Paper on growth, competitiveness and employment’ prepared by the Delors Commission, which focused primarily on unemployment reduction and job creation, but explicitly stated that policy should ‘raise levels of employment and not just lower levels of unemployment’ (Commission of the European Communities, 1993, p. 129). Increasing the employment rates, especially of women and elderly people, has since become a central concern of the European Employment Strategy, launched at the Luxembourg Jobs Summit in 1997 and translated into specific targets in the Lisbon agenda in 2000 (Goetschy, 1999). The Europe 2020 strategy sets that 75 % of the population aged 20-64 ‘should be employed’ by 2020 (European Commission, 2010).

Focusing on employment rates means accounting for the work potential of economically inactive persons in addition to the unemployed who are actively searching for a job. There are intuitively appealing reasons for this broadening of the scope of employment policies: reducing under-utilisation of resources to raise growth potential; counteracting the negative effects of an ageing population for the sustainability of social security systems; fostering social inclusion and gender equality (Commission of the European Communities, 1998, pp. 4-5). Yet, while fighting unemployment means creating conditions by which those wanting to work can more easily find the job they are looking for, raising employment means creating conditions by which a certain (minimal) proportion of people in working age actually work. The first objective takes as given people’s decision whether to work or not, whereas the second objective implies influencing the decision of people to participate in the labour market in order to push more of them to work. Clearly, this shift implies significant changes in the underlying normative views (Brandolini and Viviano, 2015). However, there are no less important statistical issues.

According to the definition of the employment rate set by the International Labour Office (ILO), 1 hour of work during a reference week is sufficient to be classified as employed. This is very crude. In the face of the wide diversity of working times and contract durations, should we not have a more nuanced approach to the measurement of employ-

<sup>(129)</sup> Bank of Italy, Directorate General for Economics, Statistics and Research. We thank Anthony B. Atkinson, Vincent Corluy, Francesco D’Amuri, Giuseppe Ferrero, Anne-Catherine Guio, Eric Marlier, Marco Paccagnella, Sophie Ponthieux, Alfonso Rosolia, Wiemer Salverda, Frank Vandenbroucke and Roberta Zizza for valuable comments. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission and the Bank of Italy bear no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [andrea.brandolini@bancaitalia.it](mailto:andrea.brandolini@bancaitalia.it).

ment levels, differentiating across the various work arrangements? In part, this is done by the European Commission (2012) when it reports information on ‘full-time equivalent employment’ and ‘very low work intensity’. The full-time equivalent employment rate assigns part-time workers a weight lower than one and equal to the ratio of the average number of hours worked in part-time jobs to the average number of hours worked in full-time jobs. It adjusts for part time, though not for overtime work. People hired on a temporary basis are counted as employed only if they are working in the reference period. However, the overall time worked during a year by somebody hired on a fixed-term basis may be lower than that worked by somebody hired on a permanent basis, since temporary jobs often last for short periods and may alternate with non-employment spells. Work intensity can account also for this aspect by measuring the fraction of total work potential actually worked by an adult during the whole year, but this indicator is only used to identify the (quasi-)jobless households in the calculation of the individuals who are ‘at risk of poverty or social exclusion’ (AROPE) in the Europe 2020 strategy (see Chapters 1 and 3 of this volume for definitions). Neither the allowance for part time nor the notion of work intensity is used to adjust, or to qualify, the European employment target, which is framed as a pure headcount ratio for individuals.

In this chapter, we argue that it is worth supplementing the partial information conveyed by the standard headcount employment rate with a rate that adjusts the employment status for the total time worked by an individual during a year (normalised by the average annual hours of work of a person employed full-time throughout the year). Indeed, a glimpse at the official figures for the EU shows that, between 2001 and 2011, the employment rate of the population aged 15 to 64 years rose from 62.6 to 64.3 %, but the corresponding rate adjusted for part time only marginally increased from 58.3 to 58.6 %; and these numbers may fail to account for the shorter work periods of employees hired on a fixed term basis, whose share rose from 12.4 to 14.1 % (European Commission 2012, p. 403). Something is clearly missing if we evaluate the performance of EU labour markets only in terms of the standard employment rate. The broader measure of employment adjusted for work intensity bet-

ter captures the variety of working time arrangements, but it also accounts for the different value judgement where work intensity, rather than having a job, has intrinsic value. Work intensity has the further advantage that it can be straightforwardly aggregated across individuals to calculate the corresponding household-level indicator. The construction of an intensity-adjusted employment rate for households can shed new light on the puzzling little association between household jobless rates and relative income poverty ratios (de Beer, 2007; Frazer and Marlier, 2010; Ponthieux, 2010; Cantillon, 2011; de Graaf-Zijl and Nolan, 2011; Vandenbroucke and Vleminckx, 2011; Marx, Vandenbroucke and Verbist, 2012; Vandenbroucke and Diris, 2014; Chapter 15 of this volume).

This chapter is organised as follows. In Section 14.2 we derive our measures of work intensity for individuals and households. In Section 14.3 we show how to calculate work intensity from EU-SILC, while in Section 14.4 we compare the evidence from EU-SILC with that from the European Labour Force Surveys (EU-LFS) which is the benchmark for labour market statistics. In Section 14.5 we examine the distribution of work intensity among individuals and households. In Section 14.6 we present the estimates of the weighted employment rate for both individuals and households in the EU countries. We conclude in Section 14.7. Tables are gathered at the end of the chapter.

## 14.2 Accounting for work intensity

The standard employment rate  $ER$ , as defined by the ILO, is the average over a given population of size  $P$  of the indicator  $E_i$  that takes value 1 if person  $i$ , with  $i=1, \dots, P$ , has worked for at least 1 hour during the reference week and 0 otherwise:

$$(1) \quad ER = \frac{1}{P} \sum_{i=1}^P E_i .$$

$ER$  is computed over the working-age population. It measures the ‘extensive’ margin of labour, but ignores its ‘intensive’ margin: people working just 1 hour per week are treated as people working 40 hours. In the same vein, those working for just



1 day during the reference period enter with unit weight in the computation of  $ER$  just like those employed on a permanent basis.

The employment rate can be adjusted for differences in the intensive margin by weighting the individual indicator  $E_i$  by a measure of person  $i$ 's work intensity,  $\omega_i$ . The weighted employment rate  $WER$  can be defined as:

$$(2) \quad WER = \frac{1}{P} \sum_{i=1}^P \omega_i E_i.$$

See Brandolini and Viviano (2015) for a more general treatment of the adjustment for work intensity, allowing also for a broader range of normative values.

We define work intensity  $\omega_i$  as the total number of (paid) hours worked by person  $i$  during a year as a ratio to the average number of hours worked yearly by a full-time full-year employed. (The choice of the time span for work intensity is arbitrary but inconsequential.) The information on annual hours of work is rarely collected in income and labour force surveys, but information may be available on the fraction of a year spent in employment (measured in months in EU-SILC) and the average working time for a certain time unit. Thus, we may write work intensity as the product of three terms:

$$(3) \quad \omega_i = \mu_i \nu_i \theta_i = \left( \frac{m_i}{12} \right) \left( \frac{w_i}{4.3} \right) \left( \frac{h_i}{H} \right).$$

The term  $\mu_i$  is the fraction of months worked during the year, where  $m_i$  is the number of months worked by  $i$ . The term  $\nu_i$  is the number of weeks worked per month  $w_i$  relative to its maximum value 4.3 (=30/7). The term  $\theta_i$  indicates the hours worked in the reference week, normalised by a benchmark level  $H$ . As discussed by Brandolini and Viviano (2015),  $H$  can be set with reference to physical limits, legal and customary norms, or actual behaviours. We fix  $H$  at 40 hours, which is the median number of hours usually worked per week by employed working-age persons in the period 2007-2011 in the EU as a whole. As shown in Figure 14.1, this is the median value in the large majority of EU Member States. Thus, the benchmark annual hours worked by the standard person is assumed to be 2 064 (=12×4.3×40). This value exceeds actual hours of work as it does not correct for any paid absence

from work, like holidays and sickness absence, but any other fixed value would only change proportionately all estimates, leaving unaffected country rankings and relative indices. The choice of a unique benchmark for all EU countries allows for cross-country comparisons.

Neither the EU-LFS nor the EU-SILC collects all the information necessary to compute (3). In the EU-LFS, it is not possible to derive an annual measure of time spent working. In EU-SILC, we have an estimate of  $m_i$  and we can extrapolate  $h_i$  from the information on the average number of hours worked per week, under the assumption that the length of the working week is constant during the previous calendar year and is the same as the one observed at the date of the interview. Lacking any information, we assume that  $w_i$  equals 4.3, i.e. that all employed persons work for the whole month. This may understate the work intensity of the self-employed, who typically enjoy fewer days of holidays than employees, and produce biased estimates of the work intensity of people employed for less than a full month, as in EU-SILC people working for at least 2 weeks are recorded as working for the whole month, while those working less than 2 weeks are recorded as not working at all. This implies that our measure of work intensity is (unfortunately) more precise for those who have a stable dependent employment and it is probably biased for those with unstable working time.

To sum up, we estimate the weighted employment rate in EU-SILC as:

$$(4) \quad \begin{aligned} WER &= \frac{1}{P} \sum_{i=1}^P \omega_i E_i \\ &= \frac{1}{P} \sum_{i=1}^P \mu_i \nu_i \theta_i E_i \\ &= \frac{1}{P} \sum_{i=1}^P \left( \frac{m_i}{12} \right) \left( \frac{h_i}{40} \right) E_i, \end{aligned}$$

where by definition  $\omega_i$  equals 0 for people who do not work. If all employed work exactly 40 hours per week throughout the year,  $\omega_i$  equals 1 for all  $i$  and  $WER$  coincides with  $ER$ . If they instead work more than 40 hours, the average  $\omega_i$  exceed 1 and  $WER$  is higher than  $ER$ . By construction, the index (4) does not depend on the size of the population. It is

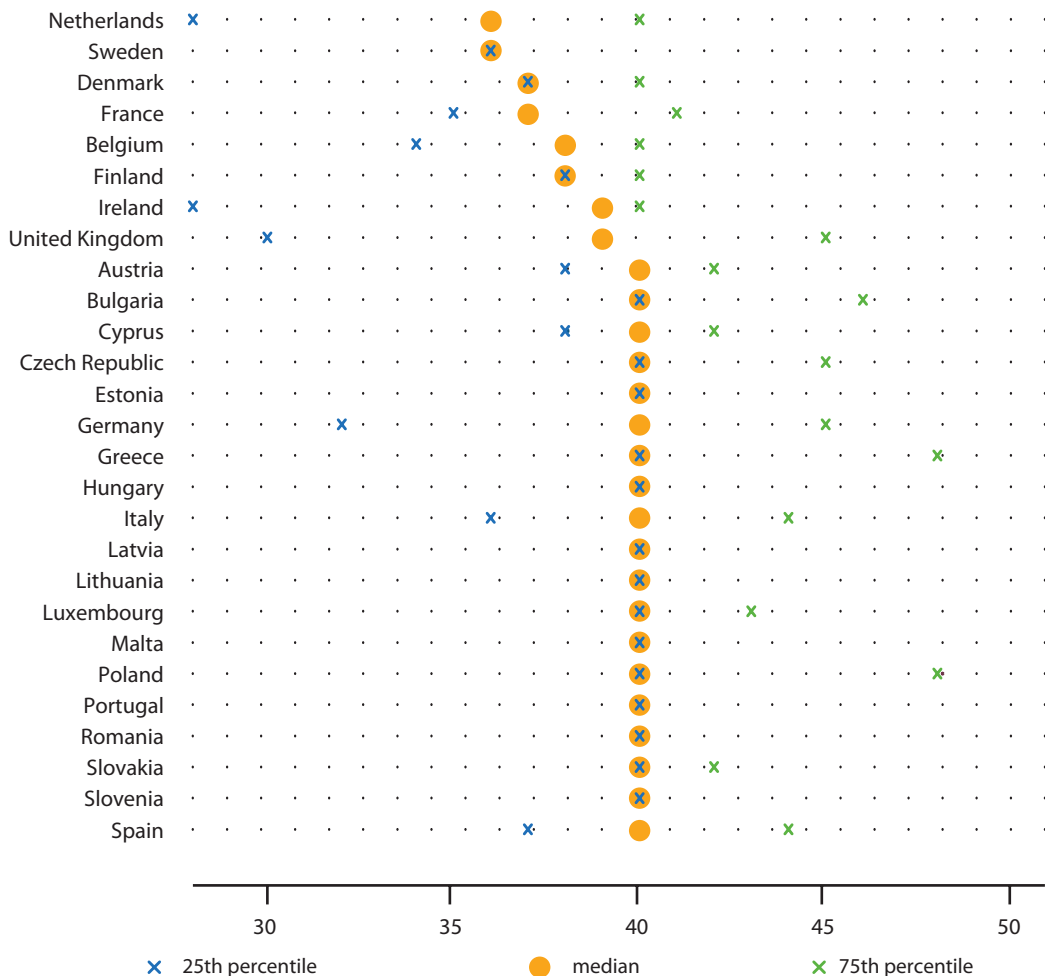
homogenous of degree 1 in  $h_i$ ; as the benchmark value  $H$  is kept constant at 40 hours, the weighted employment rate doubles whenever hours of work double for all employed, hence signalling an increase in the workload.

In (4), the dichotomous individual employment indicator  $E_i$  used to compute  $ER$  is replaced by the

continuous intensity-adjusted employment indicator  $\omega_i E_i$ , or simply  $\omega_i$ . It is then possible to analyse its distribution across the population using standard tools like inequality indices. Moreover, the indicator  $\omega_i$  can be aggregated across individuals at the household level, establishing a link with measures of household joblessness.

**Figure 14.1:** Distribution of usual weekly hours in all jobs of working-age employed (16-64) in 2007-2011 by country (pooled years)

(number of hours)



NB: Countries are ranked in ascending order of median weekly hours for all employed population.

Reading note: Each point corresponds to the median of the national distribution of weekly usual working time calculated for the pooled years 2007-2011; each point denoted by 'x' corresponds to the 25th or 75th percentile of the distribution (for some countries, not shown because of the overlapping with the median value).

Source: Authors' computation, EU-SILC UDB May 2013.

The jobless household rate *JHR* is the fraction of households where no one works according to the 1-hour-per-week criterion (e.g. Gregg and Wadsworth, 1996, 2008; Gregg, Scutella and Wadsworth, 2010). Similarly to the *ER*, the *JHR* is insensitive to the number of hours worked by those employed within the household; but it is also insensitive to how many household members work, provided that at least one is in employment. This is not the case for the Europe 2020 indicator of (quasi-)joblessness (i.e. very low work intensity), which considers the proportion of months worked by all adult household members. This idea underlies the extension to the household level of the index (4). If  $K_f$  is the number of potential workers in household  $f$ , we can compute the work intensity  $\omega_f$  of household  $f$  by averaging the work intensity of all these  $K_f$  members:

$$(5) \quad \omega_f = \frac{1}{K_f} \sum_{i=1}^{K_f} \omega_{if} E_{if},$$

where the sub-index  $if$  indicates member  $i$  of household  $f$ . Averaging across all households gives the household work-intensity-adjusted employment rate:

$$(6) \quad HWER = \frac{1}{F} \sum_{f=1}^F \omega_f = \frac{1}{F} \sum_{f=1}^F \frac{1}{K_f} \sum_{i=1}^{K_f} \omega_{if} E_{if},$$

where  $F$  is the number of households in the reference population. The indicator  $\omega_f$  can be interpreted as the share of total work from which each household eligible member can benefit even if he or she does not directly supply any work. As for the individual index, for a jobless household  $\omega_f$  equals 0.

Despite the close relationship between (4) and (6), the two indices differ for the reference population: for individuals employment rates are calculated for the working-age population, whereas for households they are computed for a sub-group of this population. As for the AROPE sub-indicator on (quasi-)joblessness, we consider eligible households those having at least one member aged between 18 and 59 who is not a dependent child, where dependent children are students younger than 25 years still living with at least one parent. We define potential worker any individual between 18 and 59 who is not a dependent child.

## 14.3 Calculation of work intensity from the EU-SILC data

The number of months worked in the year and the number of hours worked per week are the two EU-SILC variables that we use to estimate the weighted employment rate *WER*. We use the cross-sectional files. For worked months, we follow two slightly different procedures, owing to survey differences. For the period 2004-2007, we compute the number of months worked in the year prior to the interview as the sum of the variables *p1070* (number of months spent at full-time work) and *p1072* (number of months spent at part-time work). As in some months the main activity status is missing, we follow Eurostat's (2008) recommendation and calculate work intensity as the ratio of the number of worked months to the number of 'workable' months, i.e. the sum of *p1070*, *p1072*, *p1080*, *p1085*, *p1087* and *p1090* (after setting to zero any missing value in these variables). This implies imputing the work intensity recorded for the months where the activity status is known to the months where it is missing. For the period 2008-2010, this problem does not arise as the information on the number of months worked can, in principle, be computed as the sum of the variables from *p1073* through *p1076*. These variables record the number of months spent at work as full-time employee, part-time employee, full-time self-employed or family worker, and part-time self-employed or family worker, respectively. We retain all observations where up to three of these variables are missing, by setting equal to 0 the missing value(s), but we drop observations which have missing values for all four variables. For the total hours of work per week, in all years we calculate the sum of the variables *p1060* (usual hours in the main job) and *p1100* (usual hours in all other jobs), which refers to the year of the interview. Although this may exacerbate the misalignment between the timing of hours of work and that of months worked, we prefer trying to account for the total hours of work because it may be important for individuals who are forced to cumulate job positions to reach the desired working time. If the variable *p1100* is missing we set it equal

to zero. Finally, for all estimates we use the proper personal cross-sectional weights, either *pb040*, which sum to the country population of household members aged 16 and over, or *rb050*, which sum to the country population of household members of any age.

The proportion of missing values for months and hours of work is reported in Table 14.1. In most cases, this proportion is reassuringly low, but there are exceptions. For worked months, in all years but one missing values account for between 5 and 10 % of observations in Poland, and for more than 10 % in the United Kingdom. For weekly working time, the proportion of missing values exceeds 5 % in Portugal in all years and in three other cases. We do not attempt any imputation for these missing values but we instead exclude from our sample all individuals reporting them. This might bias our results in countries where missing values are more frequent.

## 14.4 Comparing the evidence from EU-SILC and the EU-LFS

In this chapter, we use EU-SILC because it contains information on the number of months worked during the year. By its continuous structure, also the EU-LFS employment rate captures some of the fragmentation of work experiences during the year, as the probability that an individual is classified as employed correlates positively with the fraction of the year spent at work. However, the EU-LFS does not allow us to estimate the level of work intensity for each individual which is necessary for distributive analysis and to calculate household-level indices. As the EU-LFS is the benchmark for labour market statistics, in this section we compare estimates from EU-SILC with the corresponding values from the EU-LFS drawn from the Eurostat web-database (data accessed on 18 July 2013).

Estimates from the two sources may diverge first of all because definitions differ. Following the ILO guidelines, in the EU-LFS persons are classified as employed if during the reference week they worked at least 1 hour or had a job from which they

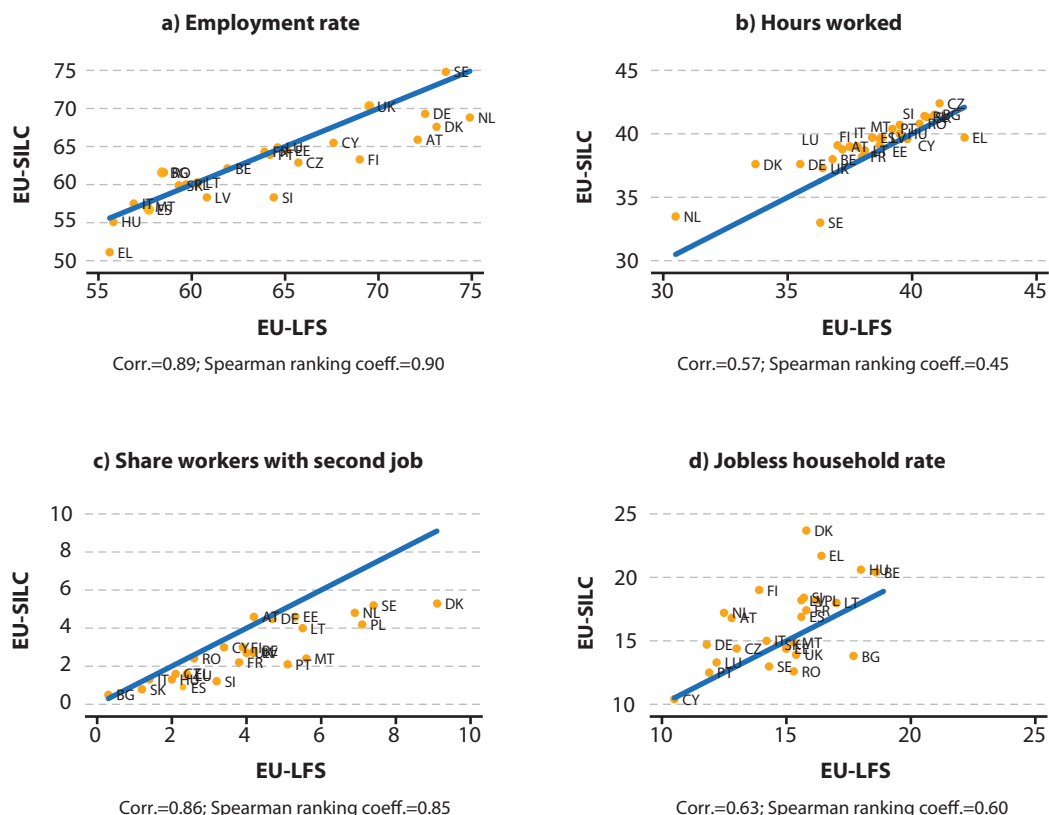
were temporarily absent, for instance due to illness. In EU-SILC, it is possible to derive at least two measures of the extensive-margin employment rate, both based on the occupational status declared by respondents: *i*) the situation at the time of the interview (variable *p1030* until Wave 2008, variables *p1030* or *p1031* for Waves 2009-10, and *p1031* for Wave 2011); *ii*) the working condition in the previous year. While the first measure is likely to be more comparable with the EU-LFS measure (as both refer to a current situation), only the second is fully consistent with *WER*, which refers to work intensity in the previous year. In both cases, the self-reported status may lead to underestimate employment, as many people working few hours at the time of the interview may not perceive themselves as employed. Similarly, defining the employment status in EU-SILC on whether a person has worked at least 1 month during the year may overstate employment levels because persons working for just 1 month count as those working for the whole year. Weekly working time is defined as actual worked hours in the EU-LFS and usual hours in EU-SILC, with a distinction in both surveys between main job and other jobs. (The EU-LFS collects usual working time only for the main job, and reports second jobs only if carried out in the reference week.) Differences between the two concepts arise from the treatment of sickness absence, holidays, extra hours worked due to a demand peak, or a shorter working time caused by demand slackness. Besides definitions, other causes for divergence between the two sources relate to the reference population (the lowest age for an employed person is 16 years in EU-SILC vis-à-vis 15 years in the EU-LFS), the time frame (the EU-LFS is conducted continuously and the reported estimates are yearly averages, while EU-SILC is carried out once per year) and the sample size (considerably smaller for EU-SILC than for the EU-LFS).

These differences show up in the employment statistics for the working-age population (see Figure 14.2). To ease comparison between the two surveys, in Figure 14.2a we report the EU-LFS employment rate, based on the ILO definition, and the EU-SILC rate, based on the current self-reported status, while in Table 14.2, we report also the EU-SILC measure based on the 1-month-in-the-year criterion. In 2011, in almost two thirds of cases, EU-SILC

(self-reported, current working condition) employment rate is lower than the EU-LFS figure; in eight countries, the absolute difference exceeds 5 % (see Figure 14.2a and Table 14.2). Except for two cases, hours worked per week in all jobs are higher in EU-SILC than in the EU-LFS, with discrepancies larger than 5 % in six countries (see Figure 14.2b and Table 14.3): given the focus on usual hours in the former and actual hours in the latter, this result may be expected in a year of poor economic conditions in many countries such as 2011. The share of people that declare to have more than one job is, some-

what counter-intuitively, understated in EU-SILC relative to the EU-LFS in almost all countries, in twelve cases by more than a third (see Figure 14.2c and Table 14.4). Jobless household rates (calculated on the basis of the current self-reported status) turn out to be higher in EU-SILC in all countries but two, and by more than a fifth in about half of the cases (see Figure 14.2d and Table 14.4). (The share of jobless households is consistently calculated for both sources as the ratio to the total number of private households of the number of households where no adult is working, excluding units composed solely

**Figure 14.2: Labour market statistics in the EU-LFS and EU-SILC in 2011**  
(% and mean number of hours)



NB: Working-age population includes persons aged 15-64 years in the EU-LFS and 16-64 years in EU-SILC; the EU-SILC employment rate is based on the current self-reported working status; the average hours worked per week are usual hours in EU-SILC and actual hours in the reference period in the EU-LFS; the jobless household rate is based on the self-reported current status in EU-SILC and the ILO definition of employment in the EU-LFS.

Reading note: The panels compare four labour market statistics from EU-SILC with the corresponding statistics from the EU-LFS; in each panel, the 45-degree line indicates the locus of points where statistics from the two sources coincide.

Source: Authors' computation, 2011 EU-LFS data and May 2013 EU-SILC UDB.

of students or solely inactive aged 65 and over.) In part, this result reflects the use of the self-reported status to define the working condition in EU-SILC. For employment rates and worked hours, the Pearson's and Spearman's correlation coefficients are generally high, around 0.8-0.9, and somewhat improving in more recent waves. In brief, the correspondence between EU-SILC and the EU-LFS for the examined statistics is far from perfect, but it is all in all acceptable, especially in the light of differences between the sources.

Due to the lack of alternative series, it is not possible to perform any comparison for the number of months worked in the year, which is also the variable used to derive the Europe 2020 AROPE sub-indicator on (quasi-)jobless households. Changes over time show a few large variations from one year to the next, although some of them may be explained by cyclical conditions (last columns of Table 14.1). As compared to the EU-LFS, the employment rate calculated on the basis of this variable does not differ much from the self-reported employment status, suggesting that the different definitions possibly matter less than other survey differences (see Table 14.2).

## 14.5 The distribution of work intensity in selected EU countries

Figure 14.3 compares the kernel density estimates of the distributions of individual and household work intensity in Germany, Italy, the Netherlands, Poland, Sweden and the United Kingdom in 2010. These countries are selected as representative of different labour market and social protection regimes, but they also differ in other relevant respects such as the demographic and household structures. For individuals (solid lines), the distribution is bimodal (except Sweden), with a first spike at 0 indicating the incidence of non-or very low employment, and a second spike around 1 indicating the share of standard-time workers (40 hours per week for the whole year). The Netherlands and Sweden exhibit low shares of non-employed but also of people working more than standard time;

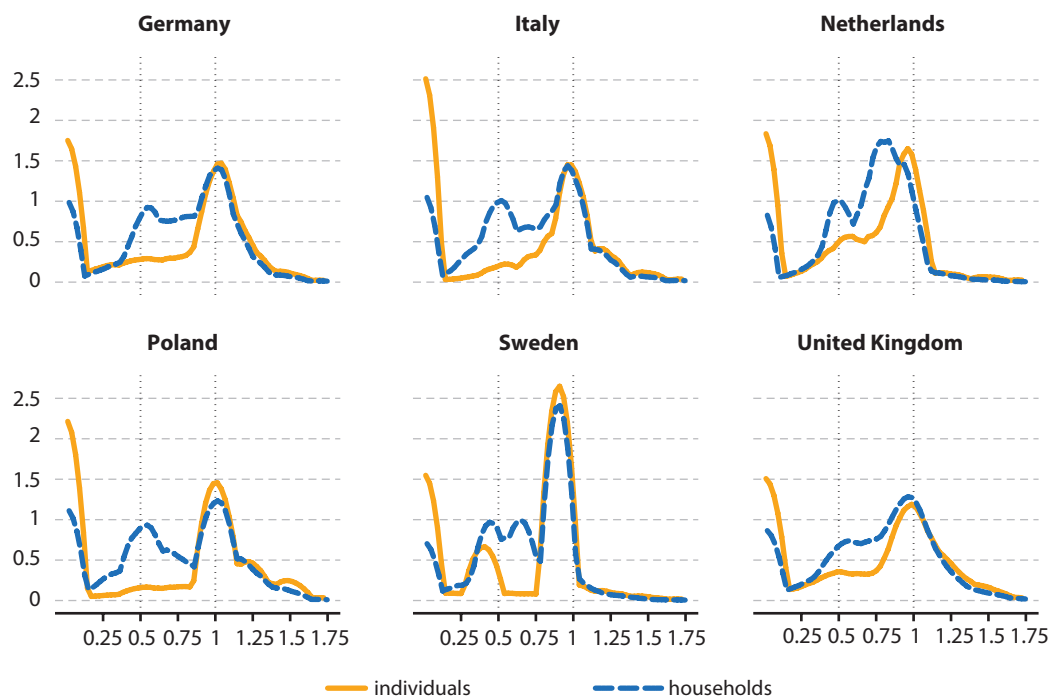
conversely, the incidence is high for work intensities comprised between 0 and 1. The shapes of the distributions are fairly similar in Germany, Italy and the United Kingdom, but the mass around zero is much higher in Italy while the distribution is more spread out in the United Kingdom. The distribution is far more polarised in Poland, where both the shares of those who do not work and that of those working full time throughout the year are very high.

For households (dashed lines), the distribution of work intensity is approximately trimodal by virtue of the combination of the different employment patterns within the households. In addition to the two spikes at 0 and 1, there is also some mass around 0.5, which is the work intensity that typically corresponds to couples, with or without dependent children, where only one adult works. This third mode is especially evident in Italy and Poland.

## 14.6 Weighted employment rates in European countries

Table 14.5 compares the headcount employment rates *ER*, based on the 1-month-in-the-year criterion, with the intensity-adjusted employment rates *WER*; the comparison for 2010 is also shown in the left panel of Figure 14.4. Henceforth, we switch to the 1-month-in-the-year criterion to calculate the extensive-margin of the employment rate because our focus on the difference between the extensive and the intensive margins of employment requires that the indices refer to the same time frame. Few figures appear to be somewhat odd, especially in early years (e.g. the United Kingdom in 2004), suggesting that EU-SILC has likely become more reliable over time, at least for some countries. Focusing on more recent years, as expected *WER* is considerably lower than *ER* in all countries. On average the discrepancy is close to 10 percentage points, but in Finland and the Netherlands it raises to 16-18 points and in Sweden it is well above 20 points, as shown in Figure 14.4. The ranking of countries changes considerably. Sweden falls from 1st to 8th position, Finland from 2nd to 13th, the Netherlands from 5th to 20th. On the contrary, some Eastern European countries jump to the

**Figure 14.3:** The distribution of work intensity of individuals and households in selected EU countries in 2011 (reference period 2010) (kernel densities)



NB: Individuals include persons aged 16-64; households include units with at least one member aged 18-59 who is not a dependent child or a student younger than 25.

Reading note: The figure shows, for each country, the kernel density estimations of the distribution of work intensity of individuals and households, calculated according to equations (3) and (5) in the text.

Source: Authors' computation, EU-SILC UDB May 2013.

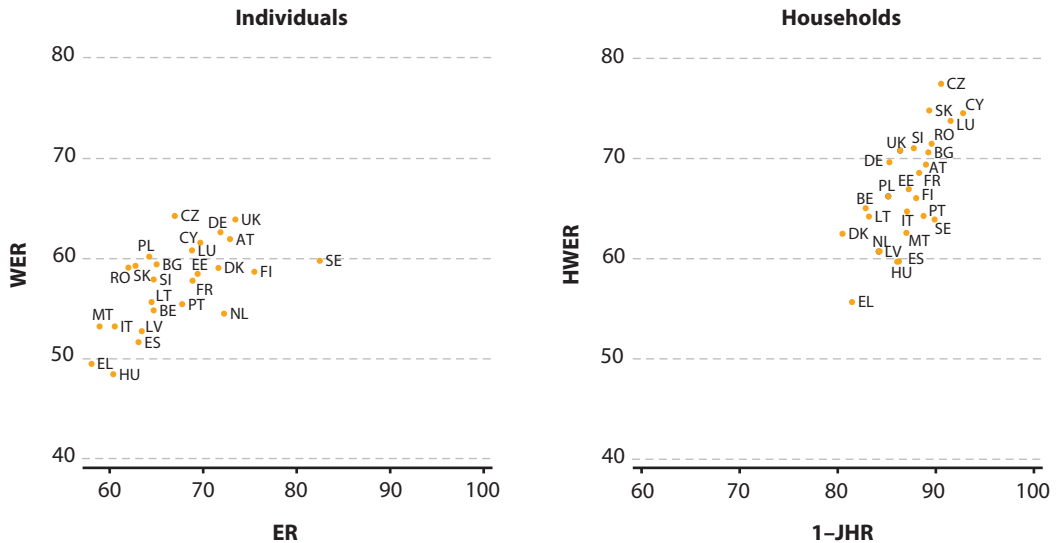
top of the list: Slovakia moves up from 21st to 10th position, Poland from 18th to 7th, and the Czech Republic from 13th to 1st. This reshuffling implies that, after 2007, the coefficient of variation for *WER* is systematically below that for *ER*. Accounting for work intensity narrows cross-national differences: the Nordic nations and the Netherlands converge to the (unweighted) mean from above, the Eastern nations converge from below, while the gap relative to the average remains virtually unaltered for Southern countries.

The two alternative measures do not show dramatically divergent time patterns, but there are in-

teresting differences during the Great Recession of 2008-2009. In several countries, *ER* reaches a peak in 2008 and then falls, or slows down, in the next 2 years, but *WER* shows an anticipated turning point, in 2007 instead of 2008. In part, this may reflect the statistical inconsistency stemming from combining the usual hours of work recorded at the time of the interview with the months worked in the previous calendar year. In part, however, it might also capture a fall in hours worked per employed in response to the economic downturn at the end of 2008, which in several countries was facilitated by the adoption of work-sharing schemes.

**Figure 14.4: Individual and household employment rates in EU countries in 2011 (reference period 2010)**

(%)



*NB:* Individuals include persons aged 16-64; households include units with at least one member aged 18-59 who is not a dependent child or a student younger than 25; *WER* and *HWER* are calculated according to equations (4) and (6) in the text, using the 1-month-in-the-year criterion. *Reading note:* The panels compare the extensive and the intensive margins of employment for individuals, on the left, and households, on the right.

*Source:* Authors' computation, EU-SILC UDB May 2013.

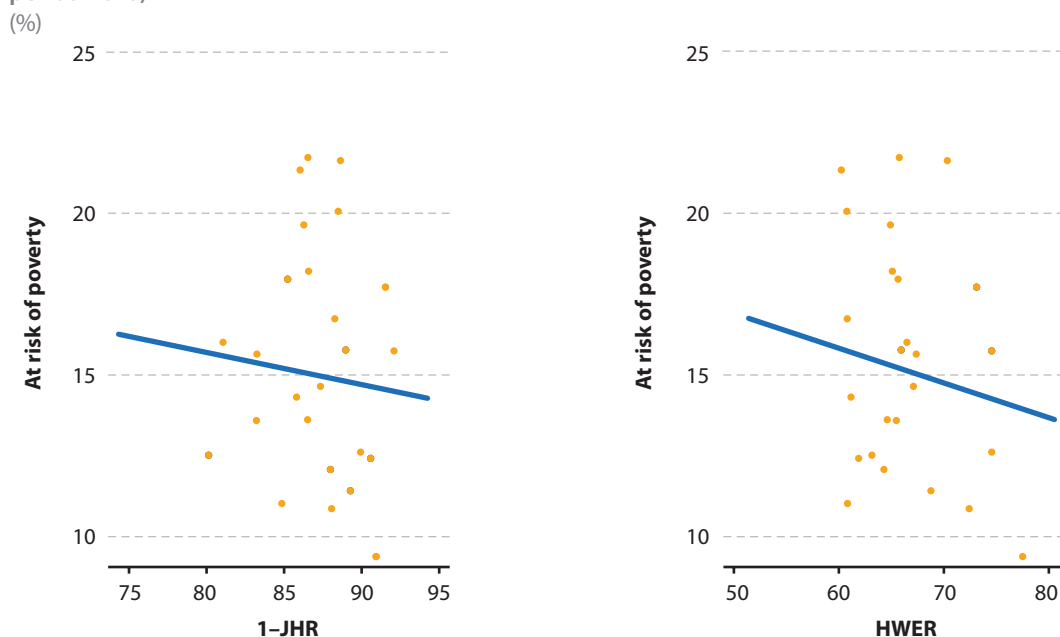
Table 14.5 reports the household employment rates *HWER* and the shares of households with at least one person employed  $1-JHR$ , both computed from EU-SILC for the same reference population and using the 1-month-in-the-year criterion for employment. The adjustment for worked hours is even larger for households than for individuals: *HWER* is systematically lower than  $1-JHR$  by 10 to 30 percentage points. The right panel of Figure 14.4 compares the two indices for 2010, using the same ranges on the horizontal and vertical axes of the left panel. This serves to illustrate that the employment rate for households is higher than for individuals, which means that many non-employed people live in households where somebody else is employed. This effect is particularly strong in Eastern Europe, but also in Belgium, Italy, France and Luxembourg. In 2010, the index *HWER* ranges from 55.8 % in Greece to 77.5 % in the Czech Republic: it exceeds 70 % in Luxembourg, the United Kingdom and many Eastern EU countries, falls to 68-69 % in Germany, Austria and France, and to between 60 and 66 % in Spain,

the Netherlands, Denmark, Sweden, Portugal, Italy, Belgium and Finland. In general, cross-national differences in employment rates appear to be lower than for individuals, especially between the North and South of Europe. In Southern countries the lower individual work participation is partly offset by the work of other household members.

Cantillon (2011, p. 439) notes a discrepancy between the trends in employment and poverty in the EU in 2004-2008 and shows that it can reflect both the fact that 'rising employment benefited workless households only marginally' and the fact that 'at-risk-of-poverty rates for households with low work intensity increased'. This observation suggests that adjusting for work intensity may increase the responsiveness of the household employment rate to changes in employment relative to a joblessness measure, and then lead to a somewhat stronger correlation with relative poverty. In Figure 14.5, we plot the share of individuals at risk of poverty in each country in 2010 (using a cut-off



**Figure 14.5: Household employment and relative poverty in EU countries in 2011 (reference period 2010)**



*NB:* Households include units with at least one member aged 18-59 who is not a dependent child or a student younger than 25.

*Reading note:* The figure compares the at-risk-of-poverty rate with the complement to the jobless household rate, based on the 1-month-in-the-year definition, in the left panel, and the *HWER*, based on (6), in the right panel.

*Source:* Authors' computation, EU-SILC UDB May 2013.

at 60 % of the overall median equivalised income (EU definition)) against *1-JHR*, in the left panel, and *HWER*, in the right panel. The relative poverty rate is computed for the same household population considered in the two employment indices. While the correlation is weakly negative for both indices, it is statistically significant only for *HWER* (at 5 %).

## 14.7 Conclusions

In this chapter, we have shown how the employment rate can be modified to measure not only how many people work but also how much they work. The adjustment for work intensity is based

on an estimate of total annual hours of work as approximated by the number of months worked per year and the number of hours worked per week. This measure sheds new light on the cross-country comparison of employment rates for both individuals and households. After adjusting for work intensity, the gap between Northern Europe and Southern and Eastern Europe in the amount of labour supplied by individuals narrows. Differences are even smaller for households. Our estimates could be improved in many respects. Yet, they highlight the importance of finding new flexible measures of labour market phenomena and, consequently, the need to enrich the informational basis on which these measures are estimated.

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**Table 14.1:** Missing values for months worked per year and usual hours of work and months worked in the year for working-age individuals (16-64 years) in 2004-2011 (% and average number of months)

Country	Missing values of months worked per year					Missing values of usual hours of work					Average number of months worked in the year											
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	0.0	0.6	0.6	0.5	0.0	0.0	0.0	0.9	1.0	0.9	0.1	0.5	0.3	0.3	7.1	7.2	7.2	7.4	7.4	7.2	7.3	7.3
Bulgaria	-	-	-	0.0	0.0	0.0	0.0	-	-	-	0.1	0.0	0.0	0.0	-	-	-	7.5	7.7	7.6	7.3	7.3
Czech Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	8.2	7.6	7.7	7.8	7.6	7.5	7.5
Denmark	1.0	1.4	1.4	0.7	0.9	2.6	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.1	8.2	8.2	8.2	8.3	8.5	8.3	8.1	8.1
Germany	0.0	0.0	1.1	1.3	0.0	0.0	0.0	1.3	0.8	0.5	0.3	0.1	0.0	0.0	7.1	7.5	7.7	7.9	8.0	8.1	8.2	8.2
Estonia	0.0	0.0	0.9	0.9	0.9	1.0	0.8	0.1	0.1	0.0	0.2	0.2	0.2	0.4	7.8	8.1	8.1	8.4	8.3	7.6	7.5	7.5
Ireland	1.0	0.3	2.9	1.9	1.8	-	-	1.0	1.2	1.1	1.1	1.2	-	-	7.2	7.3	7.4	7.2	6.3	-	-	-
Greece	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.9	0.0	0.0	7.2	7.1	7.1	7.3	7.4	7.3	6.6	6.6
Spain	0.0	0.0	0.0	0.6	1.8	2.1	1.1	0.4	1.5	1.8	3.3	5.7	4.2	2.9	7.5	7.5	7.7	7.9	7.8	7.3	7.0	7.0
France	0.0	1.1	0.6	0.6	0.6	0.8	1.1	1.1	1.1	1.0	0.9	0.8	0.9	0.8	7.6	7.6	7.6	7.7	7.8	7.6	7.7	7.7
Italy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	6.8	6.8	6.9	7.0	7.2	6.9	6.9	6.9
Cyprus	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	7.6	7.8	7.8	7.9	7.9	-	7.7	7.7
Latvia	0.0	0.0	0.0	0.0	1.6	1.0	1.2	3.3	0.5	0.3	0.6	0.6	0.4	0.5	7.8	8.0	8.2	8.3	8.1	7.0	6.9	6.9
Lithuania	0.0	0.0	0.3	0.6	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	7.5	8.0	8.0	8.0	7.4	7.1	7.1
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.4	0.1	0.1	7.6	7.9	7.8	7.8	7.8	7.9	7.8	7.8
Hungary	0.0	0.0	0.5	0.0	0.2	0.0	0.0	7.8	0.1	0.0	0.0	3.9	0.0	4.2	8.0	6.8	7.0	6.8	6.8	6.6	6.6	6.6
Malta	-	-	-	-	0.0	0.0	0.0	-	-	-	-	2.0	1.6	1.4	-	-	-	-	6.7	6.7	6.7	6.7
Netherlands	1.0	1.3	0.5	0.8	0.5	0.4	0.4	0.0	0.8	0.9	0.8	1.1	1.2	0.9	7.9	7.8	7.7	8.0	8.1	8.1	8.2	8.2
Austria	0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.3	1.3	0.8	0.3	0.2	0.4	0.3	8.0	7.8	7.8	8.0	8.1	8.0	8.0	8.0
Poland	0.0	5.2	7.3	7.8	9.4	8.7	8.8	0.1	0.1	0.0	0.1	0.0	0.0	0.0	6.1	6.5	6.8	7.1	7.2	7.2	7.2	7.2
Portugal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	6.2	5.5	7.2	7.0	7.5	6.6	8.0	7.9	7.8	8.0	7.9	7.6	7.7	7.7
Romania	-	-	-	0.0	0.0	0.0	0.0	-	-	-	2.2	3.5	3.3	3.3	-	-	-	7.2	7.3	7.3	7.3	7.3
Slovenia	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	6.8	7.3	7.2	7.4	7.6	7.5	7.4	7.4
Slovakia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.1	0.0	0.0	0.0	7.2	7.4	7.5	7.7	7.7	7.2	7.1	7.1
Finland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	3.1	0.0	0.0	0.0	0.0	0.0	7.8	8.0	8.1	8.2	8.0	7.7	7.7	7.7
Sweden	1.1	3.5	1.2	1.8	2.6	3.5	2.1	4.2	3.9	1.8	0.4	3.1	1.3	0.5	8.7	8.8	9.0	8.9	9.0	8.9	8.9	8.9
United Kingdom	13.8	10.6	10.7	14.1	22.7	12.6	0.0	1.5	0.9	1.3	1.3	11.9	0.8	1.3	8.4	7.7	7.8	7.5	7.6	8.0	8.4	8.4

Reading note: The average number of months worked in 2010 was 7.3 in Belgium, whereas the percentage of missing values was close to zero.

Source: Authors' computation, EU-SILC UDB May 2013.

**Table 14.2:** Employment rates of the working-age population in the EU-LFS and EU-SILC in 2004-2011 (%)

Country	EU-LFS: ILO definition										EU-SILC: self-reported current status										EU-SILC: at least 1 month worked in the year									
	2004	2005	2006	2007	2008	2009	2010	2011	2004	2005	2006	2007	2008	2009	2010	2011	2004	2005	2006	2007	2008	2009	2010	2011						
Belgium	60.5	61.1	61.0	62.0	62.4	61.6	62.0	61.9	59.7	61.7	62.0	62.5	62.3	61.8	62.1	62.0	63.1	63.7	65.8	65.0	63.9	64.7	64.7							
Bulgaria	55.1	55.8	58.6	61.7	64.0	62.6	59.7	58.4	—	—	—	64.1	64.7	63.0	61.6	—	—	68.6	69.1	67.5	65.0	—	—							
Czech Republic	64.1	64.8	65.3	66.1	66.6	65.4	65.0	65.7	62.8	62.5	63.1	64.3	63.9	62.6	62.9	67.8	66.3	66.6	67.4	68.4	67.6	67.0	67.0							
Denmark	76.0	75.9	77.4	77.0	77.9	75.3	73.3	73.1	69.3	69.0	69.3	69.7	70.4	68.9	67.6	72.6	72.6	71.9	72.4	73.1	72.4	71.6	71.6							
Germany	64.3	65.5	67.2	69.0	70.1	70.3	71.1	72.5	57.9	67.9	65.2	66.4	66.8	67.7	69.3	63.2	65.7	67.9	69.2	70.6	70.8	71.8	71.8							
Estonia	62.9	64.4	68.1	69.4	69.8	63.5	61.0	65.1	66.2	68.2	70.2	69.9	65.0	60.8	64.5	69.5	72.5	72.9	75.7	75.4	71.2	69.4	69.4							
Ireland	65.5	67.6	68.7	69.2	67.6	61.9	59.6	58.9	61.1	61.6	61.6	59.6	54.1	—	—	66.3	66.8	69.5	67.6	54.9	—	—	—							
Greece	59.6	60.1	61.0	61.4	61.9	61.2	59.6	55.6	60.4	60.3	60.8	62.3	61.6	60.8	51.1	63.9	63.1	62.9	64.5	65.1	65.1	58.0	58.0							
Spain	60.9	63.3	64.8	65.6	64.3	59.8	58.6	57.7	62.0	63.0	64.1	64.9	60.2	59.1	56.7	67.5	67.7	69.4	71.5	70.8	67.5	63.1	63.1							
France	63.3	63.7	63.6	64.3	64.8	64.0	63.9	63.9	63.8	63.9	63.6	64.7	63.7	63.0	64.3	68.3	68.1	67.8	69.0	69.4	68.0	68.8	68.8							
Italy	57.7	57.6	58.4	58.7	58.7	57.5	56.9	56.9	56.7	57.7	58.2	59.1	57.5	57.4	57.5	59.9	60.3	59.7	60.8	62.1	59.7	60.5	60.5							
Cyprus	69.4	68.5	69.6	71.0	70.9	69.0	68.9	67.6	64.8	66.2	66.1	67.2	65.3	—	65.5	67.4	69.4	70.2	70.4	69.5	—	69.7	69.7							
Latvia	62.2	63.3	66.3	68.3	68.6	60.9	59.3	60.8	65.5	67.3	68.3	67.9	59.2	56.0	58.3	69.9	70.5	71.9	73.7	72.4	66.3	63.4	63.4							
Lithuania	61.4	62.6	63.6	64.9	64.3	60.1	57.8	60.3	62.1	63.9	67.7	67.6	62.6	59.4	60.2	65.3	68.0	71.7	71.2	71.3	67.0	64.5	64.5							
Luxembourg	62.5	63.6	63.6	64.2	63.4	65.2	65.2	64.6	64.1	65.8	65.2	65.4	64.0	65.1	64.9	67.2	69.2	68.5	69.4	68.2	69.0	68.8	68.8							
Hungary	56.6	56.9	57.3	57.3	56.7	55.4	55.4	55.8	62.7	57.7	58.2	56.0	56.1	55.0	55.1	69.3	61.5	63.1	61.5	60.8	60.1	60.4	60.4							
Malta	53.4	53.9	53.6	54.6	55.3	55.0	56.1	57.6	—	—	—	—	56.5	56.7	57.1	—	—	—	—	59.0	58.2	58.9	58.9							
Netherlands	73.1	73.2	74.3	76.0	77.2	77.0	74.7	74.9	62.0	67.6	68.9	69.8	69.6	69.0	68.8	71.4	70.4	69.2	70.5	70.9	70.9	72.2	72.2							
Austria	66.5	68.6	70.2	71.4	72.1	71.6	71.7	72.1	66.3	64.6	64.7	65.8	65.0	65.5	65.9	70.8	69.9	70.5	71.9	72.8	73.0	72.9	72.9							
Poland	51.4	52.8	54.5	57.0	59.2	59.3	59.3	59.7	50.4	53.9	56.7	59.0	59.6	59.8	60.0	55.8	59.4	62.0	64.1	64.7	64.3	64.2	64.2							
Portugal	68.0	67.5	67.9	67.8	68.2	66.3	65.6	64.2	67.0	67.2	66.6	68.0	64.6	63.5	63.9	70.2	69.8	68.9	70.7	69.6	67.2	67.8	67.8							
Romania	58.7	57.6	58.8	58.8	59.0	58.6	58.8	58.5	—	—	—	60.1	60.1	61.5	61.6	—	—	—	61.3	61.9	62.2	62.0	62.0							
Slovenia	65.6	66.0	66.6	67.8	68.6	67.5	66.2	64.4	58.1	59.7	60.1	61.4	61.0	59.2	58.3	60.1	63.9	63.1	64.1	66.3	65.4	64.7	64.7							
Slovakia	56.7	57.7	59.4	60.7	62.3	60.2	58.8	59.3	61.2	63.1	63.2	65.3	63.0	60.4	59.9	63.8	65.3	64.9	67.1	66.9	63.9	62.8	62.8							
Finland	68.3	68.4	69.3	70.3	71.1	68.7	68.1	69.0	66.4	65.6	66.8	67.6	66.2	62.8	63.3	77.1	76.3	77.7	78.1	78.7	76.2	75.5	75.5							
Sweden	72.4	72.5	73.1	74.2	74.3	72.2	72.1	73.6	72.4	73.8	74.8	74.4	73.6	74.3	74.8	82.4	81.9	83.7	83.9	83.0	82.5	82.5	82.5							
United Kingdom	71.5	71.7	71.6	71.5	71.5	69.9	69.5	69.5	71.4	71.3	72.7	72.7	69.9	69.2	70.3	85.0	75.4	76.0	76.7	63.5	67.6	73.4	73.4							
Correlation	—	—	—	—	—	—	—	—	0.73	0.82	0.79	0.80	0.85	0.88	0.89	0.71	0.79	0.73	0.75	0.64	0.78	0.85	0.85							
Rank correlation	—	—	—	—	—	—	—	—	0.63	0.79	0.78	0.80	0.87	0.88	0.91	0.69	0.79	0.79	0.80	0.73	0.85	0.89	0.89							

NB: The working-age population includes persons aged 15-64 years in the EU-LFS and 16-64 years in EU-SILC; Pearson's correlation coefficients and Spearman's rank correlation coefficients are computed between the EU-SILC estimates and the corresponding EU-LFS estimates.

Reading note: The employment rate in 2010 in Belgium was 62.0% according to the EU-LFS against the EU-SILC values of 61.8% using the information on the self-reported status and 64.7% using the 1-month-in-the-year criterion.

Source: Authors' computation, 2004-2011 EU-LFS data and May 2013 EU-SILC UDB.

**Table 14.3:** Hours worked per week in main job and in all jobs by the working-age population in the EU-LFS and EU-SILC in 2005-2011  
(number of hours)

Country	EU-LFS: actual hours in main job					EU-SILC: usual hours in main job					EU-LFS: actual hours in all jobs					EU-SILC: usual hours in all jobs												
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011							
Belgium	370	36.8	371	36.8	36.8	36.9	36.8	38.5	38.4	38.0	38.1	37.9	38.0	37.5	37.3	37.6	37.3	37.3	37.5	37.3	39.0	39.0	38.4	38.5	38.4	38.4	38.6	
Bulgaria	41.1	41.4	41.6	41.6	41.4	41.2	40.9	—	—	—	—	42.3	42.1	41.6	41.5	41.7	41.8	41.5	41.3	40.9	—	—	—	—	46.5	42.4	41.9	41.7
Czech Republic	41.9	41.8	41.7	41.7	41.5	41.2	41.1	43.2	43.0	43.1	43.1	42.8	42.6	42.4	42.2	42.1	41.9	42.0	41.8	41.5	41.4	43.6	43.4	43.5	43.4	43.2	43.0	42.8
Denmark	35.6	35.3	34.4	34.1	33.7	33.6	33.7	38.1	38.2	37.8	37.5	37.2	37.3	37.6	35.6	35.3	34.4	34.1	33.7	34.7	34.7	38.1	38.2	37.8	38.3	37.9	37.8	38.2
Germany	35.7	35.6	35.5	35.6	35.7	35.7	35.5	37.1	32.9	35.8	36.4	37.6	37.4	37.6	36.0	35.9	35.8	36.0	36.0	36.1	35.9	37.8	33.5	36.3	36.9	38.1	37.9	38.0
Estonia	39.7	39.7	39.5	39.5	38.7	38.8	38.7	40.4	40.2	39.9	39.8	39.3	39.1	39.1	40.1	40.2	39.9	39.9	39.2	39.4	39.4	40.9	40.8	40.6	40.5	40.1	40.0	39.9
Ireland	36.8	36.6	36.4	36.1	35.2	35.0	34.9	37.0	36.3	36.4	36.0	35.1	—	—	36.8	37.0	36.9	36.6	35.6	35.4	35.3	37.5	36.8	37.0	36.4	35.4	—	—
Greece	43.1	42.7	42.5	42.4	42.5	42.3	42.1	42.0	42.0	42.2	42.2	42.2	40.1	39.5	39.7	43.6	43.2	43.0	43.0	43.1	42.9	42.5	42.9	43.7	43.3	43.1	40.9	40.2
Spain	39.4	39.4	39.3	39.1	38.8	38.6	38.4	40.6	40.3	40.5	39.7	39.5	39.5	39.7	39.8	39.8	39.7	39.5	39.2	39.0	38.7	40.9	40.5	40.8	40.1	39.9	39.8	39.9
France	38.0	38.1	38.1	38.0	38.0	38.0	38.0	37.9	37.9	37.8	38.2	38.1	38.2	38.2	38.4	38.5	38.6	38.5	38.5	38.5	38.5	38.3	38.3	38.1	38.7	38.5	38.6	38.5
Italy	38.6	38.5	38.4	38.2	38.0	37.8	37.5	39.7	39.4	39.6	39.3	38.1	38.9	39.0	38.8	38.7	38.6	38.4	38.2	38.0	37.7	40.1	39.8	40.0	39.7	38.5	39.3	39.2
Cyprus	40.4	40.2	40.2	40.2	40.3	40.1	39.8	41.7	41.9	41.0	40.5	40.1	—	39.6	41.1	40.9	40.8	40.8	40.9	40.5	40.3	42.4	42.8	42.0	41.3	40.7	—	40.4
Latvia	41.2	41.4	40.7	40.1	39.3	38.8	38.8	43.2	42.5	42.1	41.5	40.1	39.8	39.7	42.2	42.4	41.8	41.2	40.1	39.5	39.6	44.2	43.8	43.0	42.7	41.1	40.6	40.3
Lithuania	38.4	38.6	38.8	39.1	38.6	38.4	38.1	40.0	40.1	39.8	39.4	38.9	38.6	38.7	39.3	39.5	39.7	39.9	39.4	39.2	38.9	41.9	41.6	41.2	40.5	39.8	39.6	39.8
Luxembourg	37.5	37.3	36.7	36.7	37.2	37.2	37.0	39.4	39.3	39.4	39.6	39.3	39.5	39.1	37.7	37.5	36.9	36.9	37.5	37.6	37.3	39.7	39.5	39.7	39.8	39.6	39.7	39.3
Hungary	40.3	40.3	40.2	40.1	39.8	39.8	39.5	41.3	41.0	41.0	40.7	40.3	40.1	40.0	40.6	40.6	40.4	40.3	40.1	40.1	39.8	42.0	41.5	41.3	41.1	40.7	40.5	40.3
Malta	39.4	39.2	39.1	39.0	38.9	38.8	38.7	—	—	—	—	—	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.5	—	—	—	—	40.2	40.2	40.2
Netherlands	30.7	30.9	30.8	30.8	30.6	30.6	30.5	34.9	33.5	33.5	33.5	33.5	33.6	33.5	31.3	31.6	31.5	31.5	31.3	31.3	31.2	35.7	34.1	34.2	34.2	34.2	34.3	34.2
Austria	39.3	39.2	38.9	38.5	38.1	37.8	37.8	38.4	38.0	38.6	38.8	38.8	39.3	39.0	39.9	39.8	39.5	39.1	38.6	38.3	38.4	38.9	38.4	39.1	39.6	39.6	40.1	39.8
Poland	40.9	40.9	41.0	41.0	40.7	40.6	40.5	41.9	41.8	41.3	41.3	41.0	41.3	41.4	42.0	41.9	42.0	42.0	41.7	41.6	41.4	43.1	42.9	42.3	42.4	42.2	42.4	42.4
Portugal	39.2	39.1	39.0	39.0	38.9	39.0	39.2	40.8	40.9	40.6	40.2	40.5	39.9	40.4	40.1	39.9	39.8	39.9	39.8	39.8	39.8	41.5	41.7	41.5	40.7	40.9	40.4	40.9
Romania	40.8	40.6	40.5	40.5	40.4	40.3	40.3	—	—	—	—	40.9	41.2	41.2	40.8	41.3	41.0	41.1	41.0	40.8	40.7	—	—	—	—	41.6	41.8	41.4
Slovenia	40.7	40.3	40.3	40.4	39.8	39.4	39.5	40.9	41.5	41.4	41.1	40.7	40.8	40.7	41.2	40.9	40.9	41.0	40.4	40.0	40.0	41.3	42.0	41.6	41.4	41.0	41.0	40.9
Slovakia	40.9	41.0	41.1	41.0	40.8	40.6	40.6	42.3	41.8	41.7	41.4	41.2	41.2	41.3	41.1	41.1	41.2	41.1	40.9	40.8	40.8	42.6	42.0	42.0	41.7	41.4	41.3	41.5
Finland	37.7	37.6	37.5	37.6	37.3	37.3	37.2	38.9	38.5	38.3	38.4	38.5	38.7	38.8	38.2	38.2	38.0	38.1	37.8	37.7	39.2	38.8	38.7	38.8	39.2	39.3	39.4	
Sweden	36.5	36.4	36.4	36.4	36.3	36.3	36.3	38.9	38.6	38.4	32.8	32.3	32.9	33.0	36.5	36.4	36.4	36.4	37.1	37.1	37.2	39.6	39.8	39.5	33.6	33.0	33.7	33.7
United Kingdom	37.1	36.9	37.0	36.9	36.6	36.4	36.4	—	—	—	—	—	—	—	37.4	37.4	37.0	37.1	37.4	37.3	37.5	37.3	37.4	37.3	37.0	37.3	37.8	37.7
Correlation	—	—	—	—	—	—	—	0.91	0.89	0.93	0.88	0.84	0.82	0.83	—	—	—	—	—	—	—	0.91	0.89	0.93	0.86	0.83	0.82	0.82
Rank correlation	—	—	—	—	—	—	—	0.92	0.90	0.95	0.95	0.94	0.91	0.93	—	—	—	—	—	—	—	0.90	0.92	0.94	0.96	0.94	0.92	0.93

NB: The working-age population includes persons aged 15-64 years in the EU-LFS and 16-64 years in EU-SILC; Pearson's correlation coefficients and Spearman's rank correlation coefficients are computed between the EU-SILC estimates and the corresponding EU-LFS estimates.

Reading note: In 2011, the actual number of hours worked in main job in Belgium was 36.8 according to the EU-LFS, whereas the usual number of hours worked in main job were 38 according to EU-SILC.

Source: Authors' computation, 2005-2011 EU-LFS data and May 2013 EU-SILC UDB.

**Table 14.4:** Share of working-age population with more than one job and share of jobless households in the EU-LFS and EU-SILC in 2005-2011 (%)

Country	Share of working-age population with more than one job										Share of jobless households																		
	EU-LFS					EU-SILC					EU-LFS					EU-SILC													
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	
Belgium	3.9	3.8	3.9	3.8	4.0	4.2	4.2	2.5	2.5	2.5	2.6	2.4	2.8	2.8	18.7	18.8	18.3	17.9	18.6	18.3	18.6	21.1	19.4	19.1	18.3	19.3	19.8	20.4	
Bulgaria	0.6	0.8	0.7	1.0	0.5	0.6	0.3	-	-	-	7.2	0.9	0.9	0.5	18.1	16.7	15.2	13.7	14.5	15.6	17.7	-	-	-	-	-	-	-	
Czech Republic	2.4	2.2	1.6	1.8	1.9	2.2	2.1	1.9	1.9	1.8	1.7	1.8	2.0	1.6	13.6	13.3	12.6	12.4	13.1	13.3	13.0	16.3	16.3	15.3	14.5	14.1	14.8	14.4	
Denmark	-	-	-	-	-	9.8	9.1	-	-	-	11.8	5.2	5.0	5.3	-	-	-	-	-	16.9	15.8	19.2	20.0	19.9	19.6	19.1	21.0	23.7	
Germany	3.4	3.7	3.6	3.6	3.4	3.7	4.7	5.4	5.4	4.9	4.8	4.5	4.6	4.5	15.4	14.5	13.3	12.9	12.7	12.1	11.8	20.5	15.9	17.1	16.0	15.7	15.7	14.7	
Estonia	3.3	3.6	3.5	3.2	4.3	5.0	5.3	2.6	3.0	3.7	3.7	4.0	4.3	4.6	13.8	11.4	10.6	10.6	14.2	16.8	15.0	13.6	11.7	10.8	11.2	13.9	16.1	14.4	
Ireland	-	2.3	2.7	2.7	2.3	2.1	2.1	1.7	1.9	2.1	1.7	1.2	-	-	12.1	12.0	12.7	16.3	18.2	18.9	16.1	16.2	16.7	17.8	22.1	-	-	-	
Greece	2.8	3.0	3.1	3.4	3.4	3.1	2.4	3.2	3.5	3.6	3.1	2.5	2.5	1.6	12.4	12.0	11.8	11.8	12.7	14.0	16.4	12.9	13.5	13.3	13.2	14.0	15.0	21.7	
Spain	2.6	2.7	2.7	2.8	2.5	2.5	2.3	1.7	1.5	1.8	1.9	1.9	1.6	0.9	10.2	9.8	10.4	11.3	14.4	14.9	15.6	11.4	11.0	10.6	11.0	14.2	14.8	16.9	
France	2.9	3.3	3.6	3.6	3.8	3.8	3.8	1.7	1.7	1.9	2.0	2.1	2.2	2.2	14.5	15.0	14.7	14.9	15.8	15.7	15.8	16.4	16.4	16.8	16.5	16.6	17.9	17.4	
Italy	1.6	1.6	1.8	1.9	1.5	1.5	1.4	1.7	1.8	1.9	1.7	1.7	1.7	1.3	13.5	12.9	12.7	13.1	13.9	14.3	14.2	15.3	14.8	14.3	13.7	14.7	14.5	15.0	
Cyprus	6.0	4.6	4.3	4.3	3.9	3.2	3.4	2.5	3.9	4.4	3.8	2.8	-	3.0	9.2	9.0	8.4	8.4	9.7	9.9	10.5	9.7	9.1	9.0	8.4	9.0	-	10.4	
Latvia	6.0	5.8	6.1	6.1	4.7	4.3	4.2	3.9	4.3	3.5	4.6	3.3	2.8	2.7	13.9	11.7	11.0	10.6	14.9	16.5	15.6	14.4	12.3	11.3	11.2	16.7	19.3	18.2	
Lithuania	5.8	6.1	6.1	5.1	5.0	5.1	5.5	7.9	6.5	7.1	4.5	3.7	3.6	4.0	11.7	12.1	12.2	13.8	15.8	17.6	17.0	17.8	15.0	12.1	13.4	14.9	17.5	18.0	
Luxembourg	1.7	2.0	2.0	2.0	3.0	3.0	2.4	1.9	1.7	1.9	1.7	1.6	1.6	1.5	12.0	12.2	11.9	13.2	12.0	11.6	12.2	12.7	12.3	10.6	10.5	12.9	12.6	13.3	
Hungary	1.9	1.8	1.6	1.6	1.8	1.8	2.0	2.8	2.1	1.8	1.8	1.5	1.5	1.3	17.5	17.2	17.2	17.6	18.2	18.1	18.0	16.7	19.3	19.2	20.5	19.0	19.9	20.6	
Malta	4.6	5.3	5.3	5.1	5.2	5.0	5.6	-	-	-	2.5	2.5	2.4	14.4	14.7	15.1	16.1	16.3	15.2	15.3	-	-	-	-	-	16.2	15.8	14.9	
Netherlands	6.1	6.2	6.5	6.6	6.5	6.8	6.9	4.5	3.9	4.4	4.6	4.8	5.1	4.8	13.7	13.4	12.4	11.8	11.7	12.6	12.5	19.9	17.9	17.2	16.0	16.2	16.5	17.2	
Austria	4.0	4.3	4.2	4.4	4.2	4.0	4.2	2.4	2.2	2.5	4.3	4.1	4.4	4.6	14.6	13.7	12.8	12.4	12.8	12.7	12.8	15.7	16.9	17.2	15.6	16.5	16.7	16.8	
Poland	7.9	7.6	7.7	7.6	7.5	7.3	7.1	4.1	4.4	4.5	4.9	4.8	4.6	4.2	19.2	18.1	16.7	15.8	16.2	16.5	16.2	23.4	20.4	18.8	17.3	15.6	15.1	18.2	
Portugal	6.5	6.1	6.5	6.8	6.7	6.1	5.1	3.2	3.2	3.3	2.2	2.0	1.7	2.1	8.8	9.1	9.1	9.0	10.0	10.4	11.9	9.7	10.4	11.1	10.3	12.4	13.2	12.5	
Romania	3.3	2.9	3.9	3.3	3.1	2.8	2.6	-	-	2.4	2.2	2.5	2.4	14.3	13.3	13.4	13.4	14.1	14.4	15.3	-	-	-	-	-	13.9	14.3	12.9	12.6
Slovenia	3.5	3.4	3.8	3.8	3.6	3.8	3.2	1.8	2.3	1.5	1.6	1.6	1.5	1.2	13.4	13.2	12.2	12.0	13.1	14.3	15.7	16.1	14.9	14.9	15.0	15.0	17.3	18.4	
Slovakia	1.4	1.2	1.1	1.0	1.0	1.2	1.2	1.4	1.2	1.1	1.3	1.1	0.9	0.8	15.3	14.5	14.3	13.1	13.9	14.8	14.6	14.6	13.2	13.8	12.3	13.5	14.4	14.7	
Finland	3.4	3.9	3.8	3.7	3.4	3.7	3.9	1.8	2.1	2.1	2.2	3.5	3.1	3.0	14.5	13.7	13.3	12.5	14.1	14.2	13.9	17.9	18.4	17.6	16.2	17.5	19.4	19.0	
Sweden	-	-	-	-	-	6.9	7.0	7.4	3.2	4.8	5.1	5.5	4.6	5.3	5.2	-	-	-	-	14.6	15.0	14.3	14.6	13.7	12.8	13.0	16.6	16.2	13.0
United Kingdom	3.8	3.7	3.9	3.8	4.0	3.9	4.0	3.1	2.7	3.0	0.0	1.2	3.0	2.7	14.6	14.2	14.4	14.1	15.0	15.6	15.4	14.4	17.0	15.4	16.4	13.6	14.4	13.9	
Correlation	-	-	-	-	-	-	-	0.57	0.72	0.68	0.32	0.71	0.77	0.87	-	-	-	-	-	-	-	-	0.81	0.88	0.83	0.75	0.68	0.57	0.58
Rank	-	-	-	-	-	-	-	0.66	0.79	0.70	0.44	0.74	0.79	0.87	-	-	-	-	-	-	-	-	0.67	0.85	0.85	0.61	0.57	0.50	0.61
correlation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NB: The working-age population includes persons aged 15-64 years in the EU-LFS and 16-64 years in EU-SILC; the share of jobless households is the ratio of the number of households where no adult is working (excluding households composed solely of students or solely inactive aged 65 and over) to the total number of private households; in EU-SILC, the employment status is that declared by respondents at the time of the interview; Pearson's correlation coefficients and Spearman's rank correlation coefficients are computed between the EU-SILC estimates and the corresponding EU-LFS estimates.

Reading note: in 2011, the share of working-age population with more than one job in Belgium was 4.2 % according to the EU-LFS and 2.8 % according to EU-SILC.  
Source: Authors' computation, 2005-2011 EU-LFS data and May 2013 EU-SILC UDB.

Table 14.5: Employment rates for working-age individuals and households in 2004-2010

Country	Individual employment rate (at least 1 month worked in the year), ER		Work-intensity-weighted individual employment rate, WER		Household employment rate, 1-JHR		Work-intensity-weighted household employment rate, HWER							
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
Belgium	62.0	63.1	63.7	65.8	65.0	63.9	64.7	53.8	55.1	55.1	56.9	56.2	55.3	54.9
Bulgaria	-	-	-	68.6	69.1	67.5	65.0	-	-	-	67.0	64.1	61.6	59.4
Czech Republic	67.8	66.3	66.6	67.4	68.4	67.6	67.0	66.3	65.6	66.0	67.4	66.8	64.6	64.3
Denmark	72.6	72.6	71.9	72.4	73.1	72.4	71.6	61.7	62.6	62.5	63.8	63.0	60.9	59.1
Germany	63.2	65.7	67.9	69.2	70.6	70.8	71.8	50.9	51.8	59.0	61.1	60.2	61.3	62.6
Estonia	69.5	72.9	75.7	75.4	71.2	69.4	63.1	63.1	65.0	66.4	67.4	62.3	56.9	58.5
Ireland	66.3	66.8	69.5	67.6	54.9	-	-	54.0	53.1	54.5	51.8	46.0	-	-
Greece	63.9	63.1	62.9	64.5	65.1	65.1	58.0	61.4	62.1	61.7	62.5	57.1	58.0	49.5
Spain	67.5	67.7	69.4	71.5	70.8	67.5	63.1	60.0	59.2	60.3	59.0	53.6	53.4	51.7
France	68.3	68.1	67.8	69.0	69.4	68.0	68.8	57.6	57.5	56.9	58.4	58.0	56.7	57.8
Italy	59.9	60.3	59.7	60.8	62.1	59.7	60.5	54.8	54.2	55.5	55.9	53.3	53.8	53.2
Cyprus	67.4	69.4	70.2	70.4	69.5	-	69.7	64.4	66.4	65.2	65.3	63.3	-	61.6
Latvia	69.9	70.5	71.9	73.7	72.4	66.3	63.4	64.5	68.3	68.8	67.9	58.0	51.4	52.7
Lithuania	65.3	68.0	71.7	71.2	71.3	67.0	64.5	60.7	61.6	65.5	64.8	60.0	56.1	55.7
Luxembourg	67.2	69.2	68.5	69.4	68.2	69.0	68.8	61.1	62.9	62.5	62.9	60.7	62.1	60.8
Hungary	69.3	61.5	63.1	61.5	60.8	60.1	60.4	56.3	56.9	57.4	54.5	50.7	52.3	48.5
Malta	-	-	-	-	-	59.0	58.2	58.9	-	-	-	52.6	52.8	53.3
Netherlands	71.4	70.4	69.2	70.5	70.9	70.9	72.2	50.8	53.0	52.7	54.4	54.4	54.1	54.5
Austria	70.8	69.9	70.5	71.9	72.8	73.0	72.9	60.4	58.6	60.4	62.6	61.2	61.5	61.9
Poland	55.8	59.4	62.0	64.1	64.7	64.3	64.2	52.1	54.9	57.1	60.0	59.7	59.7	60.2
Portugal	70.2	69.8	68.9	70.7	69.6	67.2	67.8	58.9	59.8	59.6	58.5	56.2	53.2	55.5
Romania	-	-	-	61.3	61.9	62.2	62.0	-	-	-	59.5	58.2	59.7	59.1
Slovenia	60.1	63.9	63.1	64.1	66.3	65.4	64.7	55.2	59.7	59.5	60.7	61.1	59.2	57.9
Slovakia	63.8	65.3	64.9	67.1	66.9	63.9	62.8	61.3	62.4	63.5	65.5	62.9	59.7	59.3
Finland	77.1	76.3	77.7	78.1	78.7	76.2	75.5	59.1	58.1	61.2	62.5	61.0	57.7	58.7
Sweden	82.4	81.9	83.7	83.9	83.0	82.5	82.5	64.6	67.1	70.0	59.7	55.8	58.2	59.8
United Kingdom	85.0	75.4	76.0	76.7	63.5	67.6	73.4	40.3	66.9	67.8	66.1	58.8	63.1	63.9
Unweighted average	68.2	68.2	68.9	69.5	68.3	67.5	67.1	58.1	60.1	61.2	61.4	58.4	57.7	57.5
Coefficient of variation	9.7	7.7	7.9	7.8	8.8	7.8	8.5	10.1	8.2	7.8	7.3	7.9	6.5	7.4
								3.8	4.0	3.9	3.7	5.4	3.4	3.3
								12.5	9.0	8.3	8.8	10.1	7.2	8.1

NB: Individuals include persons aged 16-64; households include units with at least one member aged 18-59 years who is not a dependent child; where dependent children are persons who are no more than 24 years old, are students and live with at least one parent. All indices are based on the 1-month-in-the-year criterion.

Reading note: In 2010, in Belgium the individual employment rate was 64.7%, whereas the work-intensity-weighted individual employment rate was 54.9%.

Source: Authors' computation, EU-SILC UDB May 2013.





# 15

## Individual employment, household employment and risk of poverty in the EU. A decomposition analysis

Vincent Corluy and Frank Vandenbroucke <sup>(130)</sup>

### 15.1 Introduction

Is employment the best recipe against income poverty of people of working age? At the level of individual citizens and the households in which they live, participation in the labour market significantly diminishes the risk of income poverty. However, what seems evident at the level of individuals and households is less evident at the country level.

Prior to the financial crisis, the Lisbon strategy could be regarded as a qualified success in the field of employment, at least if one assumes there to have been causal relationships between the Lisbon agenda and growing employment rates across Europe. On the other hand, though, the Lisbon strategy largely failed to deliver on its ambitious promise concerning poverty and social exclusion. Notwithstanding generally higher employment rates many Member States did not succeed in bringing back their poverty and social exclusion records. We do not observe a general conversion of employment policy success in less income poverty. Hence, it is important to understand the *missing links* between employment policy success (or failure) and inclusion policy success (or failure). We explore those

missing links, relying on EU-SILC and the EU Labour Force Survey (EU-LFS).

In this chapter, we explore (i) if the difference between changes in individual employment and changes in household employment offer an adequate explanation for changes in income poverty and (ii) how we can decompose these different changes in underlying factors, such as polarisation of employment. This hypothesis builds on the argument put forward in Vandenbroucke and Vlemminckx (2011) and Cantillon (2011), to wit that the disappointing income poverty trend during the 'good economic years' is partly attributable to a failure to reduce the number of individuals living in jobless households, despite increasing individual employment rates. Our time frame for the analysis of income poverty is EU-SILC 2005-2012 (which refer to income years 2004-2011). We study the trajectory of 24 EU welfare states <sup>(131)</sup> during the 'good economic years' and during the 'crisis period'.

The analysis of the (income) poverty trends proceeds in two steps. The first step considers the distribution of individual jobs over households, thus establishing a link between individual employment rates and the configuration of household employment. Following the work by Gregg, Scutella and Wadsworth (2008, 2010), a 'polarisation index' is defined in terms of the difference between, on the one hand, the actual share of individuals living in jobless households and, on the other, the hypothetical share of individuals living in jobless households assuming that individual employment is distributed *randomly* across households. This

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<sup>(131)</sup> Bulgaria, Croatia, Malta and Romania were not yet available in the 2005 EU-SILC Wave and are excluded from the trend analysis.

benchmark of 'random distribution of jobs' allows us to signal an avoidable suboptimal situation for a welfare state (in case of positive polarisation). Not only is the (skewness of the) relation between individual and household employment of interest for our analysis, but even more important are the changes in this relation.

The second step in the analysis integrates the two missing links we explore (the link between individual employment rates and the configuration of household employment; the link between the configuration of household employment and income poverty) into one single analysis. Therefore, we decompose changes in the income poverty rates on the basis of (i) changes in the poverty risks of jobless households, (ii) changes in the poverty risks of other (non-jobless) households, (iii) changes in household joblessness due to changes in individual employment rates and changing household structures, and (iv) changes in polarisation. In principle, this method would allow assessing the impact on income poverty rates of changes in individual employment rates, all other things being equal, and the impact on income poverty rates of changes in polarisation, again all other things being equal.

The proposed technique yields interesting insights into the trajectories that EU welfare states have followed over the past 10 years. The analysis uncovers a puzzling combination of convergence and disparity within the EU. The configuration of individual and household employment is driven by forces of modernisation that affect all European welfare states in the same direction, such as declining household size, feminisation of labour markets and increasing proportions of tertiary educated individuals. Nevertheless, the configuration remains very different from country to country. Changes in the distribution of employment over households and decreasing household sizes constitute important structural background features for evolving EU welfare states. However, their impact on the explanation of differences in the Member States' performance with regard to the reduction of income poverty over time is rather limited and disperse, both before and after 2008.

This chapter is organised as follows. Section 15.2 describes the (mathematical) relation between individual and household employment and explores

the distribution of jobs over households over the timespan 1995-2012. This empirical analysis is based on EU-LFS microdata and uses an ILO (International Labour Organisation) concept of employment. Section 15.3 integrates the missing links between labour market trends and at-risk-of-poverty changes, introducing EU-SILC estimates. It explores whether the upward convergence towards a more unequal distribution of jobs is a determining factor in the analysis of income poverty evolutions. Section 15.4 concludes.

## 15.2 The distribution of jobs over households

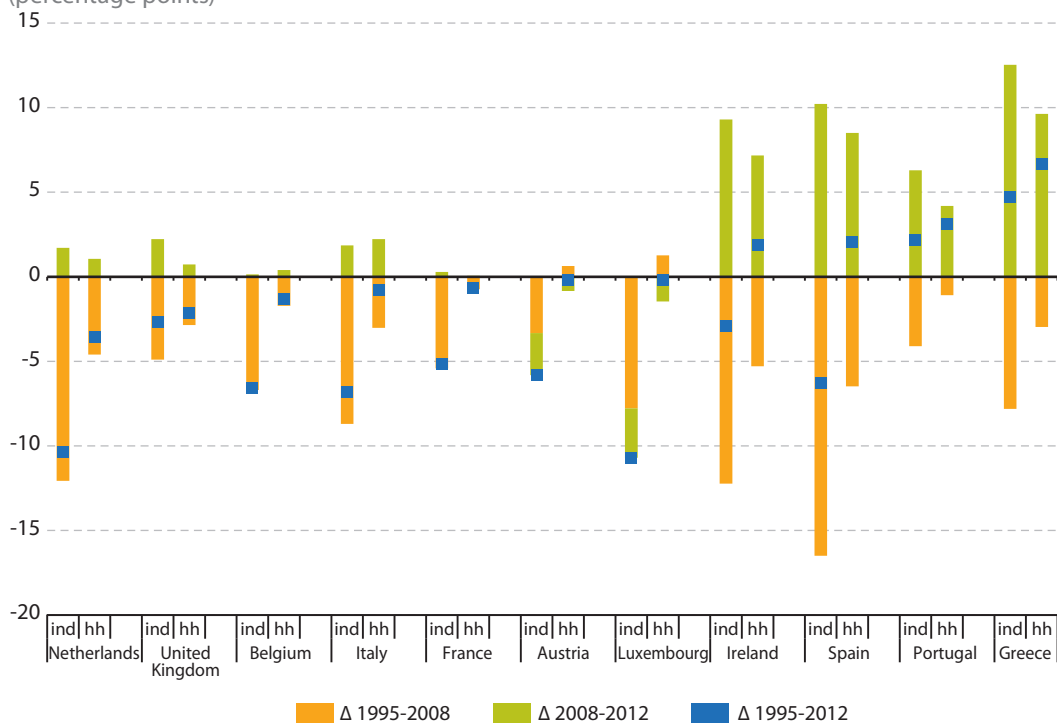
In this chapter, we use an ILO concept of employment. According to this definition, an individual is in work if employed for at least 1 hour in the week before the survey. The household is jobless if no working age adult is in employment, so defined. In this chapter, 'joblessness' is the opposite of employment, i.e. it refers both to situations of registered unemployment, invalidity, or inactivity for any other reason. Hence, our concept of a jobless household differs from the EU definition of '(quasi-)jobless households', which is based on a fine-grained measure of the work intensity of adult household members (in most countries during the year before the survey year), and applies a cut-off of 'very low work intensity'. Different definitions of household employment are discussed in Corluy and Vandembroucke (2013, Section 3 and Appendix 3). For an elaboration on those concepts, see also Chapters 14 and 16 in this volume. As a short cut, we will use 'household joblessness (rate)' to refer to the share of individuals living in jobless households<sup>(132)</sup>.

### 15.2.1 Trends in individual and household employment

We first focus on trends in individual and household joblessness in 11 old EU Member States (i.e.

<sup>(132)</sup> The age reference group is 20-59 years with exclusion of full-time students, both when we count the members of the household who are in employment (to classify the household as 'jobless' or 'not jobless'), and when we define the population for which we calculate the household joblessness rate.

**Figure 15.1: Changes in individual (ind) and household (hh) joblessness for 11 EU countries, 1995-2008-2012, EU-LFS**  
(percentage points)



NB: Countries are ranked in increasing order of the percentage point difference in household joblessness between 1995 and 2012.

Reading note: This figure presents the changes in individual and household joblessness for 11 EU countries over three periods. Yellow bars present changes between 1995 and 2008, light green bars present changes between 2008 and 2012. The blue squares show changes in household joblessness over the entire period 1995-2012.

Source: Authors' computation, EU-LFS UDB 1995-2012.

the Southern, Anglo-Saxon and Continental members of the EU-15, excluding Germany <sup>(133)</sup> for which EU-LFS data and household variables are available from 1995 to 2012 (see Figure 15.1) <sup>(134)</sup>. Changes are presented separately for the period before and after 2008.

In all countries, the gap between changes in individual joblessness and changes in household joblessness is negative. In those countries where individual joblessness is higher at the end of the period than at the start (Portugal and Greece), increases

in household joblessness over the same period are always stronger. In most countries where individual joblessness is lower at the end of the period also household joblessness has decreased, but for the same reason, at a slower pace. Two countries (Spain and Ireland) are confronted with negative changes in individual joblessness and positive changes in household joblessness (when comparing the end of the period with the start). But also here holds the finding that changes in individual joblessness are always bigger than changes in household joblessness. Although the sign of the gap between changes in individual and household joblessness is always negative, the size of the gap shows substantial variation over countries. In three countries (United Kingdom, Portugal and Greece) the gap is small. In all other 11 EU-15 countries, we observe

<sup>(133)</sup> German LFS data are only available from 2001 onwards.

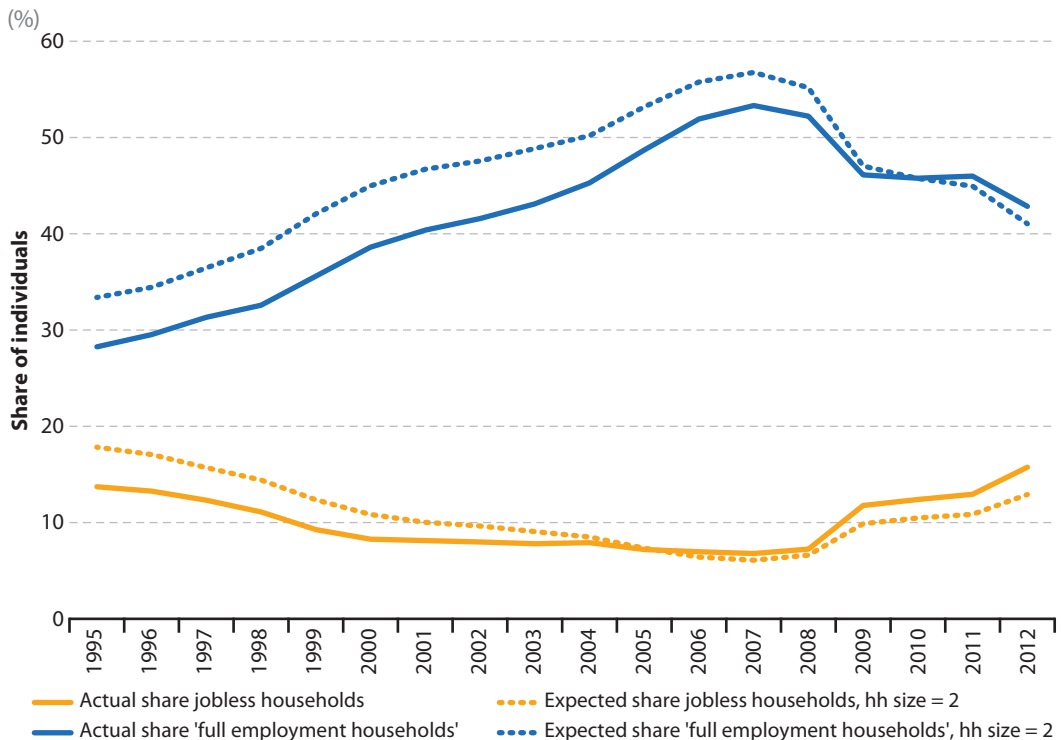
<sup>(134)</sup> The years in the text refer to the survey year, both for EU-SILC and EU-LFS. Measures of employment are based on an ILO definition and refer to the identical survey year. Observations of poverty relate to the entire income year prior to the survey year (except in Ireland and in the United Kingdom).

gaps of comparable magnitude, with only Luxembourg being an outsider. Also in Spain the difference between changes in joblessness at individual and household level is rather big.

These trends are in part explainable by a pure 'mathematical' effect, reflecting the pooling of individual risks in households. We illustrate this in Figure 15.2 with the Spanish case. Figure 15.2 shows the distribution of Spanish working-age individuals among jobless and 'full employment' households (households where all adult members are in employment). Between 1995 and 2008, the actual share of individuals living in jobless households decreased by 6.5 percentage points, while the actual share of individuals living in 'full employment'

households increased by 24 percentage points. Between 2004 and 2008 'household full employment' was the median situation in Spain. The dotted lines in Figure 15.2 show how the household distribution would have been, if all Spanish households would have consisted of 2 working-age adults and jobs would have been distributed randomly over households. Given the rise in individual employment rates, the decrease in household joblessness would have been 11.2 percentage points and the increase in the 'full employment households' share would have been 21.8 percentage points. The spectacular increase in the share of individuals in 'full employment households' is in essence the mathematical corollary of the substantial rise in individual employment rates. However, the relatively

**Figure 15.2: Distribution of the population by household employment status, Spain, 1995-2012, EU-LFS**



*NB:* The proportion of individuals living in jobless and full employment households does not add up to 100, because we do not show the proportion of individuals living in 'mixed employment households'. In those households a working and non-working adults live together (by definition only possible in households with at least two members).

*Reading note:* This figure shows the distribution of Spanish working-age individuals among jobless and 'full employment' households. In full employment households all adult members are in employment.

*Source:* Authors' computation, EU-LFS UDB 1995-2012.

small decrease in household joblessness is only in part explainable as ‘expected’ given the pooling of unemployment risks in households. The gap between the actual decline of household joblessness (6.5 percentage points) and the decline that would have been expected if jobs were distributed randomly over 2-adult households (11.2 percentage points) calls for substantial, additional explanations. This brings us to household size structure and ‘polarisation’. Before 2005 the actual share of Spanish individuals living in jobless households was lower than what one would expect if jobs would be distributed randomly. This is rather exceptional in the EU. Specific individual joblessness rates can be consistent with a range of different household joblessness rates, depending on how employment is distributed. Since 2005 actual household joblessness grows faster than expected household joblessness, causing positive and growing levels of polarisation.

### 15.2.2 The concept of polarisation

Based on the binary distinction between jobless households and other households we construct and decompose a polarisation index. Later (in Section 15.3.2), we integrate this measure in the decomposition of income poverty rates (using the EU ‘at-risk-of-poverty’ concept; see Chapter 3 in this volume for a definition of the relative approach to income poverty used at EU level).

Gregg and Wadsworth, op. cit., propose a counterfactual to evaluate polarisation in the distribution of employment. Like the benchmark used in the Lorenz curve, the counterfactual or predicted household joblessness rate is the one that would occur if jobs were randomly distributed in the population, given the specific household size structure in a country. *Polarisation* is defined as the difference between the actual and the predicted household joblessness rate. So it measures the extent to which there are more (or fewer) jobless households than predicted in the case of a random distribution of employment across individuals, given the national household size structure.

All other things being equal, the probability of having no-one in work is higher in a smaller household than in a larger one. Consequentially, if the share of smaller households increases, a given rate of

individual joblessness may be expected to lead to higher household joblessness. In what follows, households are distinguished on the basis of size only. Hence, in this analysis, the ‘predicted rate’ of household joblessness is a function of (i) the rate of individual joblessness and (ii) the structure of households in terms of size:

$$(1) \quad P_{it} = j_{it} - j_{it}^e, \text{ where}$$

$P_{it}$  is the level of polarisation in household joblessness in country  $i$  in year  $t$

$j_{it}$  is the actual share of individuals living in household joblessness

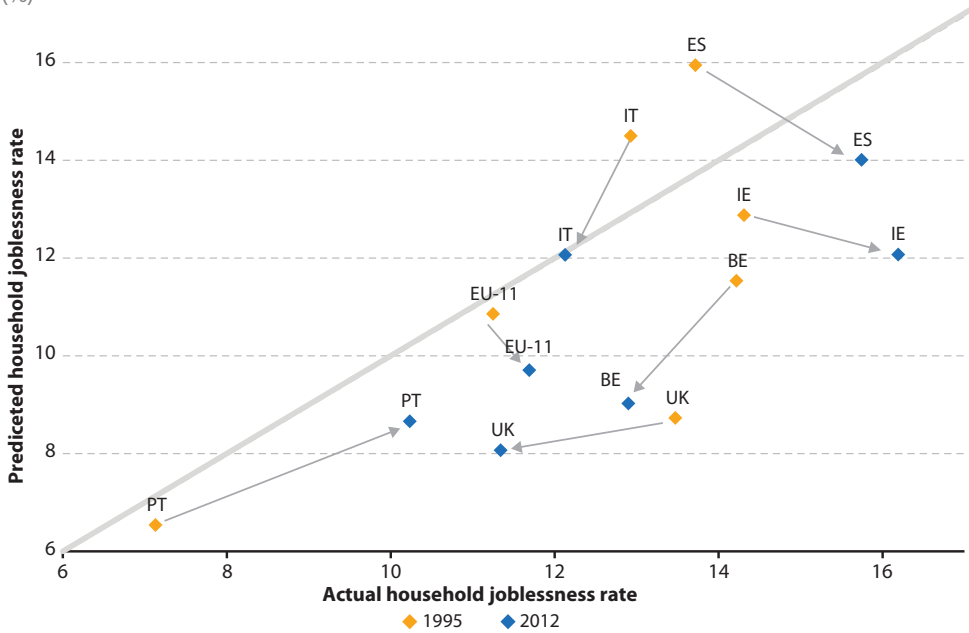
$j_{it}^e$  is the expected share of individuals living in household joblessness in country  $i$  in year  $t$ .

We should emphasise that the expression ‘polarisation’ does not carry a normative meaning for us. We do not consider the benchmark used to define the concept — a random distribution of jobs over households, given the household size structure — as a normative ideal. However, in a context of limited job opportunities ‘positive polarisation’ might be seen as a kind of ‘Matthew effect’. It reflects a concentration of additional advantage (say, a second job for the partner of someone who is already employed) for those who already have some advantage (compared with a household where both partners are jobless). ‘Negative polarisation’ might be appreciated as a form of solidarity, i.e. a fair distribution of scarce employment opportunities. However, we do not suggest that either ‘negative polarisation’, or the benchmark of ‘randomly distributed jobs’ serve a normative ideal.

### 15.2.3 Trends in the distribution of individual employment over households

In Figure 15.3, actual ( $X$ ) and predicted ( $Y$ ) household joblessness rates are presented.

If employment is randomly distributed, then the predicted and actual household joblessness rates are identical. So, the level of polarisation is zero and the country estimates appear on the diagonal. Countries above the diagonal encounter negative

**Figure 15.3: Actual (X) and predicted (Y) household joblessness, 1995 and 2012, EU-LFS**  
(%)

*Reading note:* This figure presents actual (X) and predicted or counterfactual (Y) household joblessness for 1995 and 2012. If employment is randomly distributed then the predicted and actual household joblessness rates are identical, so that the polarisation rate is zero and the country estimates appear on the diagonal. Countries above the diagonal display negative polarisation and those under the diagonal positive polarisation. The distance to the diagonal reflects the magnitude of the cardinal measure of polarisation.

*Source:* Authors' computation, EU-LFS 1995 and 2012.

polarisation and those under the diagonal positive polarisation. The distance to the diagonal reflects the magnitude of the cardinal measure of polarisation. At the start of the sample period, all Southern European countries (most saliently Spain) as well as Luxembourg had negative polarisation rates. Negative polarisation of work is consistent with theories of the gender division of non-work (Danziger and Katz, 1996) and added worker theories (Cullen and Gruber, 2000). All other old Member States exhibited limited positive polarisation, with only the UK displaying strong positive polarisation. In all countries, with exception of the United Kingdom, polarisation became more positive over time, meaning that the distribution of employment grew more unequal. The United Kingdom, Belgium and Ireland display the highest levels of polarisation, with household joblessness respectively 3.27, 3.87 and 4.12 points higher than would be the case if work were evenly distributed across households. Southern European countries and Ireland encoun-

ter increasing household joblessness rates in combination with increasing levels of polarisation.

Why should changes occur in the level of polarisation? At any point in time, the observed household joblessness rate diverges from the predicted rate if, within certain household size subgroups, the rate of household joblessness is higher or lower than what one would expect on the basis of a random distribution. Over time, these divergences can decrease or increase in one or more household subgroups. This type of change is referred to as 'within-household polarisation'. There may also be a structural shift towards household subgroups where polarisation is relatively higher, without change in the subgroup degree of polarisation itself. This is referred to as 'between-household polarisation'.

Combining this insight with earlier assertions about the determinants of 'predicted household employment rates', the observed changes in the actual household joblessness rate can be decom-

posed into four terms: (i) changes in the individual non-employment rate that affect the predicted rate; (ii) changes in the household size structure that affect the predicted rate; (iii) within-household polarisation and (iv) between-household polarisation. Such a shift-share analysis is presented in Table 15.1. The decomposition has the following form (from Gregg and Wadsworth, 2008):

(2)

$$\begin{aligned} \Delta j|_i = & \sum_{k=1}^K \Delta n^k [0.5\pi_{k,t} + 0.5\pi_{k,t+1}] & \text{(i)} + \\ & \sum_{k=1}^K \Delta \pi_k [0.5n_{t,t}^k + 0.5n_{t+1,t}^k] & \text{(ii)} + \\ & \sum_{k=1}^K \Delta \pi_k [0.5(j|_k - n^k)_{t,t} + 0.5(j|_k - n^k)_{t+1,t}] & \text{(iii)} + \\ & \sum_{k=1}^K \Delta (j|_k - n^k) [0.5\pi_{k,t} + 0.5\pi_{k,t+1}] & \text{(iv)} \end{aligned}$$

with

$n$  = individual non-employment rate of working-age adults

$k$  = household size (number of working age adults)

$K$  = maximal size of households in a country

$\pi_k$  = share of working-age adults living in a household with size  $k$

$j|_k$  = observed household joblessness rate of working-age adults in households with size  $k$ .

The first and the second term in the decomposition add up to changes in the 'predicted' rate of household joblessness  $j^e$ . The third and fourth term determine total changes in polarisation.

Over the period 1995-2012, household joblessness should have fallen in almost all countries (except for Portugal and Greece), given the rising individual employment rates in each country (column 3). Changes towards smaller household structures exert upward pressure on household joblessness rates (column 4). The impact of changing household structures on the predicted household joblessness is much smaller than the influence of declining individual joblessness. But, in the United Kingdom and Spain more than half of the expected decrease in household joblessness due to decreasing individual joblessness is offset by the emerging share

**Table 15.1: Decomposition of changes in household joblessness rate for 11 EU countries, 1995-2012, EU-LFS**  
(percentage points)

	actual change	total predicted change	of which: predicted change (unconditional)		total polarisation change	of which: polarisation	
			due to $\Delta$ non-employment	due to $\Delta$ household shares		between households	within households
Netherlands	-3.5	-4.5	-5.3	0.8	1.0	0.4	0.6
United Kingdom	-2.1	-0.7	-1.4	0.7	-1.5	0.4	-1.8
Belgium	-1.3	-2.5	-3.7	1.2	1.2	0.5	0.7
Italy	-0.8	-2.5	-4.3	1.9	1.7	-0.3	1.9
France	-0.7	-1.6	-2.8	1.2	0.9	0.2	0.7
Austria	-0.2	-1.5	-2.6	1.1	1.3	0.2	1.1
Luxembourg	-0.2	-3.0	-5.5	2.5	2.8	0.1	2.7
Ireland	1.9	-0.8	-1.8	1.0	2.7	0.1	2.6
Spain	2.0	-2.0	-4.2	2.2	4.0	-0.4	4.5
Portugal	3.1	2.1	1.1	1.1	1.0	0.3	0.6
Greece	6.7	4.2	3.1	1.1	2.5	0.3	2.2

NB: EU-11 countries are EU-15 countries minus Denmark, Germany, Finland and Sweden. Countries are presented in increasing order of actual changes in household joblessness.

Reading note: Actual change = total predicted change + total polarisation change (column 1 = column 2 + column 5); Total predicted change = change due to changes in non-employment rate + change due to changes in household shares (column 2 = column 3 + column 4); Total polarisation change = between-household polarisation + within-household polarisation (column 5 = column 6 + column 7).

Source: Authors' computation, EU-LFS UDB 1995 and 2012.

of singles. In most countries, the contribution of polarisation to the change in the jobless household rate is larger than the household structure component. This means that most of the divergence between household and individual joblessness stems from an increasingly skewed distribution of employment across households. In Ireland and Spain, changes in household size structure and changing levels in polarisation entirely offset (small) improvements in individual employment rates. So despite better outcomes at the individual level, outcomes at the household level deteriorated. Most polarisation is within household types. Only in the United Kingdom changes in polarisation are negative over time, due to more equally distributed employment within households and notwithstanding the growing share of household types already undergoing high polarisation.

Table 15.2 provides an overview of the results of the decomposition for a shorter period. Restriction of the period under consideration to 2000-2012 allows an increase of the number of countries to 23 (the EU-28 minus Denmark, Croatia, Malta, Finland and Sweden). Between 2000 and 2012 individual non-employment decreased in most countries, except for those where economic downturn hit strongest, i.e. Southern European countries (Greece, Portugal, Spain and Cyprus) and Ireland and Romania. However, in all countries except Latvia and Romania, diminishing average household size reduced the impact of the decreasing non-employment rates on household jobless rates. Polarisation of jobs over households had a divergent impact. In the United Kingdom and most of the new Member States (except Cyprus, Lithuania and Romania), changes in observed household

joblessness are larger than predicted changes because changes in polarisation have the same sign. In old European countries (and most strongly in Southern European countries) predicted changes in household joblessness are offset by changes in polarisation. Combinations of the different trends of the components in this decomposition of actual changes in household joblessness offer five emerging clusters of countries for the period 2000-2012 as shown in Table 15.2.

#### 15.2.4 Has the distribution of jobs become more unequal over time?

In the 11 countries examined we observe an *upward convergence* of the levels of polarisation. The pattern is one of both beta-convergence (a catch-up process) and sigma-convergence (a reduction in the dispersion of values). In 1995, the average value of the polarisation index was 0.40, with a particularly large positive value in the United Kingdom and negative values in Luxembourg, Spain, Italy and Greece (see Figure 15.4). By 2012 the average value of the polarisation index increased to 1.96<sup>(135)</sup>. In the United Kingdom, positive polarisation diminished. In Luxembourg and Italy, negative polarisation characterising the beginning of the period was reduced close to zero. Spain, Greece and Ireland are confronted with steep increases in the level of polarisation, with most substantial changes in the period 2008-2012. Ireland and Belgium end up with the highest levels of positive polarisation in 2012. For all 11 EU countries considered in this analysis (hereafter EU-11) we observe a consistent, upward trend in polarisation, without a fundamental shift in patterns around 2008 (see also Duyver, 2013).

<sup>(135)</sup> Beta-convergence is identified by a negative correlation of -0.83 between the initial values in 1995 and the changes over the period 1995-2012; sigma-convergence is identified by the standard deviation decreasing from 2.16 to 1.26. The sigma-convergence is quite sensitive to outliers, unlike the beta-convergence. Omission of the UK reduces the decline of standard deviation from -0.86 to -0.50; it also reduces the negative correlation from -0.82 to -0.67.



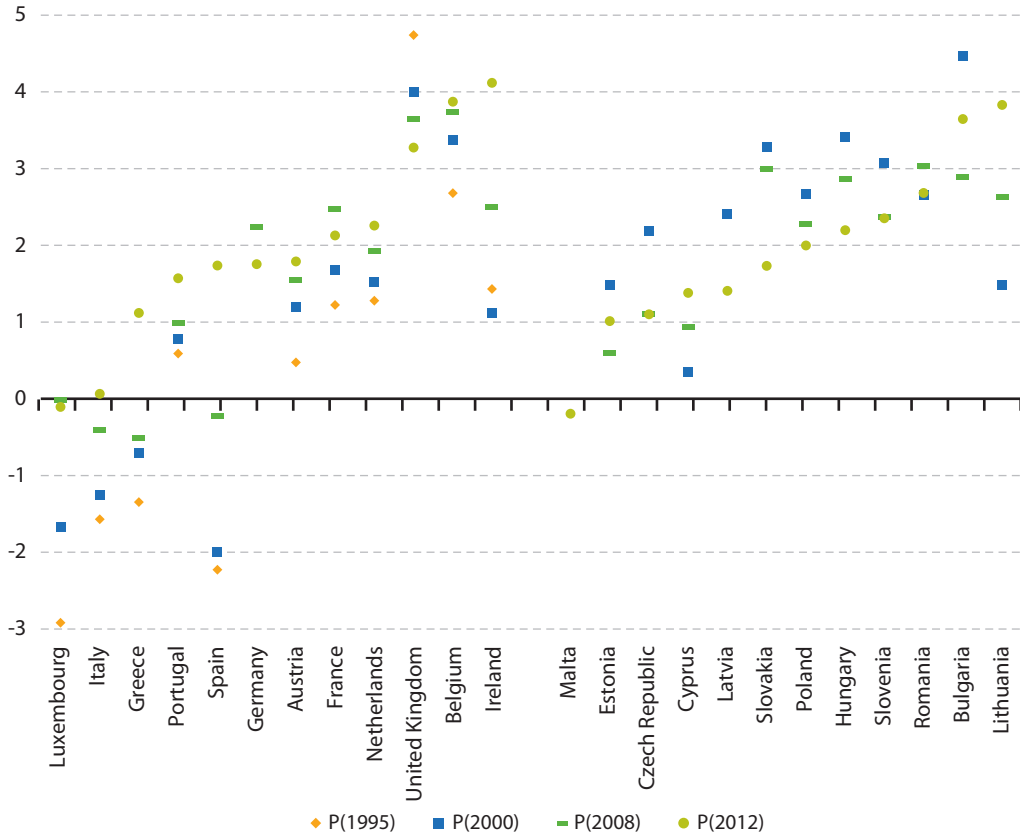
**Table 15.2: Decomposition of changes in household joblessness rate, 2000-2012, EU-23, EU-LFS**  
 (percentage points)

	actual change	total predicted change	of which: predicted change (unconditional)		total polarisation change	of which: polarisation	
			due to $\Delta$ non-employment	due to $\Delta$ household shares		between households	within households
Slovakia	-2.18	-0.63	-1.89	1.26	-1.55	0.23	-1.78
Czech Republic	-1.42	-0.33	-1.41	1.08	-1.09	0.32	-1.40
Hungary	-2.09	-0.88	-1.04	0.17	-1.21	0.06	-1.28
Latvia	-3.71	-2.69	-1.66	-1.04	-1.02	-0.01	-1.01
Bulgaria	-1.81	-1.02	-3.67	2.66	-0.79	0.16	-0.95
Estonia	-0.59	-0.12	-1.77	1.64	-0.47	0.37	-0.84
Poland	-3.95	-3.29	-4.07	0.78	-0.66	0.16	-0.83
Germany	-1.95	-2.18	-2.86	0.68	0.24	0.15	0.08
France	-0.52	-0.97	-1.88	0.90	0.45	0.18	0.27
Austria	-1.55	-2.14	-2.63	0.49	0.59	0.11	0.47
Netherlands	-0.33	-1.06	-1.47	0.41	0.73	0.19	0.54
Luxembourg	-0.36	-1.93	-2.71	0.78	1.57	-0.08	1.65
Slovenia	-0.29	0.43	-0.25	0.68	-0.72	0.30	-1.03
United Kingdom	-0.28	0.44	0.16	0.29	-0.73	0.16	-0.89
Belgium	0.05	-0.45	-1.10	0.65	0.50	0.29	0.21
Italy	0.16	-1.18	-2.97	1.79	1.34	-0.46	1.80
Romania	1.54	1.52	1.94	-0.42	0.02	0.15	-0.13
Cyprus	1.55	0.52	0.10	0.41	1.03	0.26	0.77
Lithuania	3.18	0.83	-1.73	2.56	2.35	0.52	1.83
Portugal	4.82	4.04	2.99	1.05	0.78	0.27	0.52
Spain	7.46	3.72	1.91	1.80	3.75	-0.48	4.23
Greece	7.63	5.80	4.40	1.40	1.82	0.00	1.82
Ireland	7.74	4.75	3.92	0.83	2.99	0.03	2.96

NB: EU-23 countries are EU-28 countries minus Denmark, Croatia, Malta, Finland and Sweden. Countries are presented in clusters with similar decomposition terms.

Reading note: Actual change = total predicted change + total polarisation change (column 1 = column 2 + column 5); Total predicted change = change due to changes in non-employment rate + change due to changes in household shares (column 2 = column 3 + column 4); Total polarisation change = between-household polarisation + within-household polarisation (column 5 = column 6 + column 7).

Source: Authors' computation, EU-LFS UDB 2000 and 2012.

**Figure 15.4:** Level of polarisation (P), 1995-2000-2008-2012, EU-24, EU-LFS

NB: Countries are presented in increasing order of levels of polarisation in 'old' and 'new' Member States clusters. 'New' Member States are those countries that joined the EU in May 2004 or after.

Reading note: In this figure we present levels of polarisation for 'old' and 'new' Member States for 4 different years. EU-24 countries are EU-28 countries minus Denmark, Croatia, Finland and Sweden.

Source: Authors' computation, EU-LFS UDB 1995, 2000, 2008 and 2012.

If one restricts the period under consideration to 2000-2012, the number of countries can be increased to 24 (the EU-28 minus Denmark, Croatia, Finland and Sweden). Between 2000 and 2008, one again observes beta and (albeit less robustly) sigma-convergence, both for the group of 24 EU Member States and for the 11 for which data availability stretches back to 1995<sup>(136)</sup>. There is no real *upward* convergence in the levels of polarisation across the 24 EU Members: the average value of the polarisation index for the group under review increased

from 1.62 in 2000 (with a standard deviation of 1.76) to 1.95 (with a standard deviation of 1.17). In the smaller group of 11 countries for which data are available from 1995 onwards, the *upward* movement is more evident: in 2000 the average value of the polarisation index for these Member States was 0.73 (standard deviation 1.88) increasing to 1.98 (standard deviation 1.26) by 2012. This trend seems to have been driven mainly by the declining size of households and the rising female participation in the labour markets of Spain, Italy and Greece. The ten new Member States under examination were characterised by high levels of polarisation in 2000 (with an average polarisation index of 2.72); in this

<sup>(136)</sup> The beta-convergence is more robust than the sigma-convergence when eliminating outliers. The negative correlation between starting values for P, signalling beta-convergence, is -0.56 for the EU-24 and -0.53 for the EU-11.

respect their starting position in the beginning of the Lisbon era was very different from that of Spain, Italy and Greece, which were still characterised by negative polarisation in 2000 with extended families still pooling unemployment risks.

The choice of the first year of this shorter period, 2000, is dictated primarily by data availability. However, it appears that 2000 is a useful cut-off in describing the evolution of polarisation for some countries. For instance, in Spain and Ireland, the increase in polarisation accelerated after 2000; in Belgium, and to a lesser extent France, the year 2000 marked the beginning of a deceleration or even a standstill in polarisation. Hence, if one takes account of the timing, there appears to be no uniform pattern of evolutions across the EU, apart from the general trend of upward convergence. The difference in pace at which women entered the labour market offers part of the explanation.

A first approach to gaining an understanding of the underlying societal trends that affect polarisation consists in the construction of 'conditional counterfactuals'. We construct a variety of counterfactual household employment rates and allow individual employment rates to vary by gender, age and educational level of working-age household members. One can then compare the 'unconditional polarisation' index (the counterfactual being based on household size only) with various 'conditional polarisation' indices (see Gregg et al., 2010). Subsequently one can calculate the *share* (as a percentage) of the absolute level of the unconditional polarisation index that is explained by gender, age, education, etc., or by combinations of those factors. Applying this approach shows that the level of polarisation is predominantly explained by gender. A second approach applies regression techniques. A simple regression for the EU-11 over 1995-2012 shows that the changes in the ratio of female and male employment rates have a significant and substantial impact on changes in the unconditional polarisation index, while changes in the structure of educational attainment of the population seem to have no significant impact.

These findings reflect fundamental societal trends in Europe, some of which follow a clear pattern of convergence, whereas others — surprisingly — show no *prima facie* convergence at all. The ratio

of female and male employment rates displays very strong beta and sigma-convergence in the EU-11 over these years. However, there is neither beta-convergence nor sigma-convergence with regard to the proportion of the population with post-secondary education (International Standard Classification of Education (ISCED) levels 5-6) in the EU-11 over this period (the correlation between starting values and change is actually positive, and the dispersion increases); with regard to the proportion of the population with lower than secondary education (ISCED levels 0-2), the correlation between starting values and change is mildly negative, but the dispersion is not reduced.

Other results show that 'increased homogamy' (increased matching of couples on the basis of education attainment of the partners) is not an explanatory factor for increasing polarisation since 1995, that is, there is no increasing gap between the degree of homogamy one sees in reality in couples and the degree of homogamy one would expect if couples are formed at random.

## 15.3 Relationship between changes in labour markets and poverty risks

### 15.3.1 Relationship between poverty risk and employment rates

On a cross-country level, national rates of individual and household employment calculated on the basis of EU-SILC correlate in a different way with national poverty risks. Table 15.3 shows that both individual and household joblessness correlate positively with *pre-transfer* poverty (risk) rates over the entire period 2005-2012. The correlation is strongest when employment is measured at the household level. Looking at post-transfer poverty (risk) rates, individual joblessness correlates positively over the entire period, whilst household joblessness correlates only positively from 2009 onwards. Here, the correlation is strongest at the individual level. As expected, household 'full employment' rates correlate negatively both with pre- and post-transfer

**Table 15.3: Cross-sectional correlations of post- and pre-transfer poverty risk and individual and household concepts of employment, 2005-2012, EU-24, EU-SILC**

Correlations of post-transfer poverty risk rates and ...	... employment								
	2005	2006	2007	2008	2009	2010	2011	2012	Δ 05-12
... individual joblessness	0.58	0.51	0.48	0.40	0.61	0.62	0.65	0.72	0.46
... 'jobless' households	0.09	0.00	-0.04	-0.04	0.22	0.30	0.37	0.48	0.56
... 'mixed employment' households	0.59	0.52	0.54	0.50	0.55	0.55	0.56	0.61	-0.20
... 'full employment' households	-0.62	-0.53	-0.53	-0.48	-0.60	-0.62	-0.64	-0.70	-0.30
Correlations of pre-transfer poverty risk rates and ...	... employment								
	2005	2006	2007	2008	2009	2010	2011	2012	Δ 05-12
... individual joblessness	0.36	0.27	0.37	0.53	0.52	0.62	0.53	0.58	0.79
... 'jobless' households	0.73	0.62	0.69	0.75	0.76	0.77	0.74	0.79	0.89
... 'mixed employment' households	-0.13	-0.15	-0.06	0.05	0.05	0.12	0.04	0.14	-0.05
... 'full employment' households	-0.09	-0.02	-0.13	-0.28	-0.29	-0.40	-0.29	-0.39	-0.63

NB: EU-24 countries are EU-28 countries minus Bulgaria, Croatia, Malta and Romania. In mixed employment households working and non-working adults live together.

Reading note: In this table we show the relation between at-risk-of-poverty rates (both pre- and post-transfers) and employment rates (both at individual and household level). These correlations do not imply causality, nor significance; they merely serve to structure our data.

Source: Authors' computation, EU-SILC UDB 2005 (version 5), 2006 (version 4), 2007 (version 6), 2008 (version 6), 2009 (version 2), 2010 (version 2), 2011 (version 2) and 2012 (version 2).

poverty rates, but the correlation is substantially larger for post-transfer poverty rates.

Given our earlier assertion that one should study the link between employment and poverty through *household* employment, it may be rather surprising that, *levels of individual* employment rates correlate negatively with post-transfer poverty rates, whilst *household* joblessness rates show no correlation with post-transfer poverty rates during the 'good economic years'. During the economic downturn an increasing positive correlation emerges between household joblessness and post-transfer poverty rates. The stronger relation between household joblessness and post-transfer poverty during the economic downturn is entirely caused by those countries that were confronted with a strong unemployment crisis (causing increasing levels of pre-transfer poverty) and that lack a sufficient welfare state structure to reduce post-transfer poverty<sup>(137)</sup>.

Different factors explain this *prima facie* counterintuitive result<sup>(138)</sup>. First, household joblessness correlates positively with pre-transfer poverty, but the impact of household joblessness on post-transfer poverty is mitigated by social spending. Second, national pre-transfer and post-transfer poverty rates are also influenced by the poverty rates prevailing in 'non-jobless' households, which carry a large weight in the overall poverty record of many countries. Higher individual employment rates are associated with lower levels of pre-transfer poverty among the 'non-jobless' households. The 'non-jobless' segment in a country encloses two groups of individuals, i.e. those living in 'mixed employment' households and those living in 'full-employment' households. When individual employment improves, the relative proportion of 'full employment' households increases in the non-jobless segment (see also Section 15.2.1). Be-

<sup>(137)</sup> Elimination of Southern European countries from the correlation matrix brings correlation between proportion of individuals living in jobless households and post-transfer poverty around zero, also during the period of economic downturn.

<sup>(138)</sup> This observation contradicts an earlier result by the OECD (2001, pp. 59-61), that no significant correlations are found between aggregate employment rates and poverty measures. This result may have inspired Gregg and Wadsworth (2008), Dickens and Ellwood (2002) and Nickell (2004) to focus on household joblessness. The OECD's result relates to a different sample of countries (European Community Household Survey (ECHP) countries and Canada and the USA), a different database (ECHP) and a different time than the correlations displayed in Table 15.3.

cause individuals in ‘full employment’ households have lower poverty risks compared to individuals living in ‘mixed employment’ households, the pre-transfer poverty of the non-jobless segment decreases with improving individual employment rates. Hence, higher individual employment rates reduce pre-transfer poverty rates both because of their impact on household joblessness (individual and household employment correlate with each other) and because of their impact on pre-transfer poverty among the ‘non-jobless’ segment. Finally, higher individual employment rates are associated with higher levels of spending on working-age cash benefits. Higher levels of spending are associated with a larger extent of poverty reduction through social transfers, both within the jobless and the non-jobless segment of the population. Together, all these elements explain why in a cross-country comparison post-transfer poverty correlates with individual joblessness but not (or to a smaller extent) with household joblessness.

With regard to *changes* in at-risk-of-poverty rates between 2005 and 2012, both individual and household joblessness correlate positively with changes in poverty rates, as can be inferred from Table 15.3 (a correlation coefficient of 0.46 for changes in individual joblessness and 0.56 for changes in household joblessness). These macro-level correlations ask for more in depth analysis. In the next section we apply a decomposition analysis to disentangle the relation between changes in employment and changes in poverty for EU-28 countries separately.

### 15.3.2 Integrated decomposition of labour market trends and poverty risk changes

In Section 15.2.4 we described an ‘upward convergence in polarisation’ with regard to the distribution of jobs over households. This ‘upward convergence’ had a substantial impact on the evolution of household joblessness, certainly in relative terms. The question now is whether polarisation is also an important factor in the analysis of poverty risk trends.

We examine this question by decomposing changes in the poverty risk rates on the basis of (i) chang-

es in the poverty risks of jobless households, (ii) changes in the poverty risks of other (non-jobless) households, (iii) changes in household joblessness due to changes in individual employment rates and changing household structures and (iv) changes in polarisation. We integrate the two missing links we explore in this chapter (the link between individual employment rates and the configuration of household employment; the link between the configuration of household employment and poverty) into one single analysis. In principle, this would enable us to assess the impact of changes in individual employment rates on at-risk-of-poverty rates, all other things being equal, and the impact on at-risk-of-poverty rates of changes in polarisation, again all other things being equal. In practice, data challenges make such an integrated analysis not easy<sup>(139)</sup>.

Formally, the second step in this integration exercise proceeds as follows. The at-risk-of-poverty rate can be written as a weighted average of the at-risk-of-poverty rate of individuals in jobless households and the at-risk-of-poverty rate of individuals in the non-jobless households. The poverty risk of individuals in jobless households ( $j|l$ ) is much higher than the poverty risk in other households ( $njl$ ) in all EU Member States. Labelling these other households as the ‘non-jobless’ (the share of individuals in non-jobless households  $njl = 1 - j|l$ ), we can write:

$$(3) \quad pov_{it} = j|l_{it} p_{j|l}_{it} + njl_{it} p_{njl}_{it} \text{ with}$$

$p_{j|l}_{it}$  = the at-risk-of-poverty rate for individuals in jobless households

$p_{njl}_{it}$  = the at-risk-of-poverty rate for individuals in non-jobless households

Changes over time can be decomposed as:

$$(4) \quad \Delta pov_t = \overline{njl}_t \Delta p_{njl}_t + \overline{j|l}_t \Delta p_{j|l}_t + (\overline{p}_{j|l}_t - \overline{p}_{njl}_t) \Delta j|l_t$$

with, for a change from  $t = 0$  to  $t = 1$ ,

<sup>(139)</sup> First, the differences between the moment of observation for employment (survey year) and for poverty (survey year — 1) may cause an unintended bias between both indicators. Second, as shown in Section 15.2.3, the changes in the index of polarisation are driven by changes in demographic, structural and cultural balances. Hence, this indicator only changes slowly over time. EU-SILC data series are rather short to incorporate substantial changes in levels of polarisation.

$$\Delta \text{pov}_i = \text{pov}_{i1} - \text{pov}_{i0}$$

$$\bar{j}l_i = 0.5j_{i0} + 0.5j_{i1}, \text{ etc.}$$

In this way, the change in the overall poverty risk is decomposed into three subcomponents or contributory factors:

- a contribution by the change in the at-risk-of-poverty rate of individuals in jobless households;
- a contribution by the change in the at-risk-of-poverty rate of individuals in non-jobless households;
- a contribution by the change in the share of the population living in jobless households.

This mechanical approach should be interpreted with due caution (see also de Beer, 2007). It simply calculates by how much a decomposable variable changes if one of the factors informing the decomposition changes, *all the other factors being equal*. It is only an accounting device, which does not imply any causality. Moreover, changes in one subcomponent may be intrinsically linked to changes in other subcomponents of the decomposition. For instance, reducing the share of people living in jobless households may be achieved by means of a deliberate policy of increasing the poverty risk of people in jobless households through stricter conditionality and less generosity in unemployment benefits. Or increasing employment may push up the median income, to the effect that a decreasing share of jobless households and higher poverty rates go hand in hand. Conversely, jobless households may become non-jobless because their members accept jobs that are at the lower end of the pay scale, thus marginally increasing the average risk of poverty of the non-jobless group. Diverging evolutions in household size structure between the jobless and the non-jobless, implying changes in the relative median poverty risk gap (see Chapter 3 in this volume for definition) between the two categories, may also be at play. These examples do not invalidate the decomposi-

tion as such, but rather illustrate a general *caveat* concerning its interpretation.

Using equations (1), (2), (3) and (4), it is possible to integrate the decomposition of changes in household employment and changes in poverty on the basis of the following equation:

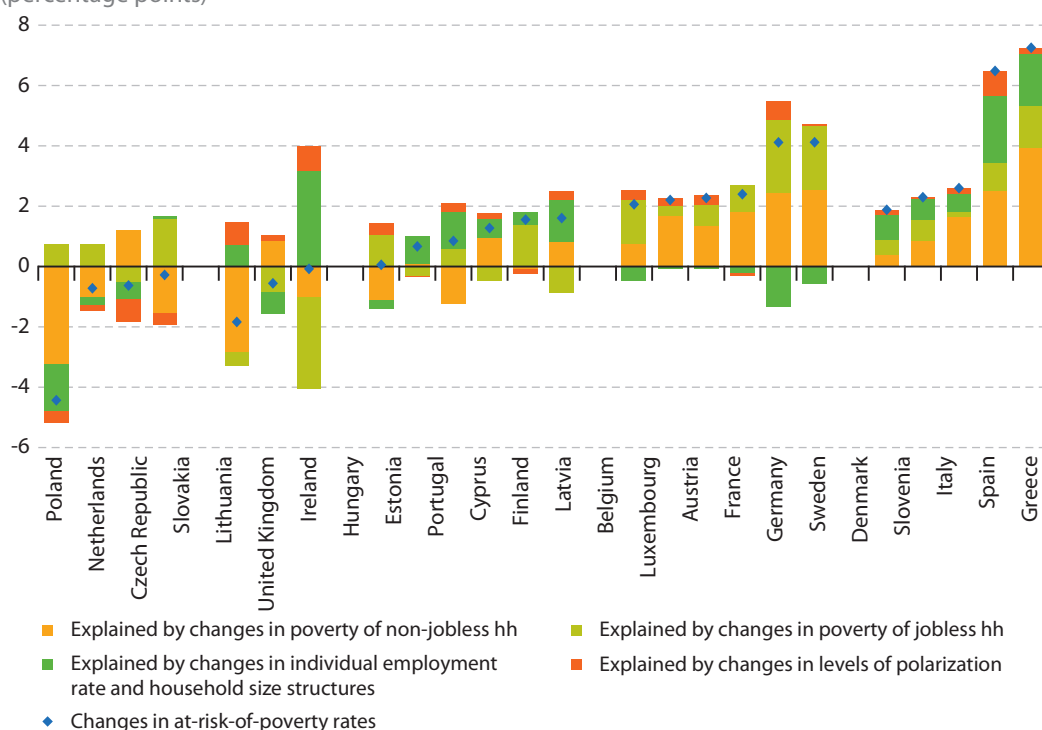
$$(5) \quad \Delta \text{pov}_i = \bar{n}j_i \Delta \text{pn}j_i + \bar{j}l_i \Delta \text{p}j_i + (\bar{p}j_i - \overline{\text{pn}j}_i) (\Delta j_i^e + \Delta p_i)$$

This requires that the data used to decompose changes in individual and household employment and changes in poverty are consistent. Since we have to rely on EU-SILC to establish a link between employment and income, it is only possible to pursue this integrated decomposition from 2005 onwards. For some countries, there are considerable differences between individual and household employment data obtained through EU-LFS and EU-SILC (also discussed in de Graaf-Zijl and Nolan, 2011). Hence, circumspection is called for when connecting this analysis based on EU-SILC with the employment analyses presented in the previous sections based on EU-LFS. In order to allow some comparison on a conceptual level, in this section we apply the same ILO definition of joblessness (as defined in Section 15.2) and the same age reference group as in the EU-LFS analysis, even though EU-SILC makes it possible to define joblessness on a retrospective basis for the 12 months prior to the survey.

Figure 15.5 summarises the integrated decomposition of changes in household joblessness and poverty risks over the period 2005-2012. The underlying estimates (with statistical significance of the decomposed changes) and a further division in two periods before and after the economic downturn are presented in Table 15.4.

The poverty record of EU Member States during the period 2005-2012 is decomposable in quite different trajectories, which seem in part linked to different *policy* trajectories and in part related with the effects of the economic downturn.

**Figure 15.5: Decomposition of changes in poverty risks, 2005-2012, EU-24, EU-SILC**  
(percentage points)



NB: EU-24 countries are EU-28 countries minus Bulgaria, Croatia, Malta and Romania. Countries are presented as in Table 15.4.

Reading note: This figure summarises the integrated decomposition of changes in household joblessness and poverty risks over the period 2005-2012. This decomposition exercise is not a causal analysis. It simply calculates by how much at-risk-of-poverty rates change if one of the factors informing the decomposition (level of polarisation, individual employment rate, household size structure, poverty rate of jobless households, poverty rate of non-jobless households) changes, all the other factors being equal.

Source: Authors' computation, EU-SILC UDB 2005 (version 5) and 2012 (version 2).

*Southern European welfare states* (but also Denmark and Slovenia) are confronted with increasing household joblessness rates. Individual joblessness rose sharply after 2008 and improvements in individual employment prior to 2008 are entirely offset. The rise in household joblessness is also partly driven by growing levels of polarisation over the entire period. Also decreases in poverty rates within jobless and non-jobless households prior to 2008 are wiped out by substantial increases in subgroup poverty risks after 2008. Over the period 2005-2008 all separate components increased translating in growing overall at-risk-of-poverty rates. In *continental welfare states* household joblessness did not change over time. Despite (limited) growing levels of polarisation (not affected by the economic crisis) the net change in individual joblessness is negative

(but also small). Decreases in individual joblessness prior to the crisis are only marginally affected by (some) small increases during the economic downturn. However, both before and after 2008, poverty grew in jobless and non-jobless households. These subgroup increases in poverty risks also drive country level increases in poverty, most explicitly in Germany<sup>(140)</sup> and Sweden. In Belgium, the relative contribution of increasing poverty in the jobless household segment to overall changes is the largest. Ireland (and to a certain extent also Lithuania) are confronted with huge challenges in their labour markets. Prior to the crisis they re-

<sup>(140)</sup> We have doubts concerning the quality of the German EU-SILC data, which yield a picture that is very different from that provided by the German SOEP data for crucial components of this analysis. (See also Frick and Krell, 2010.)

corded decreasing individual joblessness and decreasing poverty rates, but after 2008 both levels of polarisation and unemployment increased. But contrary to Southern European countries, increasing household joblessness is offset by the strong generosity of social protection. Decreasing poverty risks of both jobless and non-jobless households counterbalanced changes in the labour market and translated in fairly stable poverty records over the entire period under study. However, decreasing poverty rates in the jobless subgroup stem mainly from the period before 2008. In most of the new Member States (notably Hungary, Estonia, Cyprus and Latvia) economic growth in the period before 2008 led to substantial increases in individual employment rates and decreases in household joblessness (helped by decreasing polarisation, except in Estonia and Latvia). This contributed to significant improvements in overall poverty risks in the 20-to-59 age cohort. After 2008, these effects have eroded due to increasing individual joblessness. Moreover, poverty risks for the elderly increased in these countries, sometimes very substantially. So, their trajectory is not only employment and growth-based, but also shows an intergenerational shift. In other new Member States (Poland, Slovakia and Czech Republic, but also in the Netherlands) decreasing levels of polarisation translated in decreasing household joblessness. Together with decreasing at-risk-of-poverty in non-jobless house-

holds, overall poverty rates decreased significantly over the entire period 2005-2012.

On the basis of this analysis, we can begin to verify one of the hypotheses put forward in Vandembroucke and Vleminckx (2011) and Cantillon (2011) to explain the disappointing poverty trends in the EU. They state that this disappointing outcome is partly attributable to a failure to reduce the number of individuals living in jobless households, despite increasing individual employment rates. We find that differences among EU Member States in *levels* of polarisation and household size do play a role in explaining the diversity of configurations of individual employment, household employment and at-risk-of-poverty rates. But, in a rather short time frame, one may conclude that the impact of *changes* in employment polarisation in explaining changes in poverty rates was very limited and disparate. In some countries the factor of polarisation as such added slightly to the decline in poverty realised over the given period (Poland, the Netherlands, Czech Republic and Slovakia). In others, most notably Spain, Greece and Ireland polarisation deteriorated an already very challenging situation of increasing poverty due to rising unemployment and eroding protection of the jobless households. Also in Germany, polarisation apparently added to growing poverty (but important doubts exist concerning the German EU-SILC figures).



**Table 15.4: Decomposition of changes in poverty risks, 2005–2012, EU-24, EU-SILC**  
(percentage points)

	explained by changes in poverty risk of non-jobless households			explained by changes in poverty risk of jobless households			explained by changes in individual employment rate and household size structure			changes in levels of polarisation			changes in at-risk-of-poverty rates		
	2005-2008	2008-2012	2005-2012	2005-2008	2008-2012	2005-2012	2005-2008	2008-2012	2005-2012	2005-2008	2008-2012	2005-2012	2005-2008	2008-2012	2005-2012
Poland	-2.86 ***	-0.37 ***	-3.23 ***	-0.26	0.73	0.75 ***	-1.27 ***	-0.07	-1.57 ***	-0.26	-0.08	-0.38	-4.64 ***	0.21	-4.43 ***
Netherlands	-0.57	-0.47	-1.03 *	0.44	0.22	0.74 **	-0.36 ***	0.17 ***	-0.23 ***	-0.35	0.21	-0.19	-0.84	0.13	-0.72
Czech Republic	0.05	1.18	1.21 **	-0.29	-0.20	-0.53	-0.67 ***	0.07	-0.57 ***	-0.69	-0.08	-0.74	-1.60 **	0.97	-0.63
Slovakia	-3.11 ***	1.54 ***	-1.56 ***	0.31	1.04 ***	1.56 ***	-0.47 ***	0.75 ***	0.10	-0.24	-0.10	-0.38	-3.51 ***	3.23 ***	-0.28
Lithuania	-1.51	-1.38	-2.84 ***	-0.30	-0.07	-0.46	-1.49 ***	2.18 ***	0.71 ***	0.39	0.35	0.76	-2.92 ***	1.08	-1.84 *
United Kingdom	0.37	0.48	0.84 *	-0.58 **	-0.23	-0.86 ***	-0.77 ***	0.03 **	-0.72 ***	-0.26	0.41	0.18	-1.24 **	0.68	-0.56
Ireland	-0.46	-0.55	-1.00	-2.70 ***	0.32	-3.05 ***	0.74 ***	1.89 ***	3.18 ***	0.31	0.38	0.80	-2.11 ***	2.03	-0.08
Hungary	-1.75 ***	0.64 ***	-1.11 **	-0.10	1.19	1.05 ***	-0.18	-0.07	-0.27	0.44	-0.12	0.38	-1.59 ***	1.65 **	0.06
Estonia	-1.98 ***	2.06	0.10	0.13	-0.45	-0.34	-0.70 ***	1.63 ***	0.91 ***	-0.36	0.34	-0.01	-2.91 ***	3.58 ***	0.67
Portugal	-0.29	-0.96	-1.24	0.41	0.11	0.60 *	-0.05	1.38 ***	1.21 ***	0.01	0.30	0.28	0.08	0.77	0.85
Cyprus	0.10	0.84 ***	0.94 **	0.11	-0.60 *	-0.48 *	-0.32	0.96 ***	0.65 ***	0.15	0.03	0.17	0.04	1.24 **	1.27 **
Finland	1.26 ***	-1.35 ***	-0.09 ***	0.48 *	0.81 ***	1.39 ***	-0.32 ***	0.79 ***	0.41 ***	-0.25	0.12	-0.15	1.17 ***	0.38 ***	1.56 ***
Latvia	1.99 **	-1.12 ***	0.82	0.35	-1.20	-0.88 ***	-1.09 ***	2.40 ***	1.37 ***	-0.30	0.58	0.30	0.95	0.66	1.61 *
Belgium	0.11	0.65	0.75	1.10 ***	0.24	1.47 ***	-0.98 ***	0.56 ***	-0.49	-0.14	0.52	0.33	0.09	1.97 ***	2.06 ***
Luxembourg	0.71	0.98	1.68	0.63	-0.37	0.34	-0.23 ***	0.16 ***	-0.07	-0.26	0.58	0.26	0.86	1.35	2.21 *
Austria	-0.67	2.02	1.36 **	0.48	0.21	0.68 ***	0.07	-0.18	-0.09	0.17	0.17	0.32	0.05	2.22 ***	2.27 ***
France	0.51	1.30 ***	1.82 ***	0.00	0.89 ***	0.89 **	0.05	-0.22 ***	-0.23 ***	-0.02	0.00	-0.08	0.54	1.97	2.40 ***
Germany	1.49 ***	0.96 ***	2.46 ***	1.92 ***	0.57 ***	2.39 ***	-0.55	-0.90 ***	-1.35 ***	0.41	0.21	0.60	3.28 ***	0.84	4.11 ***
Sweden	1.84 ***	0.70 ***	2.54 ***	0.90 ***	1.12	2.13 ***	-0.48 ***	0.02	-0.58 ***	0.05	-0.04	0.03	2.31 ***	1.81 ***	4.12 ***
Denmark	0.45	-0.04	0.39	-0.03	0.49	0.49	-0.31 ***	1.15 ***	0.84 ***	-0.15	0.32	0.17	-0.03	1.92 *	1.88 *
Slovenia	-0.08	0.94	0.85 **	0.34	0.27 **	0.70 ***	-0.61 ***	1.37 ***	0.69 ***	-0.04	0.10	0.06	-0.39	2.68 ***	2.30 ***
Italy	0.42	1.24 *	1.65 ***	-0.19	0.37 ***	0.16	-0.20	0.78 ***	0.60 ***	0.05	0.13	0.19	0.08	2.52 ***	2.60 ***
Spain	-0.15	2.66 **	2.52 *	0.20	0.60 ***	0.92 ***	-0.29	2.65 ***	2.24 ***	0.44	0.37	0.80	0.20	6.28 ***	6.48 ***
Greece	2.42 ***	1.65 ***	3.92 ***	-0.37	1.91	1.42 ***	-0.24 ***	1.73 ***	1.71 ***	0.02	0.14	0.20	1.83 **	5.42 ***	7.25 ***

*Note:* EU-24 countries are EU-28 countries minus Bulgaria, Croatia, Malta and Romania.

*Reading note:* This table summarises the integrated decomposition of changes in household joblessness and poverty risks over the period 2005–2012. Besides, we make a further division in two periods before and after the economic downturn. We present estimates with statistical significance of the decomposed changes. Changes differ significantly (in the statistical sense) from 0 at 95% (\*\*\*) at 90% (\*\*), and at 85% (\*). Because the estimate of polarisation is the difference between a random distribution of a national estimate over household size structures and an observed estimate, it is rather hard to calculate confidence intervals (although bootstrapping might offer a defensible solution here). Countries are presented in clusters with similar decomposition terms. First, we cluster on the direction of the poverty changes. Within these two clusters, we group countries by the sign of decomposition terms. For example, in the cluster Denmark, Slovenia, Italy, Spain and Greece both changes in poverty and the underlying decomposition terms are positive. In the cluster Belgium, Luxembourg, Austria, France, Germany and Sweden the changes in poverty and most decomposition terms are positive, with exception of the expected change in household joblessness.

*Source:* Authors' computation, EU-SILC UDB 2005 (version 5) and 2012 (version 2).

## 15.4 Conclusions

The configuration of individual employment rates and household employment rates proves to be relevant for differentiating EU welfare states. In this chapter, we used a binary concept to structure data on household employment, i.e. 'household joblessness' based on an ILO definition of employment. This measure allows a decomposition on the basis of evolutions in individual joblessness, household size structure, and polarisation between and within households. The configuration of individual and household employment is driven by forces of modernisation that affect all European welfare states in the same direction, such as declining household size, feminisation of labour markets and increasing proportions of tertiary educated individuals. Nevertheless, the configuration remains very different from country to country. Further research is necessary to understand these cross-country differences (see Corluy and Vandenbroucke, 2015, for a more thorough analysis of the Belgian case, both from a cross-country and an intertemporal perspective).

At the start of the Lisbon era, the individual/household employment configuration was rather different in Spain, Greece and Italy from most other EU Member States, including new Member States. The level of polarisation was negative in Spain, Greece and Italy — a corollary of the pooling of non-employment risks in extended families — and became gradually less negative evolving towards positive polarisation at the end of the period studied in this chapter. Until 2008, their welfare states were still in a process of taking over from familial solidarity, but after 2008 losses in individual employment translated in stronger increases in household joblessness (especially in Spain and Greece). In all EU-11 Member States (no household data are available for Scandinavian countries) we observe a consistent, upward trend in polarisation of employment. The pattern in the new Member States after 2000 was very different. Gains in individual employment rates were enhanced by decreasing polarisation of jobs over households, i.e. by a more even distribution of jobs over households, thus additionally decreasing welfare state dependency. Experience in the United Kingdom suggests that the prevalence of jobless households, and thus the extent of 'pos-

itive' polarisation, can be influenced by policy: the drive to diminish the number of jobless lone parents during the New Labour government was both influenced by analyses on polarisation in the British labour market, and contributed to its reduction.

However, changes in the share of jobless households cannot explain very much of the diversity in the changes in national at-risk-of-poverty rates, both during the period of economic upswing and the downturn. Or, to put it differently, it would be incorrect to attribute disappointing poverty trends during the employment boom years solely to the modest conversion of individual employment successes in household employment successes, or more specifically to ongoing polarisation of jobs over households. But that does not reduce the importance that national and EU policymakers should attach to the presence of high numbers of jobless households and polarisation, as possibly problematic conditions for welfare states. The multidimensional Europe 2020 social inclusion target (see Chapters 1 and 3 of this volume), which includes the reduction of people living in (quasi-)jobless households, may find a justification here.

The decomposition of changes in poverty risks on the basis of 'household joblessness' suggests that the convergence in at-risk-of-poverty rates is the combined result of different evolutions. A number of countries recorded an overall poverty standstill, mainly because of opposite evolutions in overall poverty (and within household subgroups) before and after 2008. Some countries with historically low poverty rates (such as Sweden and Germany) followed a clearly inegalitarian trajectory (with increasing poverty rates among jobless households over the entire period 2005-2012). In contrast, Anglo-Saxon Member States successfully managed to reduce poverty during the economic upswing and kept poverty records more or less constant during the economic downturn, yet with a different policy emphasis in the United Kingdom (successful activation) and Ireland (much enhanced social protection generosity). Finally, Southern European Member States struggle with increasing at-risk-of-poverty rates, as a result of an unemployment crisis combined with less intra-family protection leading to increasing levels of polarisation and eroding protection of jobless households.

Economic and socio-demographic convergence was a dominant background condition, but the policy trajectories with regard to public social spending on working-age benefits (including child benefits) were quite different. These conclusions point simultaneously to the need to refuel economic convergence in the EU, to allow the new Member States to reconnect on a sound basis with the 'good years' in terms of growth and employment creation, and to the necessary complementarity of employment creation and income poverty reduction through social transfers and inclusive labour market policies.

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# 16

## Risk of poverty or social exclusion over time: a focus on (quasi-)joblessness

Sophie Ponthieux <sup>(141)</sup>

### 16.1 Introduction

Fighting poverty and social exclusion is one of the headline targets of the Europe 2020 strategy. Within this framework, the key indicator is a measure of the size of the population 'at-risk-of-poverty-or-social-exclusion' (AROPE), i.e. the number of people living in households which are at risk of monetary poverty (AROP) and/or facing severe material deprivation (SMD) and/or '(quasi-)jobless'. (See Chapters 1 and 3 in this volume for a definition of the three AROPE component indicators.) The rationale for using several indicators of poverty and social exclusion generally refers to poverty/social exclusion as a multifaceted or multidimensional phenomenon that cannot be captured by a single indicator. The novelty with the Europe 2020 AROPE indicator is to refer to an integrated measure combining several indicators. Among the three indicators combined in the AROPE measure, poverty risk and MD have been investigated at length, as well as their association. The purpose of this chapter is to explore the advantages and disadvantages of the third indicator of (quasi-)joblessness (hereafter 'QJ-ness') and to assess its contribution to the AROPE measure.

QJ-ness refers to households with very low work intensity, i.e. where there is no (or almost no) employment. The QJ measure is a headcount of people living in these households — actually, not all people living in these households: only those less than 60 years old. Precisely, QJ people are '*people of all ages (from 0-59 years) living in households where the adults (those aged 18-59, but excluding students aged 18-24) worked less than 20 % of their total combined work-time potential during the previous 12 months*'. The household total potential (the denominator of the ratio of work intensity) is '*the total number of months that could, in theory, have been worked by adults in the same household*'. Worked months (the numerator of work intensity) are measured in terms of full-time equivalent: '*For persons who declared having worked part-time, an estimate of the number of months in terms of full time-equivalent is computed on the basis of the number of usually worked hours at the time of the interview*' <sup>(142)</sup>.

From the perspective of analysing the risk of poverty and social exclusion, QJ-ness, assessed at household level, may be of interest for a number of reasons:

- employment is the main source of regular income of working-age individuals and households;
- even though not a guarantee (on account of in-work poverty), employment is a prevention/protection against the risk of poverty;

<sup>(141)</sup> French National Statistical Institute (INSEE). The author would like to thank Nuno Alves, Anthony B. Atkinson, Anne-Catherine Guio and Maria Iacovou for their comments and suggestions. She also thanks her colleagues at INSEE, especially Carine Burricand and Marie-Emilie Clerc, who answered her (many) queries on the transmission of data to Eurostat, and Eric Marlier for many discussions and for his patience. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission and INSEE bear no responsibility for the analyses and conclusions, which are solely those of the author. Any error would be her own. Email address for correspondence: [sophie.ponthieux@insee.fr](mailto:sophie.ponthieux@insee.fr).

<sup>(142)</sup> Definition from the European Commission (2011, p. 155). See also Eurostat website: [http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php/Material\\_deprivation\\_and\\_low\\_work\\_intensity\\_statistics](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Material_deprivation_and_low_work_intensity_statistics).

- employment (or joblessness) assessed at the individual level only does not allow to account for employment polarisation, the concentration of jobs (or absence thereof) in some households — a phenomenon manifested by an increase in the levels of employment at individual level *and* in the share of workless households) pointed out by Gregg and Wadsworth (1996) and Gregg et al. (2010) (see also Chapter 15 in this volume);
- joblessness may affect not only the jobless person, who is excluded from the labour market, but also the other members of his/her household: in addition to the whole household being affected by economic insecurity (including the fact that various social benefits — pensions, healthcare — are derived from being employed), a long-term lack of contact with the world of work in a household may be detrimental in terms of social participation, health, and children's well-being (see e.g. Pedersen et al., 2005; Atkinson et al., 2002).

Including an indicator of QJ-ness in an integrated measure of poverty and social exclusion also puts 'the emphasis on labour market participation as a way of achieving social inclusion' (European Commission, 2012, p. 105), and in turn allows making links between the EU social and employment strategies — the employment rate is one of the other Europe 2020 headline targets <sup>(143)</sup>.

However, the meaning of the QJ indicator and its integration in the key indicator of the Europe 2020 social inclusion target has also been subject to a range of criticisms.

Copeland and Daly (2012, p. 281) question the underlying concept as *'another one of those elastic terms which cover a range of potential "problems"'* and the functions it serves as an indicator. They highlight the character of compromise of the AROPE target, reflecting various positions of the Member States between 'social' and 'activation' concerns. They identify three positions: Member States in favour of a target in terms of income poverty (AROP) only, Member States advocating a strong social component, and Member States favouring the inclusion of an employment dimension, including Member

States particularly concerned with the issue of benefit dependency (on this, see also Frazer et al., 2014).

Other researchers have questioned the rationale for combining the measure of QJ-ness with the two other components of AROPE (Nolan and Whelan, 2011; Graaf-Zijl and Nolan, 2011; Maitre et al., 2012, 2013). They do not question the usefulness of QJ as an analytical dimension, but rather its relevance as a component of an integrated measure which already includes both monetary and non-monetary elements. Maitre et al. (2013) argue that combining too many dimensions in a single indicator might lead to confusion — a recurring criticism of aggregate indicators. QJ households compose a very heterogeneous social group, in which significant proportions are neither at risk of poverty nor severely materially deprived, raising questions about the nature of the social exclusion faced by this population. Graaf-Zijl and Nolan (2011) while recognising that household joblessness may be an important contributory factor in poverty and MD, and that welfare dependence and the transmission of disadvantage are clearly of concern, warn that the AROPE measure might include households which *'may not be a suitable focus for anti-poverty policy, and may distract from those most in need'* (Graaf-Zijl and Nolan, 2011, p. 35).

From a more technical perspective, Ward and Özdemir (2013) raise several issues relating to the definition and implementation of the indicator. Their primary concerns are twofold: (1) that the definition of work potential (the denominator of the indicator) excludes people older than 59 years; and (2) that the threshold for identifying household QJ-ness is set at 20 %. According to the European Commission, this threshold of 20 % reflects 'the fact that, below that level of work intensity, household members experience very high rates of poverty and material deprivation' (European Commission, 2012, p. 155). Ward and Özdemir advocate raising the threshold to 30 %, arguing that the risk of poverty in households where work intensity is between 20 % and 30 % may, in some countries, be as high as the risk in workless households. However, raising the threshold could result in increasing the heterogeneity of QJ and making its interpretation more difficult. Ward and Özdemir also note that the measurement of work intensity mixes information from the reference period (year *N-1* in most coun-

<sup>(143)</sup> See: [http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index\\_en.htm](http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm).

tries) and the current situation at the time of interview (year  $N$ ). This may be particularly problematic for people with loose attachment to employment, or in times of instability, that is when the individual's situation at time  $N$  is most likely to be different from the situation 1 year previously.

In the light of these critical analyses, this chapter assesses QJ-ness on the basis of a descriptive approach. Section 16.2 examines the population affected by QJ-ness as defined above, with the aim of identifying, across countries, a specific social group. Section 16.3 examines the evolution of QJ over time and its marginal contribution to the Europe 2020 integrated measure of risk of poverty or social exclusion (AROPE). Section 16.4 concludes. It underlines difficulties of interpretation of both people in QJ households as a social group and the contribution of QJ to AROPE. It also raises some conceptual and methodological issues which may account for these difficulties, and suggests some revisions.

## 16.2 A statistical overview of (quasi-)joblessness

In 2012 <sup>(144)</sup>, about 39 million people lived in QJ households in the EU-27. This represents about 8 % of the EU-27 population aged 0 to 59, with most countries standing between 5 % and 10 % (see Figure 16.1). The exceptions are Sweden (below 5 %) and, at the other end of the scale, Greece, Belgium, Spain and Ireland (all above 10 %, with Ireland an outlier at close to 20 %).

Note that the QJ measure includes only people aged 0-59 living in QJ households, differing from the two other components of AROPE (AROP and SMD) which take into account all people irrespective of their age. The rationale for setting an upper age limit appears conceptually inconsistent: why include children but exclude persons aged 60+ who live in the same households? The upper limit also entails difficulties for the analysis of QJ-ness

<sup>(144)</sup> 2012 is the year of the dataset, not the year of the reference period (the period over which very low work intensity is assessed). The reference period is the previous civil year for all countries except Ireland and United-Kingdom, where it is a moving period (the 12 months preceding the date of survey). Note that this may entail some problems of comparability.

at individual level, because it links the evolution of QJ-ness with ageing — making both cross-country comparisons and the interpretation of variations over time difficult. Counting all the people, regardless of their age, in QJ households would of course increase the measure (see Figure 16.1); the difference would be relatively small at EU level, negligible in a few countries (Sweden, Netherlands, Germany, Denmark), but significant in a few others where multi-generational households are more common (especially Portugal, Italy, Greece and Spain).

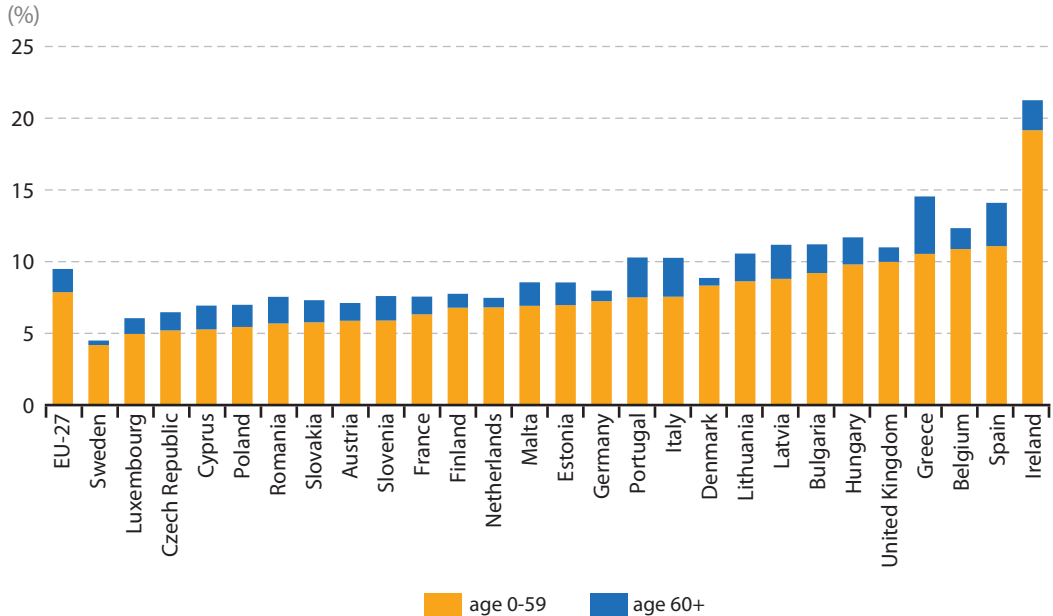
We now examine QJ-ness in terms of household composition, employment and work potential, and its association with poverty risk and material deprivation.

### 16.2.1 Household composition

There is a great deal of cross-country variation in the composition of the QJ population by household type (see Table 16.1, part A). The percentage living in one-adult households without dependent children <sup>(145)</sup> ranges from about 5 % (Bulgaria, Portugal) to almost 50 % (Denmark); the percentage living in single-parent households ranges from 4.5 % (Greece) to 34 % (United Kingdom); and the percentage living in households with three or more adults ranges from 1 % (Denmark) to almost 50 % (Bulgaria). The differences in the shares living in two-adult households are less pronounced.

The overall percentage of the QJ population living in households with dependent children is rather high in general, especially in Bulgaria, Ireland, Hungary and the UK, where it is over 65 %. However, it is difficult to attribute this specifically to QJ-ness, because the population examined is distorted by the absence of people older than 59 years. It is therefore more informative to consider indicators of concentration, i.e. the ratios of the percentage of each household type among people of QJ households to the percentage observed among the total population aged 0-59; a ratio greater than 1 indicates over-representation, i.e. a higher risk of living in a QJ household than on average. These results are presented in Table 16.1, part B, and show a striking over-representation, in all countries, of people living in one-adult households

<sup>(145)</sup> Dependent children are defined as children aged below 18 or aged from 18 to 24 and not economically active.

**Figure 16.1: Individuals living in QJ households, 2012**

*NB:* Countries are ordered by the proportion of QJ. The percentages are lower than those available from the Eurostat web-database because the share of individuals (aged 0-59) living in QJ households is computed here as a share of the whole population instead of a share of the population aged 0-59 living in eligible households. This is to allow for the incidence of QJ-ness to be directly comparable with that of the two other components of AROPE.

*Reading note:* In the EU-27 in 2012, about 8 % of people aged 0-59, and about 10 % of the total population lived in a QJ household.

*Source:* Author's computation, UDB August 2014.

(particularly in single-parent households). This relates directly to QJ being assessed at household level: in one-adult households, the likelihood that an adult's absence of worked months will be counterbalanced by another adult's worked months is nil. No general pattern emerges on the share of people living in other types of households.

The other striking feature of the structure by household composition is, in all countries, the under-representation of people in two-adult households with dependent children, and in most countries of people in households of any type with dependent children, except Bulgaria and United-Kingdom. Then the share of people in QJ households with dependent children is quite high (especially in Ireland <sup>(146)</sup> and Hungary), but not higher (even smaller in a number of countries) to the average observed among people aged 0-59.

<sup>(146)</sup> This could account for the very high share of QJ-ness in this country as underlined in a report from the Irish National Economic and Social Council (2014).

## 16.2.2 Employment and work potential in QJ households

According to the definition, a QJ household is a household where, during the reference period, the total number of months of employment (measured in full-time equivalent <sup>(147)</sup>) is less than 20 % of the household total work potential (basi-

<sup>(147)</sup> That is 1 month in part-time work is weighted less than 1, the coefficient depending on the number of hours relative to full-time. Note that EU-SILC provides the number of hours of work only for the current job — if any — at the time of interview but not for the months of work in the period of reference. So, the coefficient is measured for the number of hours observed at the time of interview, and applied to all the months of part-time work observed in the reference period. This mixing of information from the reference period (*N-1* in most countries) and from the time of interview (in *N*, i.e. the year after) makes the estimate of full-time equivalent, and in turn of work intensity, somewhat fragile. This affects of course particularly countries where the incidence of part-time employment is high. Beside these technical drawbacks, one may also wonder whether, conceptually, it is relevant to refer to work in terms of full-time equivalent to assess exclusion from employment.



**Table 16.1: Individuals in QJ households by household type (%) and concentration of QJ-ness, 2012**

	A. Household type (%)							B. Concentration						
	1 adult		2 adults		3 +	Total	All	1 adult		2 adults		3 +	All	
	no kids	with kids	no kids	with kids			with kids	no kids	with kids	no kids	with kids		with kids	
Belgium	22.5	22.8	16.2	24.5	14.1	100	54.4	2.1	2.8	1.1	0.5	0.9	0.8	
Bulgaria	5.8	9.0	13.4	22.3	49.7	100	70.4	1.9	2.7	1.2	0.7	1.0	1.1	
Czech Republic	15.0	16.1	25.2	21.3	22.4	100	49.0	2.5	3.0	1.6	0.4	0.9	0.8	
Denmark	50.9	18.1	17.9	11.9	1.3	100	30.3	2.7	1.9	1.0	0.2	0.2	0.5	
Germany	40.5	17.6	18.1	15.7	8.1	100	36.4	2.6	2.5	0.9	0.4	0.6	0.6	
Estonia	22.4	10.8	20.7	26.6	19.5	100	44.6	2.2	1.5	1.3	0.6	0.9	0.7	
Ireland	8.2	20.5	11.0	35.6	24.8	100	69.3	1.8	2.1	0.9	0.7	1.2	0.9	
Greece	6.7	4.5	17.9	23.4	47.5	100	39.5	1.3	2.6	1.6	0.5	1.5	0.6	
Spain	9.4	6.7	18.3	31.2	34.4	100	53.4	1.6	2.0	1.2	0.7	1.1	0.8	
France	18.7	17.9	23.4	27.2	12.7	100	51.9	1.9	2.3	1.3	0.5	1.0	0.8	
Italy	11.6	9.7	18.8	22.1	37.8	100	44.8	1.5	2.2	1.7	0.5	1.3	0.7	
Cyprus	8.9	11.1	25.4	27.9	26.7	100	49.9	1.8	2.9	2.0	0.6	0.8	0.7	
Latvia	16.1	11.7	19.7	25.3	27.2	100	49.4	2.5	1.6	1.3	0.7	0.8	0.8	
Lithuania	20.5	16.8	20.0	20.6	22.2	100	48.0	2.8	2.2	1.6	0.5	0.8	0.7	
Luxembourg	24.3	15.5	23.6	21.3	15.3	100	43.4	2.3	3.2	1.7	0.4	0.7	0.6	
Hungary	8.8	10.0	17.5	32.9	30.9	100	65.4	1.9	2.2	1.2	0.8	0.9	1.0	
Malta	16.1	24.8	19.5	16.4	23.2	100	51.9	3.6	6.8	1.4	0.5	0.5	0.9	
Netherlands	41.3	23.0	15.8	14.8	5.1	100	39.7	3.2	3.8	1.0	0.3	0.4	0.6	
Austria	29.4	11.6	21.4	22.3	15.4	100	39.0	2.6	2.3	1.4	0.5	0.6	0.6	
Poland	15.3	8.0	26.1	17.3	33.5	100	44.0	3.9	3.1	2.2	0.5	0.7	0.6	
Portugal	5.4	11.3	24.7	23.0	35.5	100	49.4	1.7	2.2	2.0	0.5	1.0	0.7	
Romania	11.3	4.0	28.9	21.2	34.7	100	46.9	3.4	1.9	2.4	0.5	0.8	0.7	
Slovenia	23.9	9.4	31.0	17.0	18.6	100	32.5	3.5	1.9	2.8	0.3	0.7	0.5	
Slovakia	13.9	5.8	16.6	22.6	41.2	100	51.8	3.5	2.1	2.0	0.6	0.9	0.8	
Finland	37.4	13.7	22.1	21.5	5.3	100	35.7	2.7	2.1	1.0	0.4	0.8	0.6	
Sweden	33.4	23.3	13.9	24.8	4.7	100	50.8	2.7	2.9	0.8	0.5	0.5	0.8	
United Kingdom	15.8	34.1	12.1	24.2	13.7	100	65.5	2.0	3.6	0.6	0.6	0.7	1.1	

NB: 'Kid' is used here for brevity and refers to dependent children.

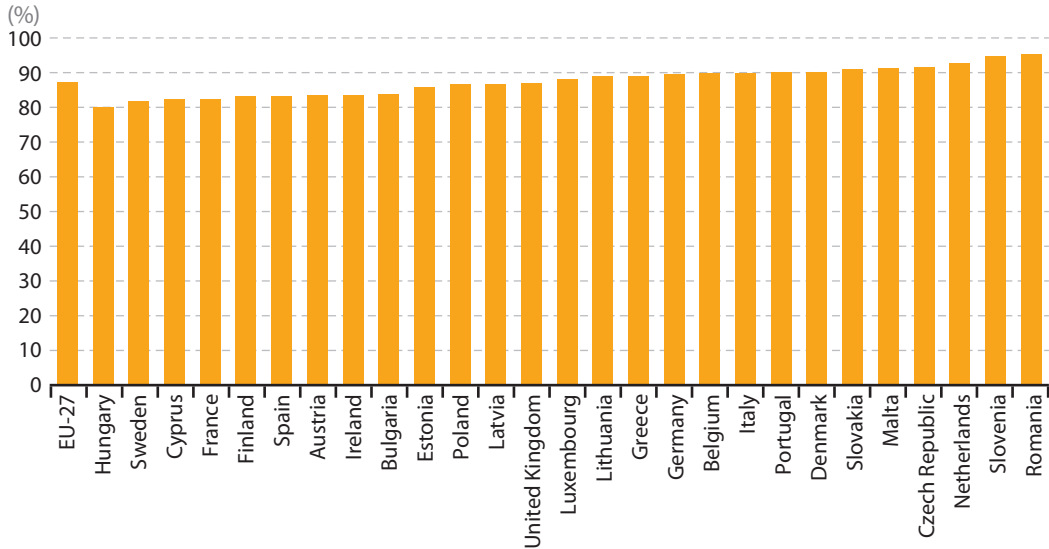
Reading note: In Belgium, 22.5 % of people aged 0-59 living in QJ households live in a single-adult household without children; this is 2.1 times as high as on average among people aged 0-59.

Source: Author's computation, UDB August 2014.

cally, 12 times the number of working age adults, excluding students, in the household). We now examine QJ households in the perspective of these two constituents of work intensity.

A first question is that of the respective shares of 'Q' and 'J'. In all countries, most QJ households — about 87 % in the EU-27 in 2012 — are completely jobless, meaning that no adult (aged less than 60) in these households has spent even a single month in employment during the reference period (see Figure 16.2).

These large shares of completely jobless households mean that across the QJ population as a whole, the share of worked months relative to households' work potential is extremely small: 3 % on average in the EU (see Figure 16.3). In addition, large proportions of these worked months are worked part-time, especially in Germany, Luxembourg, Ireland and France. Combining the small share of worked month and work being measured in terms of full-time equivalent, the value of work intensity is finally extremely low on average, well below the 20 % threshold in all countries.

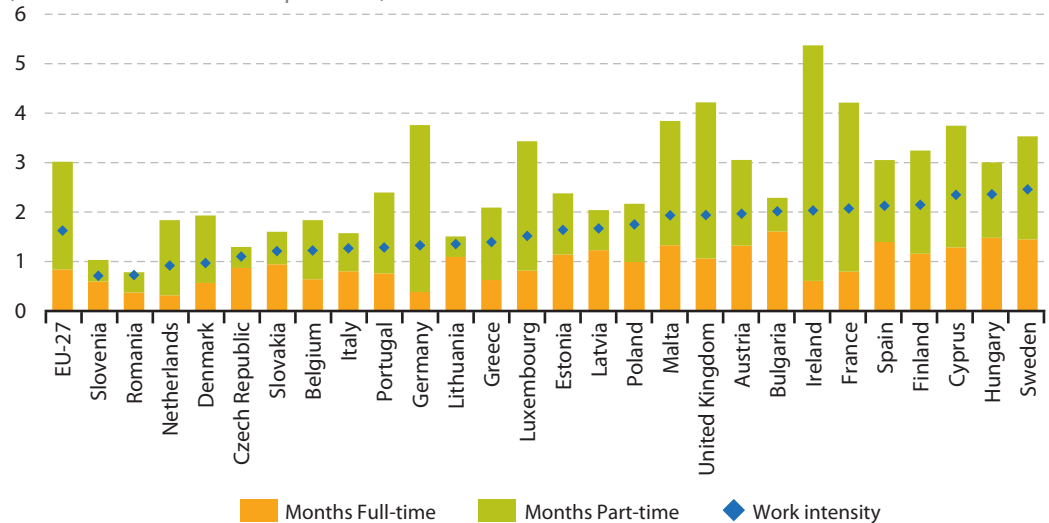
**Figure 16.2:** Share of jobless households among QJ households, 2012

NB: Countries ordered by share of jobless households.

Source: Author's computation, UDB August 2014.

**Figure 16.3:** Worked months and work intensity in QJ households, 2012

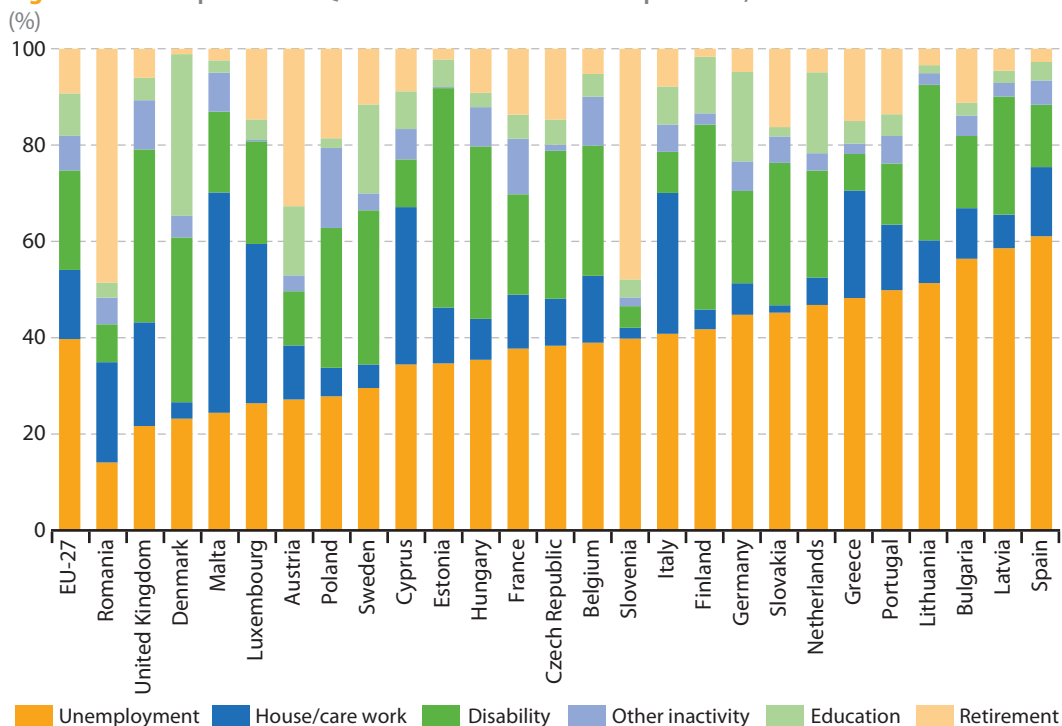
(in % of households' work potential)



NB: Countries ordered by level of work intensity. Worked months are measured as a percentage of the household work potential.

Reading note: The share of worked months in the total work potential of QJ households is about 3 % on average in the EU, with months of full-time work representing about 0.8 % and months in part-time work about 2.2 %. The level of work intensity is around 1.5 %.

Source: Author's computation, UDB August 2014.

**Figure 16.4: Composition of QJ households' unused work potential, 2012**

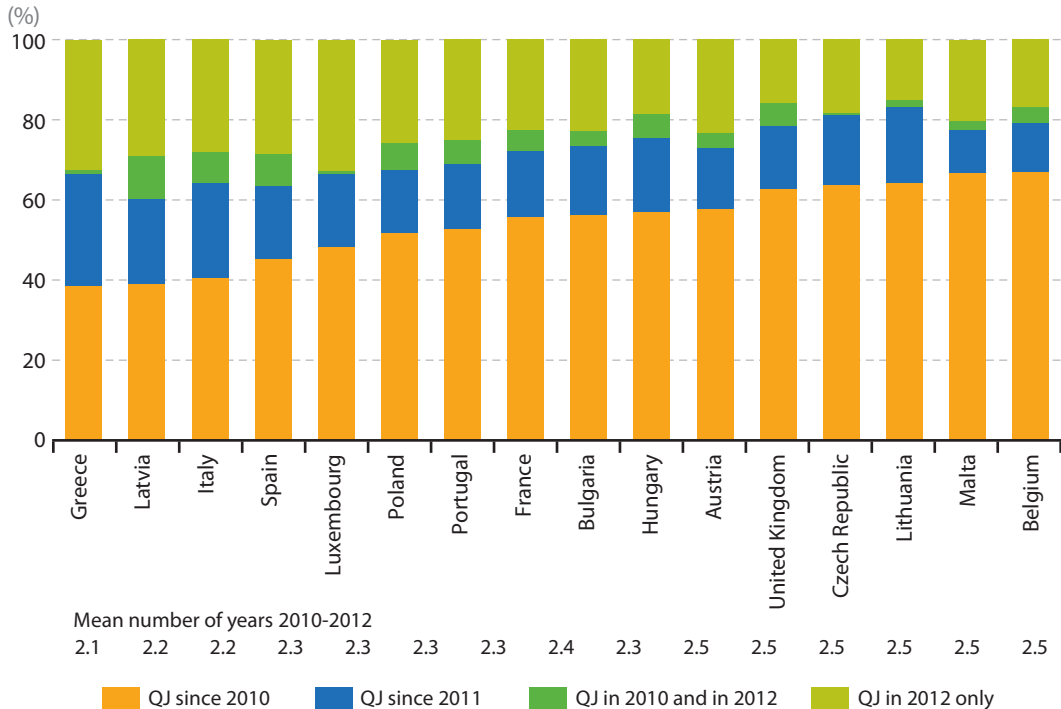
NB: Countries ordered by share of unemployment. Ireland could not be taken into account because the variables on activity statuses other than work are not reliable in this version of the UDB.

Reading note: In the EU-27, the months spent out of work by the adults in QJ households during the reference period are composed roughly as follows: 40 % unemployment, 15 % house/care work, 20 % of disability, 7 % unidentified status, 9 % education and 9 % retirement.

Source: Author's computation, UDB August 2014.

The next question relates to the composition of the other months, i.e. the 'unused' work potential of QJ households. A first striking fact is the relatively small share of unemployment: in most countries, it represents under half of the available (not worked) months and less than 25 % in Romania, Denmark, United-Kingdom and Malta (see Figure 16.4). There are wide variations between countries in the distribution of all the other statuses: for instance, the share of months reported as housework/care is especially large in Malta, especially small in Denmark and Finland, and also very small in a number of other countries. For months of disability, the share seems rather large in many countries considering that the household work potential is measured over a relatively young population (i.e. aged less than 60); the share is particularly large in the United Kingdom, Denmark, Sweden, Estonia and Hungary.

The analysis of the unused work potential shows significant shares of months spent in education (especially large in Denmark, Sweden, Netherlands, Finland) and months of retirement (especially large in Romania, Slovenia, Austria). Students are technically identified by their status at the time of interview, which may differ from their activity during the reference period, resulting in mismatches (see Ward and Özdemir, 2013). As for people aged 60+, the exclusion based on an age threshold leaves those aged less than 60 but already retired (or with months of retirement during the reference period) included in the household work potential. These 'false' available months result in over-estimating the household work potential and under-estimating household work intensity; since not all countries are equally affected, it reduces both the comparability and interpretation of QJ-ness at EU level.

**Figure 16.5: People living in QJ households in 2012 by QJ status, 2010 and 2011**

NB: Countries ordered by 'QJ since 2010'.

Reading note: In Greece, among people living in QJ households in 2012, about 40 % are already in a QJ household since 2010, about 28 % since 2011, and about 30 % are observed for the first time in a QJ household.

Source: Author's computation, UDB August 2014.

An issue of a different nature but related to the notion of work intensity, is the exclusion of workers and potential workers aged 60 years and over from the computation of household work intensity. This is problematic for two reasons. First, it goes against the evidence: significant shares of people aged 60+ remain economically active and, moreover, are not even eligible to retire in a number of countries. Secondly, the notion of work intensity measured for people aged less than 60 years runs counter to other EU employment targets and notably the Europe 2020 employment target, set for the population aged from 20 to 64. It is also not consistent with the emphasis put on 'active ageing' in the EU (e.g. European Commission, 2012, 2013). All in all, the addition of a technical problem resulting in 'false' workable months, as shown above, and the neglect of worked and/or available months of peo-

ple aged 60-64 affects the level of QJ, its scope and comparability, and its meaning.

### 16.2.3 Permanent or transitory?

We explore now the extent to which QJ-ness is a long-lasting or a transitory status, and the proportion of people who escape QJ-ness. For this, we use the EU-SILC longitudinal UDB, a specific dataset consisting of the compilation of 4 years covering from year  $N$  back to year  $N-3$  (See Chapter 27 in this volume for a discussion of the research value of the longitudinal component of EU-SILC). Given the rotational design of EU-SILC, national samples are not large enough for computing accurate descriptive statistics on people living in QJ households over a period of 4 years, so we limit the analysis to a 3-year balanced panel, then covering 2010 to

2012 (2009 to 2011 in terms of reference period). Not all EU-27 countries are taken into account: first, Germany, Ireland, Romania and Slovakia are not available in the longitudinal UDB 2012; secondly, Denmark, the Netherlands, Slovenia, Finland and Sweden cannot be included in the analysis because the variables required for the computation of work intensity are not available in the EU-SILC longitudinal UDB. Thirdly, Estonia and Cyprus could not be included due to too small sample sizes. With these various limitations, the description below has mostly an exploratory value: the samples are relatively small, only 3 years are observed and, for those living in a QJ household the first year, we do not know since how many years.

Duration is examined for people in QJ households in 2012 (year of data collection), looking at their QJ status in 2010 and 2011 (see Figure 16.5).

In the 16 countries considered, the majority of people in QJ households in 2012 had been in this situation since 2011, and since 2010 in 12 of the 16 coun-

tries examined (within the limits mentioned above: 2010 is the first year observed, not necessarily the first year of QJ-ness). On average, people in QJ households in 2012 have spent from 2.1 to 2.5 years in this status in a 3-year period. On the basis of this relatively short period of observation, QJ-ness could then be said to be an enduring situation.

Nevertheless, some people get out of QJ-ness. Among people in QJ households in 2010, the share of those in a not-QJ household in 2011 runs from 18 % (Lithuania) to 46 % (Italy) (see Table 16.2). At the horizon of 2012, a large majority of these exits appear 'definitive' (that is they do not re-enter the status in 2012). The exit rate is in general lower for those in a QJ household 2 years in a row (here in 2010 and 2011); it is conversely in general higher for those who experienced only 1 year of QJ, prior to the exit (QJ in 2011 but not in 2010). This suggests that 'long lasting' QJ-ness reduces the chance of exit; it is not counter-intuitive, but the narrow window of observation does not allow very robust conclusions.

**Table 16.2:** Exits from QJ-ness in 2011 and 2012 and share of people aged 59 prior to the exit (%)

	QJ in 2010		QJ in 2010 and 2011 Exit rate in 2012	QJ in 2011 only Exit rate in 2012	Aged 59 before the exit (% of all exits)
	Exit rate in 2011	In which: definitive			
Belgium	22.1	84.1	19.7	44.4	18.1
Bulgaria	23.7	82.8	16.6	42.0	25.6
Czech Republic	28.7	98.5	16.1	49.9	34.6
Greece	28.8	94.5	17.0	23.0	16.7
Spain	30.2	67.1	21.0	47.5	14.7
France	28.6	84.0	30.8	50.7	24.1
Italy	46.2	83.3	24.9	50.7	13.5
Latvia	41.1	73.8	31.9	40.6	7.0
Lithuania	18.4	90.9	18.4	45.8	24.8
Luxembourg	28.3	96.8	25.2	39.8	29.4
Hungary	26.6	77.8	23.2	39.8	24.6
Malta	22.4	89.7	19.9	45.6	33.1
Austria	34.3	90.8	22.4	51.8	23.6
Poland	38.5	84.4	25.7	51.1	29.5
Portugal	31.0	78.9	16.5	43.2	26.5
United Kingdom	34.2	85.5	16.2	42.6	10.1

*Reading note:* In Belgium, 22.1 % of people in QJ-ness in 2010 are no longer in this status in 2011 and 84.1 % of them remain out of QJ-ness in 2012. The exit rate in 2012 is 19.7 % among those in QJ-ness in 2010 and 2011, and 44.4 % among those in QJ-ness only in 2011. In 18.1 % of the total number of exits, the person is 59 years old the year prior to the exit.

*Source:* Author's computation, UDB August 2014.

As for why some escape QJ-ness, it may result from any factor resulting in an increase in the household work intensity (e.g. an unemployed household member getting a job, a change in the household composition), or from the person herself moving to another household with better labour market attachment. Another potential factor is ageing: since the age threshold is set at 59 years for the headcount of people in QJ households, individual 'QJ-ness' automatically disappears at the 60<sup>th</sup> birthday; these automatic exits range from 7 % (Latvia) to 35 % (Czech Republic) of all the exits (see Table 16.2, last column).

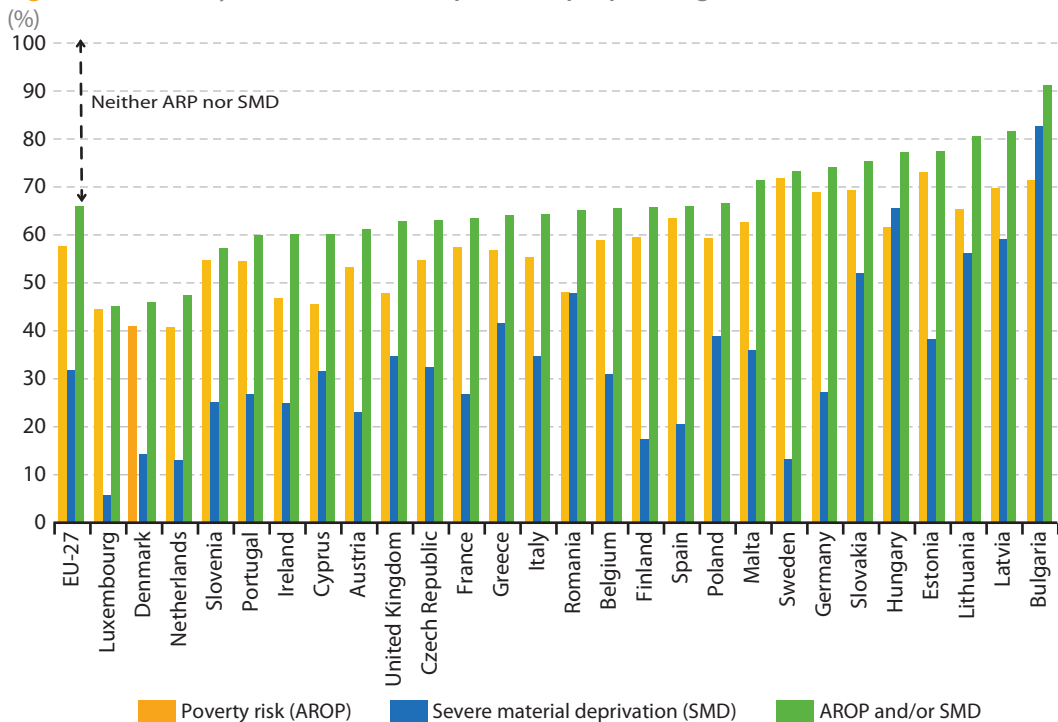
## 16.2.4 Poverty risk and material deprivation in QJ households

We now look at the incidence of the risk of poverty, severe material deprivation and their combination

within the QJ population (see Figure 16.6). In 2012 in the EU-27, about 65 % of people in QJ households were also either at risk of poverty (AROP) or facing severe material deprivation (SMD); this is about three times higher than in the average population, indicating that people in QJ households face, on average, a greater risk of poverty and social exclusion than the general population. People in QJ households are, on average, more often at risk of poverty (about 58 %) than materially deprived (about 32 %), with the exceptions being Bulgaria and Hungary where it is the opposite.

As underlined previously (see Section 16.1), there are also significant shares of people in QJ households which are neither at risk of poverty nor facing severe MD: about one third across the EU-27 (see Figure 16.6), and a much higher percentage in Luxembourg, Denmark or Netherlands, where more than half the population in QJ households is neither

**Figure 16.6: Poverty risk and material deprivation, people living in QJ households, 2012**



NB: Countries ordered by 'AROP or SMD'.

Reading note: At EU-27 level, about 58 % of people living in QJ households are also at-risk-of-poverty, 32 % are also severely materially deprived; 65 % are AROP and/or SMD and about 45 % neither AROP nor SMD.

Source: Author's computation, UDB August 2014.

at risk of poverty nor materially deprived. This can, at least partly, be related to a possible overestimation of household QJ-ness due to overestimating the denominator (the months available for work, see above). These households who are QJ but neither AROP nor SMD might also be barely above the at-risk-of-poverty threshold ('line thickness'); this is however not the case, as most of these households are significantly above the at-risk-of-poverty threshold and more than one third of them across the EU-27 are in the upper half of the income distribution (see Figure 16.7).

This raises some questions, which we discuss later, on the meaning of the inclusion of this group among people defined as being at risk of social exclusion. It is certainly a limitation, particularly given the variation of both the share of QJ households

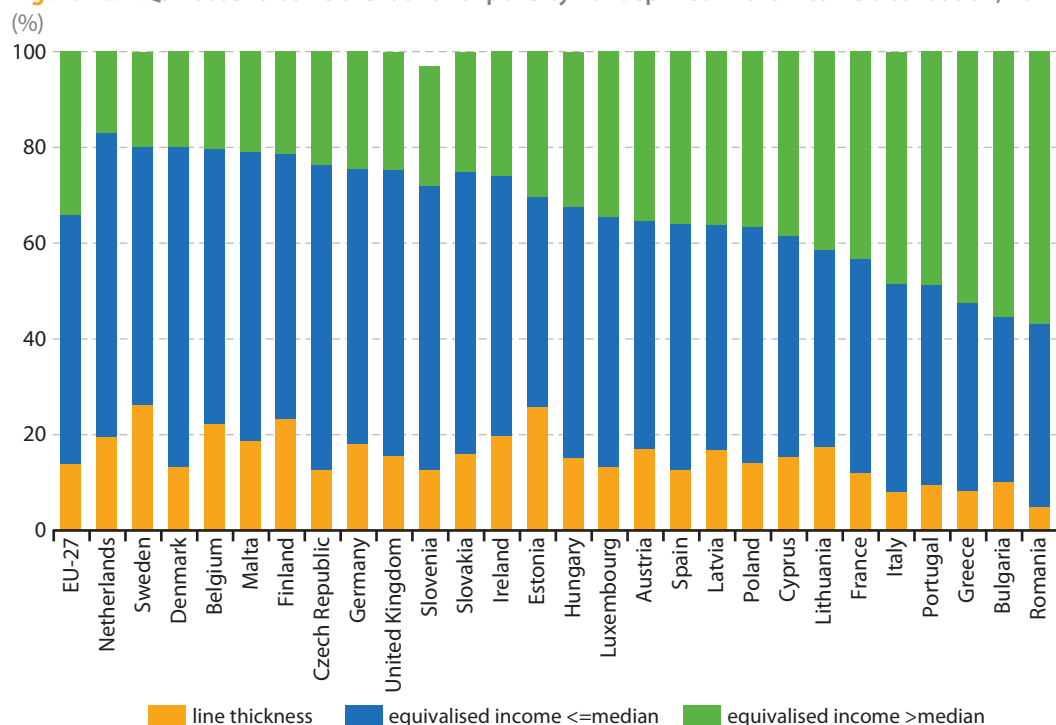
who are 'neither/nor' and, among them, the sizeable percentage in the upper part of the income distribution. It is also a sign of fragility of the notion and/or its implementation; at a minimum, it suggests that QJ-ness may capture quite different phenomena across countries.

### 16.3 QJ in AROPE over time

In this second part of our statistical review, we turn to the evolution of QJ over time (2008-2012) and its contribution to AROPE.

In 2012, the share of people aged 0-59 living in QJ households is barely higher, at the EU level, than in 2008 (see Figure 16.8). In about half the countries, this share is either broadly unchanged or

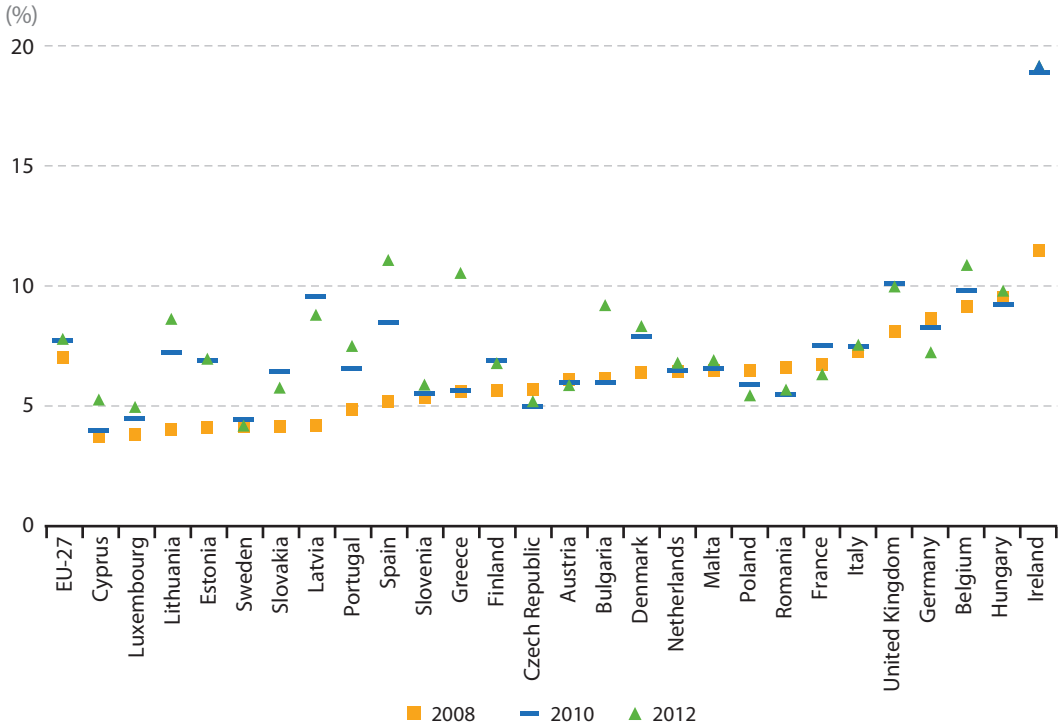
**Figure 16.7:** QJ households neither at risk of poverty nor deprived in the income distribution, 2012



NB: Countries ordered by % above the median equalised income. 'Line thickness' is measured as up to 10 % above the at-risk-of-poverty threshold.

Reading note: At EU-27 level, about one-third of the QJ households neither AROP nor SMD are above the median equalised income, one half are between this median income and 10 % above the at-risk-of-poverty threshold, and 14 % could be attributed to 'line thickness'.

Source: Author's computation, UDB August 2014.

**Figure 16.8: People aged 0-59 living in QJ households, 2008, 2010 and 2012**

NB: Countries ordered according to the level in 2008.

Reading note: At EU-27 level, the share of people living in QJ households is broadly the same in 2008, 2010 and 2012.

Source: Author's computation, UDB August 2014.

even slightly lower in 2012 than in 2008 (e.g. Czech Republic, Poland, Romania, Germany). In countries where it is higher, the increase occurred in most cases between 2008 and 2010 (that is, in terms of reference period, between 2007 and 2009) except in Spain, Greece and Bulgaria where the increase from 2010 to 2012 was significant too.

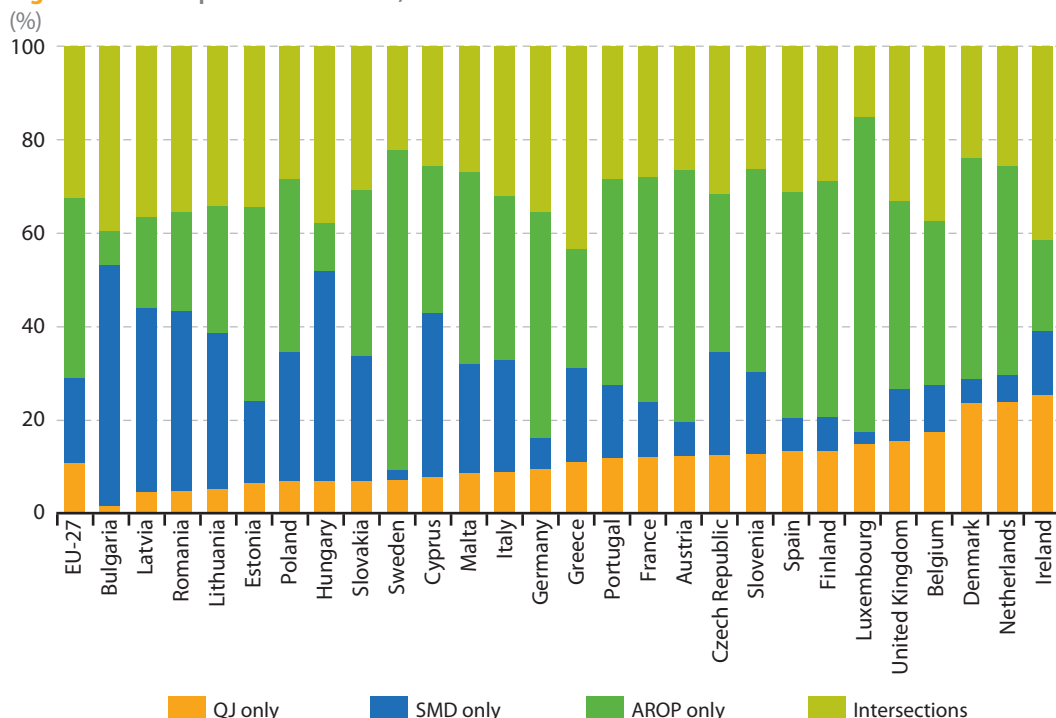
How does QJ contribute to the evolution of AROPE? To answer this question, we compare what would have been the evolution of AROPE without QJ as a specific component, and the observed evolution of AROPE. As seen above (see Figure 16.6), QJ can be broken down into people at the intersection of QJ with AROP or SMD and people who are 'QJ-only', that is living in QJ households neither AROP nor SMD.

In terms of headcount, the difference between what the level of AROPE would be without QJ as a specific component and its observed level results

exclusively from 'QJ-only', since the other part of QJ (people who are either QJ and AROP or SMD) is already included in the group of people who are AROP and/or SMD. This does not mean that QJ-ness has no effect on the risk of poverty or severe MD; but this effect is already accounted for in the intersection of QJ with AROP or SMD. Thus, not having a specific QJ component would affect AROPE only insofar as a proportion of QJ households are neither AROP nor SMD. Subsequently, the contribution of QJ to AROPE is relatively small in most countries <sup>(148)</sup>, the highest (around 25 %) in Denmark, Netherlands and Ireland (see Figure 16.9).

<sup>(148)</sup> In addition, people who are 'QJ only' are also all less than 60 years old, since the QJ measure counts only people aged 0-59. For this same reason, the intersection of AROP, SMD and QJ automatically excludes people aged 60+.



**Figure 16.9: Composition of AROPE, 2012**

NB: Countries ordered by % of people in QJ-only households.

Source: Author's computation, UDB August 2014.

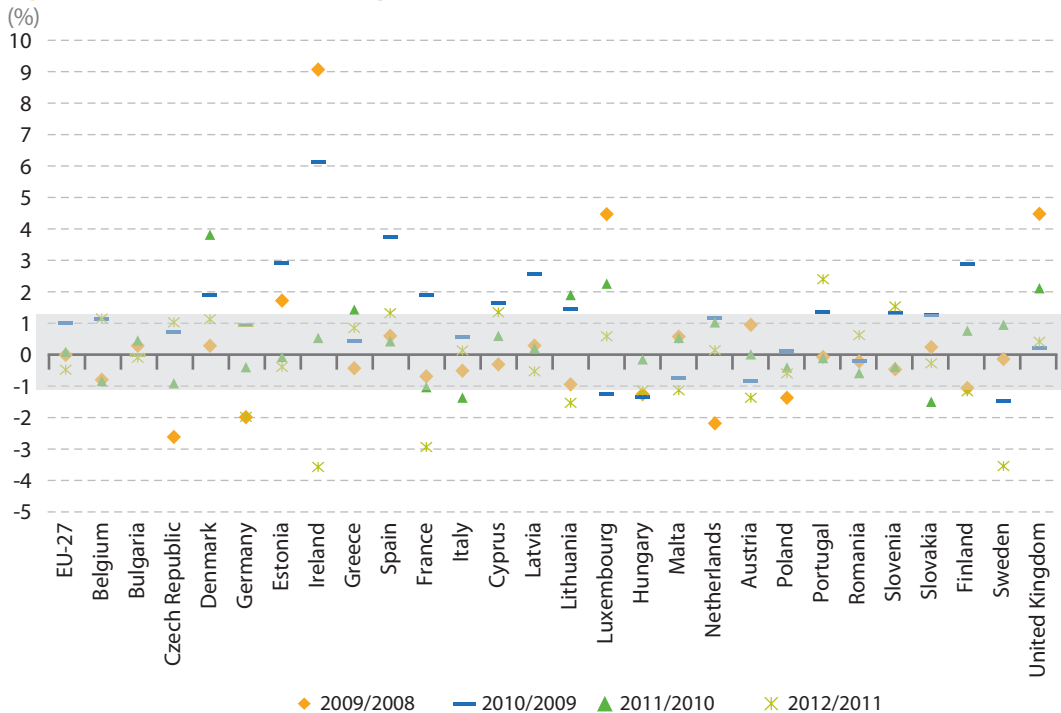
The specific contribution of changes in QJ to the evolution of AROPE over time is also exclusively due to this 'QJ-only' part of QJ (since the remaining part of QJ is already included in AROP and/or SMD). This contribution appears very small at the EU-27 level <sup>(149)</sup>; in the annual variations of the period 2008-2012, changes in the level of AROPE attributable to changes in the level of 'QJ-only' are barely different from zero, at most 1 % in 2010 (see Figure 16.10). The contribution appears nevertheless more pronounced in some countries/years (especially in Ireland, Luxembourg and United-Kingdom). The contribution can also be negative, then meaning that adding QJ as a specific component results in a reduced change in AROPE relative to what the change would have been if determined only by AROP and SMD.

<sup>(149)</sup> This is consistent with the results of a cluster analysis by Lelkes and Gasior (2012), which shows that AROPE is primarily driven by AROP and SMD rather than QJ.

## 16.4 Conclusions and suggested way forward

In this chapter, we have proposed an assessment of QJ-ness, as defined in the AROPE framework, from two perspectives:

First, we have compared the characteristics of the population living in QJ households across countries. Based on the analysis of QJ-ness and people in QJ households, cross-country differences seem to be more remarkable than common patterns in many of the dimensions examined. We found two features common to all countries: the overrepresentation of one-person and one-parent households (the mechanical effect of very low work intensity being assessed at household level); and the absence of overrepresentation of children less than 18 years old. Another feature common to most but not all

**Figure 16.10: Contribution of changes in QJ to annual variations in AROPE between 2008 and 2012**

NB: The contribution is measured as the ratio (expressed in %) of the variation in the level of QJ-only between year 1 and year 2 to the level of AROPE in year 1.

Reading note: In the EU-27, about 1 % of the change in the level of AROPE between 2009 and 2010 is attributable to the change in QJ-only.

Source: Author's computation, UDB August 2014.

countries, about which much caution is needed given data limitations, is that QJ-ness would be rather a 'permanent' (i.e. lasting at least 2 years) than a transitory status. As for the other dimensions examined, there are striking differences between countries, and no grouping immediately suggests itself. The composition of QJ households' unused work potential in terms of activity status shows large discrepancies in the shares of unemployment, house/care work and disability. There are also unexpected occurrences of education or retirement, in substantial proportions in some countries, which is in contradiction with the definition (students and people older than 59 are to be excluded). In all countries, the at-risk-of-poverty and severe MD rates among people living in QJ households are much higher than national averages (especially the at-risk-of-poverty rate). But in a number of countries, non-negligible shares of people in QJ households are neither at-risk-of-poverty nor

materially deprived, with significant shares in fact in the upper part of the income distribution. It is finally difficult to draw a clear profile of the population living in QJ households, the addition of discrepancies suggesting that QJ-ness captures different phenomenon in different countries.

Secondly, we have examined, in terms of headcount, the evolution of QJ over time and its contribution to AROPE. No general trend appears in the evolution of QJ from 2008 to 2012: its level remains unchanged in some countries, while it increases in others and decreases in a few countries. The contribution of QJ to AROPE is, by construction, entirely due to the part of QJ with no intersection either with AROP or with SMD; between 2008 and 2010, the contribution of changes in the level of QJ to annual changes in the level of AROPE appears small in most countries; however, this contribution is problematic since the part

of QJ with no intersection either with AROP or with SMD is also rather difficult to interpret.

In the course of the statistical analysis, we have also uncovered some technical problems. One affects the measurement of household work intensity: 'false' available months are counted in households' work potential, resulting in underestimated work intensity. The other is the implementation of employment in terms of full-time equivalent without the information that would be necessary to obtain a reliable estimate.

We also came up against a number of issues of consistency:

- the 59-year age threshold for the measurement of household work potential, which is incoherent with the Europe 2020 employment target;
- the reference to employment in terms of full-time equivalent when, if QJ is taken as a measure of lack of contact with the world of work, it is participation, not the number of hours, that matters;
- the 59-year age threshold for the QJ headcount, resulting in a population interpretable neither as the number of people who should/could be employed (it includes dependent children) nor as a particular form of social exclusion affecting all household members (it excludes people above 59 years old who live in the same households).

Finally, from our point of view, there is a very problematic conceptual issue: the interpretation of the type of social exclusion faced by people in QJ households neither at-risk-of-poverty nor materially deprived. The crux of the issue is that QJ households either at-risk-of-poverty or materially deprived are already accounted for in the union of AROP and SMD without needing an explicit QJ component; then adding QJ households neither at risk of poverty nor materially deprived necessarily increases the heterogeneity of the target and reduces its interpretability. By the same token, since there are finally two sorts of QJ-ness (i.e. QJ-ness only and QJ-ness combined with AROP and/or SMD) probably driven by different factors, the QJ component of AROPE is problematic too from a policy point of view.

To sum up, from a methodological point of view, QJ hardly meets the 'Principles of indicator construc-

tion' agreed upon for EU social indicators <sup>(150)</sup>. In its current formulation, the meaning of the indicator is unclear, its definition lacks consistency and its statistical implementation is fragile. In the remainder of this conclusion, we present a few alternatives to improve the definition/ implementation of the QJ measure. Even though we think these improvements would be useful, in our view none of them would solve the issue of the meaning of QJ as a component of the AROPE measure.

Substantial revisions of the current QJ indicator are possible in four directions:

- Alternative 1 (improved measurement of household work potential): we have seen that using the current activity status to exclude students and referring to an age threshold to exclude people assumed to be retired are not efficient, resulting in 'false' available months of education and months of retirement included in the household work potential and in turn pushing work intensity downwards and consequently the QJ measure upwards. To avoid this problem, we propose to select the adults eligible for the computation of work intensity not on the basis of their current status or their age, but on the basis of a measure of 'main activity status in the reference period', as computed for the indicator of in-work poverty risk, where 'in-work' means at least 7 months of employment during the reference period. By analogy, we define 'student' as aged 18-24 with at least 7 months in education, and 'retired' as any adult with at least 7 months of retirement.
- Alternative 2 (improved consistency with the Europe 2020 employment strategy): we suggest including people aged 60-64 (if they are not 'retired' — see above) in the computation of household work intensity.
- Alternative 3 (improved measure of months worked): as mentioned above, EU-SILC does not provide the information on the hours of work required to compute worked months in full-time equivalent. To avoid imputations necessarily resulting in unreliable measures, one could

<sup>(150)</sup> See Atkinson et al. (2002). See also 'Methodology for the definition of EU social indicators' online: <http://ec.europa.eu/social/main.jsp?catId=756>.

**Table 16.3: Number of people (000) with alternative measures of QJ, 2008 and 2012**

Main elements of the definition of QJ and changes	QJ			AROPE		
	2008	2012	2012/ 2008	2008	2012	2012/ 2008
<b>Current</b>						
— people from 0-59 years old living in QJ households						
— work intensity measured for the adults aged 18-59						
— work intensity measured excluding those aged 18-24 in education at the time of interview						
— work intensity measured on the basis of the number of worked months in terms of full-time equivalent	34 426.0	39 110.1	1.14	116 354.4	123 054.7	1.06
<b>Alternative 1</b>						
— work intensity measured excluding those aged 18-24 ew mostly in education and those of any age mostly in retirement during the reference period	30 429.6	36 716.7	1.21	113 692.5	121 312.6	1.07
<b>Alternative 2</b>						
— work intensity measured for the adults aged 18-64	35 547.4	42 355.5	1.19	116 989.9	124 666.6	1.07
<b>Alternative 3</b>						
— work intensity measured on the basis of the total number of worked months	28 777.2	34 626.5	1.20	113 084.6	120 601.2	1.07
<b>Alternative 4</b>						
people of all ages living in households with very low work intensity	36 307.5	43 885.6	1.21	117 355.2	125 773.9	1.07
<b>Variant A:</b> combining (1), (2) and (3)	33 663.2	40 018.8	1.19	116 254.1	123 824.9	1.07
<b>Variant B:</b> combining (1), (2) and (4)	40 138.5	47 633.8	1.19	119 894.4	128 029.9	1.07
<b>Variant C:</b> combining (1), (2) and (3) and (4)	38 133.1	45 181.9	1.18	119 065.9	127 119.1	1.07

NB: Due to some unreliable variables for Ireland affecting the computation of the technical alternative (alternative 1), these results could be slightly different when computed using the next revised version of the 2012 UDB.

Source: Author's computation, UDB August 2014.

count worked months regardless of whether it is full-time or part-time employment. By the same token, it would also gain consistency with the Europe 2020 employment target, which does not specify a target in terms of full-time or part-time employment.

- Alternative 4 (improved comparability with the scope of AROP and SMD): we have seen (see Section 16.2) that the scope of the QJ measure is not comparable to that of AROP and SMD, due to the age threshold set at 59 years. This threshold affects also the structure of QJ households and the evolution of QJ over time and at individual level (see Section 16.2.3). The alternative consists in not setting any age threshold for the headcount of people living in QJ households.

Table 16.3 indicates what the number of people in QJ and the number of people in AROPE would be

in the EU-27 <sup>(15)</sup> using these alternative approaches for 2008 and 2012. First, we present the headcounts corresponding to each alternative, keeping the other elements of the definition unchanged, except that we systematically apply the improved measure of household work potential (alternative 1) which is purely technical. Secondly, we combine the alternatives — which gives three variants. The technical revision alone (alternative 1) would yield lower numbers of people in QJ households and lower numbers of people in the AROPE target. All the other alternatives would result in greater numbers of people in QJ and in AROPE, with the exception of alternative 3 where work intensity would be measured regardless of whether worked months are worked in full-time or part-time employment. In terms of evolution between 2008 and 2012, the increase in QJ would

<sup>(15)</sup> Results at country level are available on request.

always be larger than with the current implementation: from +18 % to +21 %, depending on the alternative or variant implemented, instead of +14 % with the current implementation. However, the increase in AROPE would be almost unchanged: +7 % instead of +6 %, this relatively small impact of the alternative approaches on the change in AROPE highlighting again the relatively small contribution of QJ to AROPE.

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# 17

## The Euro Area wage distribution over the crisis

Andrea Brandolini and Alfonso Rosolia <sup>(152)</sup>

### 17.1 Introduction

There is little doubt that the burden of the economic crisis begun in 2008 has not been equally shared by workers across the Euro Area (EA). According to the European Central Bank (2014, p. 51), 'the marked rise in euro area unemployment over the course of the crisis has been heavily concentrated temporally, sectorally, demographically and by country. While virtually all euro area economies were affected to some extent during the first recession [global financial crisis], over the course of the second euro area recession [sovereign debt crisis] the brunt of the job losses was (almost exclusively) borne by the stressed economies'. As a consequence, as observed in the European Commission's *Employment and Social Developments in Europe 2014*, 'the convergence in terms of economic and social performance that had been under way across the EU over the past two decades came to a halt with the crisis, and reversed strongly in the case of employment and unemployment rates. This particularly reflected the adverse impact of the crisis on Southern and peripheral EU-15 Member States, while convergence did continue for most of the Member States that joined the EU in 2004 or later' (Bontout, 2014, p. 232).

The bulk of the analysis, in official documents as well as more academically oriented research, delves into

the impact of the crisis on employment and unemployment. For instance, Bachmann et al. (2015) and Casado et al. (2015) investigate the effects on transitions among labour market states, Jauer et al. (2014) and Beyer and Smets (2015) study the role of internal migrations as a response to the downturn, while others try to disentangle structural from demand factors behind the increase in unemployment (e.g. Rosolia, 2014a, for Italy). Less attention has been paid to the effects on wages and salaries. In part, this may reflect their sluggish adjustment during the crisis, due to nominal rigidities, staggered wage negotiations or compositional effects (e.g. D'Amuri, 2014, and Rosolia, 2014b for Italy). Indeed, as observed by an ad hoc team of the European System of Central Banks (2015, p. 60), '... the wage response in the euro area was rather limited during the first phase of the crisis; however, wages seemed relatively more responsive to unemployment in the second phase of the crisis ... [when] the downward rigidities seem to have become somewhat weaker, partly related to the implementation of structural reforms in labour markets across a number of euro area countries, and/or to public sector wage restraint associated with fiscal consolidation'. However, these muted dynamics of wages in the EA are observed *on average*: they may be fully consistent with offsetting movements in the distribution of labour earnings among employees, both within and across countries.

In this chapter, we provide novel evidence on the adjustment of the EA labour markets during the recent economic crisis by investigating the evolution of the wage distribution in the EA as a whole. This analysis supplements existing studies focusing on labour force participation by considering the adjustment occurring through 'prices' rather than 'quantities'. The

<sup>(152)</sup> Bank of Italy, Directorate General for Economics, Statistics and Research. We thank Nuno Alves, Anthony B. Atkinson, Anne-Catherine Guio, Marco Magnani and Eric Marlier for valuable comments. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission and the Bank of Italy bear no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [alfonso.rosolia@bancaditalia.it](mailto:alfonso.rosolia@bancaditalia.it).

evidence presented in this chapter suggests a perceptible wage response, calling for some qualification of the widely held view of downward wage rigidity in many EA labour markets. As known from the extensive research on real wage cyclicality (see Abraham and Haltiwanger, 1995, and Brandolini, 1995, for a survey, and Verdugo, 2016, for a recent analysis of EA countries), the sensitivity measured at the aggregate level may be much less pronounced than that experienced by individuals, especially job-movers. The little change in the value of the means need not imply an immobile earnings distribution, as it may be accompanied by a reshuffling of workers' positions along the wage ladder depending on their personal characteristics, labour contract or sector. In a monetary union, internal devaluations aimed at recovering competitiveness add a further dimension to the adjustment, as different wage responses across countries entail that national boundaries matter for the whole earnings distribution. In a fully integrated EA labour market, there would be no 'country effect' in the explanation of the overall earning distribution, except for the indirect effects due to differences in the sectoral, demographic and skill composition. Abandoning the customary approach of comparing national developments and looking instead at the EA as a whole allow us to see countries simply as an additional dimension of the heterogeneity shaping the overall wage distribution. It implies a fundamental change of perspective, but one that should be natural in studying a monetary union.

In order to allow for a period of adjustment to the new monetary framework, we define the EA as comprising the twelve countries that had joined the union for some years before the start of the recession at the end of 2008. We divide these countries into two groups according to their exposure to the sovereign debt crisis of 2011-2012: following a debatable yet common practice, we label 'periphery' the group with the five countries hit by the crisis (Ireland, Greece, Spain, Italy and Portugal) and 'core' the group with the remaining seven countries (Belgium, Germany, France, Luxembourg, the Netherlands, Austria and Finland). In Section 17.2 we describe the data, drawn from EU-SILC and the national accounts, which are used in the estimation of the distribution of real monthly full-time equivalent gross earnings (MEGE). In Section 17.3 we summarise the aggregate dynamics of wages and employment in the EA using both

the EU-SILC data and the national accounts. In Section 17.4 we compare the MEGE distributions in the EA in 2007 and 2011. In Section 17.5 we sketch the decomposition technique that we apply in Section 17.6 to study the determinants of the MEGE distributions. We draw the main conclusions in the final section.

## 17.2 Data definitions

We base our analysis on data drawn from the EU-SILC Waves 2008 and 2012. This source provides information on various definitions of labour earnings: current gross monthly earnings; annual employee cash or near cash income in the previous year (2007 and 2011), net or gross of taxes and social contributions deducted at source; social insurance contributions paid by employers, allowing for the calculation of total labour cost. The cash income is the employee's compensation including wages and salaries and any other payment in cash (holiday, overtime and piece-rate payments, tips and gratuities, 13th month payment, bonuses, performance premia, allowances for transport and work in remote locations), but excluding allowances and reimbursements for work-related expenses, severance and redundancy payments, and union strike pay. In spite of the efforts of statistical agencies, definitions are not fully comparable across countries, as discussed in detail by Brandolini, Rosolia and Torrini (2010). The EU-SILC data have been used recently by Dreger et al. (2015) to study the evolution of wage dispersion from 2006 to 2011 across the EU Member States.

In this chapter, we focus on annual (cash) earnings gross of social contributions and income taxes paid by the employee, the only variable which is available for all EA countries, while net annual earnings and current gross monthly earnings are often unavailable (see Brandolini, Rosolia, Torrini, 2012, for a thorough discussion of this issue). As annual earnings reflect both the wage rate and the amount of time spent at work, to gauge the variation of the price of labour across countries, we compute full-time equivalent monthly earnings by dividing the annual value (PY010G) by the number of months worked adjusted for part time. Because of data limitations, we use consistent definitions of the number of months worked in full-time jobs and in part-time jobs which do not



distinguish between jobs worked as employee or self-employed (PL070 until Wave 2008 and the sum of PL073 and PL075 from Wave 2009, for full-time jobs; PL072 until Wave 2008 and the sum of PL074 and PL076 from Wave 2009, for part-time jobs; a month is spent at work if the respondent worked for 2 or more weeks). As this choice may lead to wrong estimates of wage rates when persons declare themselves to have been working both as employee and self-employed, we keep only observations without any income from self-employment (PY050G\_F equal to 0). To derive the number of equivalent months worked, the number of months in part-time jobs is scaled down by a country-year-sex specific factor equal to the ratio of median hours of work in part-time jobs to median hours of work in full-time jobs. Both the hours of work (PL060) and the job status (PL030 until Wave 2008 and PL031 from Wave 2009) refer to the employment status (with no distinction between salaried employment and self-employment) at the time of the interview. We restrict the attention to employees aged 20 to 69 years who report positive monthly values of the wage rate, which implies dropping observations with positive annual earnings but missing or nil months of work.

The personal cross-sectional weights (PB040) sum to the population of household members aged 16 and over. These weights ensure that the composition of the sample properly reflects the structure of the underlying population, but they do not take into account the number of months worked. Put differently, they ensure that area-wide aggregation is meaningful, but treat equally employees working a different number of months. We then adjust these weights by multiplying them by the number of equivalent months worked: this adjustment implies that the sum of the weights yields the total number of months, adjusted for part time, worked by the country's employees, which is a measure of their aggregate labour input in the year. Using these adjusted weights amounts to estimating the wage distribution among full-year full-time equivalent employees. An alternative way of interpreting this choice is that we are interested in studying the evolution of the EA distribution of the wage rate at a given moment in time; not rescaling by the number of months worked in the year would lead to an overrepresentation of short employment spells and, depending on the correlation of the wage rate with the length of em-

ployment spells, to overrepresentation of specific segments of the wage rate distribution. Indeed, a regression of the (logarithm of) the real wage rate on the number of months worked shows that each additional full time equivalent month worked is associated with a 4-5 % higher real wage rate. Thus, rescaling the personal cross-sectional weights by the number of equivalent months worked controls, in an admittedly simple way, for such correlation.

Earnings are expressed, as all other EU-SILC income variables, in euros. To transform nominal into real values, we apply a double correction. First, we deflate all current earnings by the Harmonised Index of Consumer Prices for the whole EA (HICP) to express all values at the prices of 2010. Second, we account for cross-country differences in the cost of living by dividing earnings by an index of Purchasing Power Parities (PPP), which adjusts for the relative national values of a fixed bundle of consumption goods and services (see Chapters 1 and 3 in this book). We take the PPP index for the household final consumption expenditure (PPP-HFC), but consider also the index calculated for GDP (PPP-GDP), which is generally applied to derive all national accounts variables expressed in Purchasing Power Standard (PPS). Both indices are normalised to 1 for the EA. Figure 17.1 displays, for the 2 years considered, the percentage difference between the country's price level and the EA average. Not only price levels differ across countries in a given year but also such differences have changed, substantially in some cases, during the crisis. For example, in 2007 the gap between Finnish and Greek wages narrows, all else equal, by around 33 percentage points after accounting for price level differences; the adjustment falls below 30 points in 2011 because of the (relatively) higher price level in Greece.

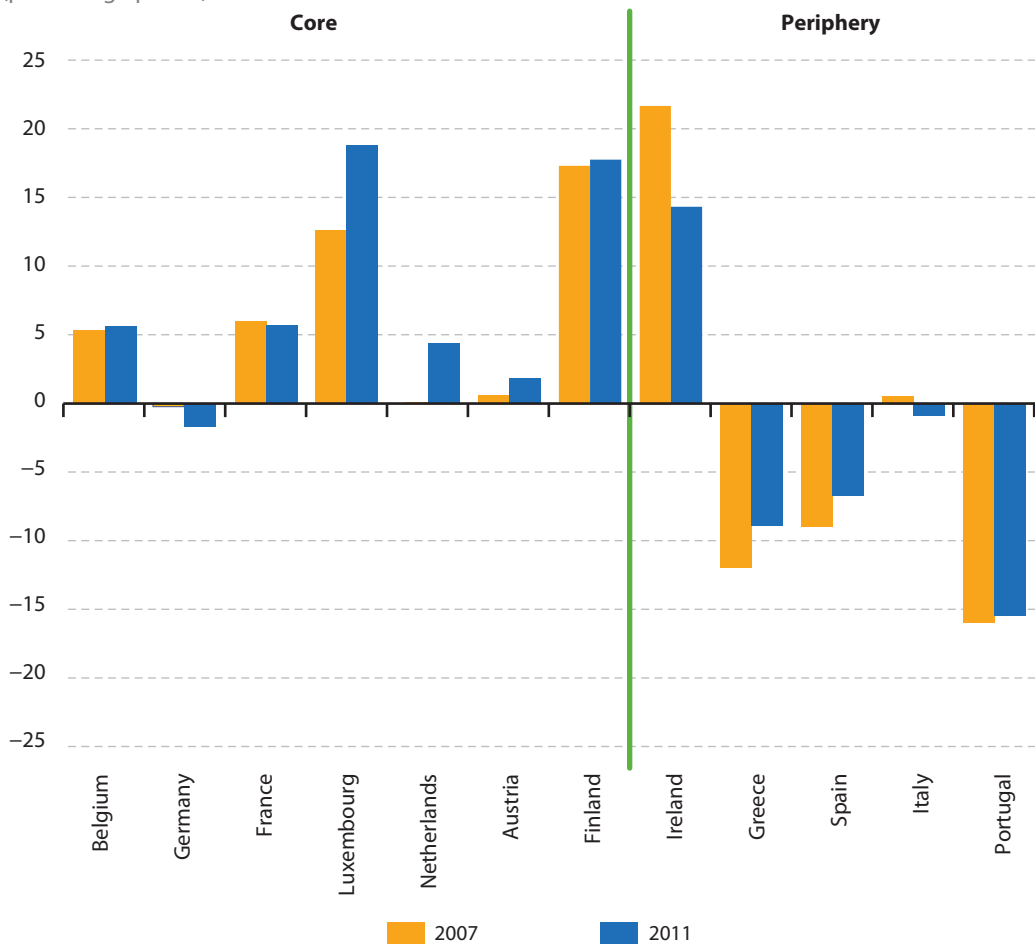
### 17.3 Aggregate dynamics of wages and employment

Figure 17.2 summarises the impact of the economic crisis on a selection of macroeconomic indicators for the EA as a whole and separately for the core and periphery countries. In 2014, the most recent available data at the time of writing, the EA real GDP per capita was 3.1 % lower than in 2007, before the crisis began. The number of hours worked by em-

employees dropped more than GDP per capita (5.4 %), while real hourly wages rose by 4.7 %, engendering the impression of a very slow response of wage rates to the economic downturn. As suggested by the initial citations, the area-wide developments hide a variety of country-specific dynamics: on average, between 2007 and 2014 real GDP per capita and hours worked by employees fell considerably in periphery countries (-11.4 and -14.1 %, respectively), but did not change much in core countries

(-1.6 and 1.9 %, respectively); real hourly wages declined in the former group of countries but rose in the latter (-4.5 and 5.8 %, respectively). The available EU-SILC data allow us to study the evolution of the wage distribution in the EA until 2011 only. Although they cannot capture the effects of the sovereign debt crisis which broke out in that year, they can shed lights on the divergence between core and periphery economies brought about by the global financial crisis.

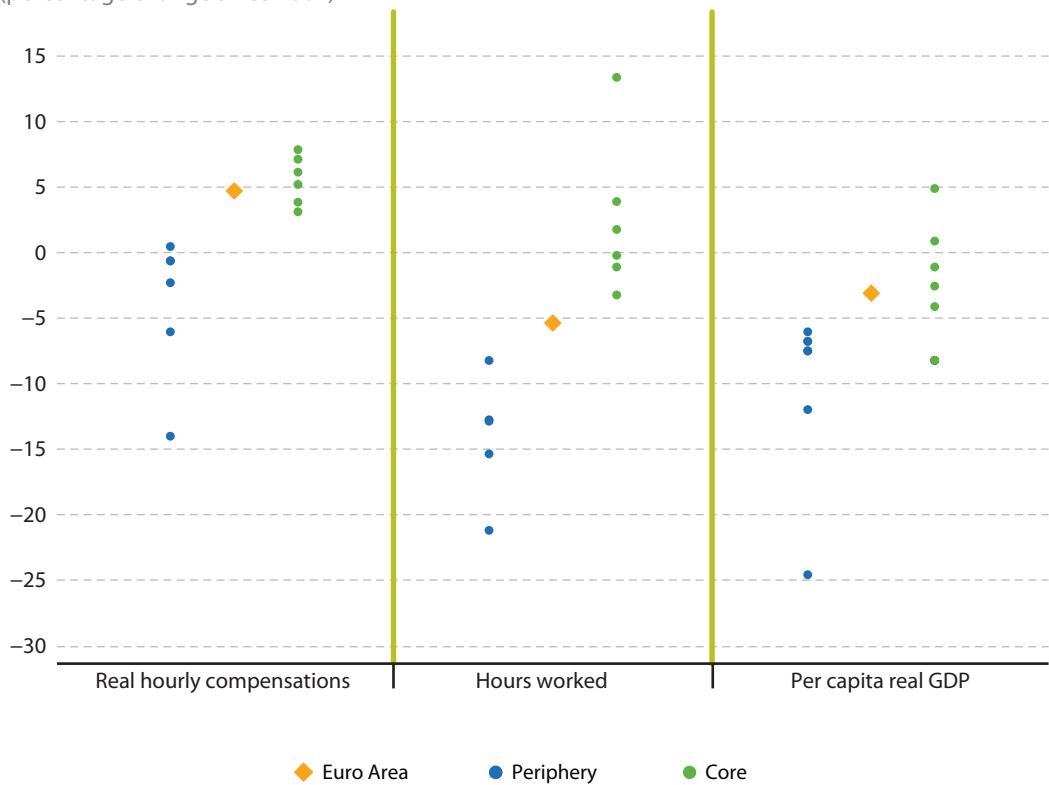
**Figure 17.1:** Household final consumption expenditure purchasing power parities, 2007 and 2011 (percentage points)



*Reading note:* The figure displays the percentage difference between country and EA price levels as measured by the Purchasing Power Standards for household final consumption expenditures.

*Source:* Authors' computation on data from Eurostat web-database, code *prc\_ppp\_ind*.

**Figure 17.2: Selected macroeconomic indicators in 2014**  
(percentage change since 2007)



NB: For the list of Core and Periphery countries, see Figure 17.1.

Reading note: Each point in the figure is the cumulative percentage change between 2007 and 2014 of the corresponding variable for periphery countries, core countries and the EA as a whole.

Source: Authors' computation from Eurostat web-database, code *t\_nama*.

In Table 17.1 we report EU-SILC averages for salaried employment and real wages, and provide some comparisons with corresponding figures from the national accounts. The number of employees is 4-5 % lower in EU-SILC than in national accounts, in the EA as well as in the two country groups. In part, the discrepancy may be explained by our restricting the EU-SILC statistics to the age class 20-69 and to employees who do not receive any additional income from self-employment; the use of the national concept of employment, instead of

the domestic concept underlying Table 17.1, does not make much difference. Variations between 2007 and 2011 are qualitatively aligned, although they are somewhat more pronounced in EU-SILC than in national accounts for core countries. Total hours worked in the year cannot be computed from the EU-SILC data (see Chapter 14 in this book). However, their variations in national accounts are qualitatively similar to the changes in the EU-SILC number of equivalent months worked, a rough but acceptable approximation.

**Table 17.1: Salaried employment and real wages in national accounts and EU-SILC, 2007 and 2011**

Variable	Euro Area			Core			Periphery		
	2007	2011	Change (%)	2007	2011	Change (%)	2007	2011	Change (%)
<b>National accounts</b>									
Employees (thousands)	123 619	122 428	-1.0	77 506	78 943	1.9	46 113	43 485	-5.7
Hours worked (millions)	187 041	182 438	-2.5	108 180	108 646	0.4	78 861	73 793	-6.4
Real monthly wage per employee (euros)	2 338	2 356	0.8	2 532	2 545	0.5	2 012	2 011	0.0
<b>EU-SILC (cross-sectional weights)</b>									
Employees (thousands)	117 237	116 741	-0.4	72 972	74 942	2.7	44 265	41 800	-5.6
Equivalent months worked (millions)	1 226	1 202	-1.9	751	766	2.0	474	435	-8.2
Real monthly wage per employee (euros)	2 151	2 141	-0.5	2 373	2 390	0.7	1 785	1 694	-5.1

NB: For the list of Core and Periphery countries, see Figure 17.1.

Reading note: The table compares employment and wage levels in 2007 and 2011 in periphery countries, core countries and the EA as a whole as recorded in national accounts and EU-SILC.

Source: Author's computation from Eurostat web-database, code *t\_nama* and EU-SILC UDBs of January 2010 and May 2013.

With both national accounts and EU-SILC data, we calculate the real monthly wage by dividing 1/12 of total gross wages and salaries by the number of employees, and then deflating by the area-wide HICP. This definition of real monthly wage adjusts neither for part time, nor for cross-national differences in the cost of living. The EU-SILC estimates fall short of national accounts values by 8-9 % in the EA, but the discrepancy is more than double in periphery than core countries. Somewhat more worryingly, a difference between the two sources arises for the change in real monthly wages between 2007 and 2011 in periphery countries: it is nil according to national accounts against a drop by 5.1 % in the EU-SILC data.

All in all, the EU-SILC evidence confirms that the global financial crisis brought about a strong divergence in the performance of the EA labour markets already in the period 2007-2011, although it shows a much sharper divergence between the core and the periphery than national accounts. However, the severe drop in the EU-SILC per capita wage rates in periphery economies is at variance with the stability signalled by aggregate data. From the statistical viewpoint, the extant discrepancies between the two sources call for a thorough work of reconciliation (see also Branolini, Rosolia and Torrini, 2010, and Chapter 3 in this book). More importantly, the EU-SILC evidence sug-

gests that the conclusions on the lack of adjustment of wages during the crisis, reached on the basis of national accounts, needs careful scrutiny.

## 17.4 Evolution of the earnings distribution

We report several statistics on the distribution of the real monthly full-time equivalent gross earnings (MEGE) among working-age full-year full-time equivalent employees in Table 17.2. The adjustment for cross-country differences in the cost of living has virtually no impact on EA mean wages, but it narrows the gap between core and periphery means, especially when the PPP index for GDP is used. Both adjustments reduce measured inequality in the EA as a whole, as the Gini indices for PPP-adjusted wages are more than half a percentage point lower than those for wages in euros. An even stronger impact is found for the periphery group, but not for the core group, where adjusting for price-level differences appears to increase measured inequality. The extent of the adjustment of wage levels for the cost of living is fairly stable over time, and it does not influence significantly the changes between 2007 and 2011.

**Table 17.2:** Distribution of real monthly full-time equivalent gross earnings (MEGE) among working-age full-time full-year equivalent employees, 2007 and 2011

Variable	Euro Area			Core			Periphery		
	2007	2011	Change (%)	2007	2011	Change (%)	2007	2011	Change (%)
<b>Real MEGE (EUR)</b>									
Mean	2 469	2 495	1.1	2 765	2 804	1.4	1 999	1 951	-2.4
Gini index (% , p.p.)	32.2	32.1	-0.1	31.1	30.8	-0.3	30.5	30.4	-0.1
<b>Real MEGE (PPS, PPP-GDP)</b>									
Mean	2 466	2 486	0.8	2 666	2 709	1.6	2 149	2 094	-2.6
Gini index (% , p.p.)	31.4	31.3	-0.1	31.5	31.0	-0.5	29.4	29.3	-0.1
<b>Real MEGE (PPS, PPP-HFC)</b>									
Mean	2 461	2 483	0.9	2 698	2 741	1.6	2 086	2 028	-2.8
Gini index (% , p.p.)	31.6	31.5	-0.1	31.5	31.0	-0.5	29.4	29.3	-0.1
1st decile	981	988	0.8	1 055	1 108	5.0	924	892	-3.5
2nd decile	1 360	1 357	-0.2	1 501	1 546	3.0	1 207	1 166	-3.4
3rd decile	1 611	1 629	1.1	1 775	1 822	2.6	1 422	1 375	-3.3
4th decile	1 845	1 876	1.7	2 060	2 107	2.3	1 618	1 583	-2.2
Median	2 109	2 144	1.7	2 360	2 419	2.5	1 812	1 777	-1.9
6th decile	2 421	2 470	2.0	2 695	2 743	1.8	2 024	2 003	-1.1
7th decile	2 794	2 843	1.7	3 087	3 137	1.6	2 314	2 296	-0.8
8th decile	3 301	3 349	1.5	3 604	3 677	2.0	2 725	2 685	-1.5
9th decile	4 197	4 207	0.2	4 555	4 606	1.1	3 446	3 346	-2.9

*NB:* Estimates computed using cross-sectional weights adjusted by the number of equivalent months worked. For the list of Core and Periphery countries, see Figure 17.1. PPP-HFC is the PPP index for the household final consumption expenditure and PPP-GDM the index calculated for GDP. *Reading note:* The table shows the Gini indices and the wage levels at different points of the MEGE distributions in 2007 and 2011 in periphery countries, core countries and the EA as a whole.

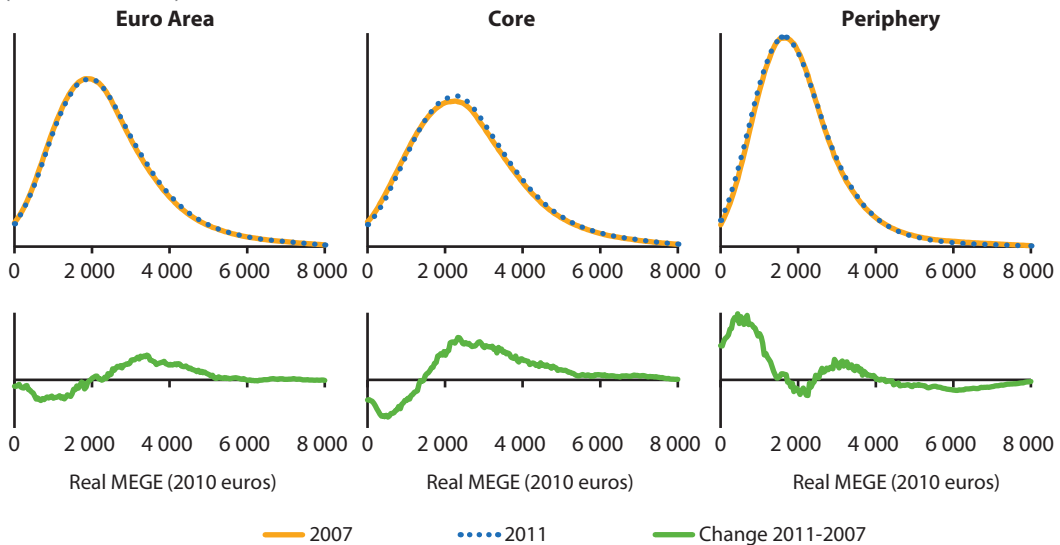
*Source:* Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

Using the PPP-HFC index, in 2007 the monthly full-time equivalent gross earnings in the EA as a whole were on average equal to EUR 2 461, at 2010 prices; in periphery economies they equalled EUR 2 086, 23 % less than the EUR 2 698 recorded in core economies. In the following 4 years, the EA real wage went up by 0.9 % to 2 483, as a result of a rise by 1.6 % to 2 741 in the core and a fall by 2.8 % to 2 028 in the periphery. The gap between the two areas of the monetary union rose to 26 %. As measured by the Gini index, wage inequality does not appear to have changed much within each country group. Yet, the two distributions moved differently (see Figure 17.3). In core countries, there was a general shift upwards: earnings increased throughout the distribution but far more intensely at the bottom than at the top, and the relative frequency

of low earners decreased to the benefit of that of middle earners. The opposite happened in periphery countries, where the mass of the distribution moved downwards and the across-the-board drop of earnings was more pronounced at the bottom (and the very top) than in the middle.

In brief, the EU-SILC data show that the wage adjustment within the EA was substantially larger than that measured in national accounts, with periphery real monthly full-time equivalent gross earnings decreasing on average by over 4 % relative to core levels. However, the strikingly different changes across the deciles of the respective earnings distributions imply that the relative costs of low wage labour have fallen far more in the periphery, by some 6 to 8 %.

**Figure 17.3:** Distribution of real monthly full-time equivalent gross earnings (MEGE) among working-age full-time full-year equivalent employees in the EA, core and periphery, 2007 and 2011 (kernel densities)



NB: Estimates computed using cross-sectional weights adjusted by the number of equivalent months worked. For the list of Core and Periphery countries, see Figure 17.1.

Reading note: The figure shows the density distribution functions of real monthly full-time equivalent gross earnings in the upper panels and their changes between 2007 and 2011 in the bottom panels in the EA, core and periphery countries.

Source: Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

The evolution of the EA-wide distribution reflects the combination of within-country-group changes with the falling share in employment of the periphery vis-à-vis the core. In the rest of the chapter we try to disentangle changes in the wage schedules from changes in the socio-demographic composition of the pool of employees.

## 17.5 Decomposition techniques

Intuitively, the change of a given statistic of the wage distribution between two periods can be split into a part due to the change in the *composition* of the underlying population and a part due to the change of the *wage* of any given individual profile. To identify the two components we can construct a fictitious intermediate distribution in which each individual profile in a given year is as-

signed the same weight that the profile has in another year. In this section, we sketch the reweighting technique developed by DiNardo, Fortin and Lemieux (1996), Biewen (2001) and Bover (2010), which we use to decompose the change between 2007 and 2011 in the EA distribution of MEGE in the following section.

Let earnings  $w$  be distributed at time  $t$  according to the distribution  $F(w, x | t)$ , where  $x$  is a vector of individual attributes. The density of earnings at time  $t$  can be written as:

$$f_t(w) = \int dF(w, x | t) = \int f(w | x, t) dF(x | t),$$

where the conditional density of earnings  $f(w, x | t)$  is the wage schedule at time  $t$ . Under the assumption that it does not depend on the distribution of attributes, the conditional wage density at time  $t_0$  can be combined with the marginal distribution of attributes  $x$  at time  $t_1$  to generate the counterfactual wage distribution:

$$f^c(w) = \int f(w | x, t_0) dF(x | t_1).$$

Counterfactuals can be derived by assuming different marginal distributions for the individual attributes. If the vector  $x$  is split into the two sub-vectors  $x_a$  and  $x_b$ , it is:

$$F(x_a, x_b | t) = F(x_a | x_b, t) F(x_b | t)$$

and the marginal distribution of earnings at time  $t$  is:

$$f_t(w) = \int dF(w, x_a, x_b | t) = \int \int f(w | x_a, x_b, t) dF(x_a | x_b, t) dF(x_b | t).$$

Specific counterfactuals can be constructed by choosing alternative periods for the three conditional densities above. In practice, under appropriate assumptions, the estimation of counterfactual distributions amounts to suitably reweighting the actual densities.

In our application in the next section, we include a limited set of observable attributes in the vector  $x$ : sex, age, education, citizenship and country of residence. We cannot consider other relevant individual characteristics, such as sector of activity, job title and hours worked, because the corresponding information collected in EU-SILC refers to the job held at the time of the interview, whereas earnings normally refer to the previous year. We denote by  $c$  the socio-demographic group defined by the interaction of sex, age, education and citizenship, by  $k$  the country of residence, and by  $G$  the two country groups. If  $p_{it}$  indicates the weight of employee  $i$  at time  $t$ , as defined in Section 17.2,  $Q_{Gct} = \sum_{i \in G,c} p_{it}$  is the weight of the socio-demographic group  $c$  in country group  $G$  at  $t$ ,  $Q_{Gt} = \sum_{i \in c} p_{it}$  is the overall weight of country group  $G$  at  $t$ , and  $Q_t = \sum_i p_{it}$  is the sum of the weights across the EA. The (normalised) weight of employee  $i$  at  $t$  can be written as:

$$\omega_{it} = \left( \frac{p_{it}}{Q_{Gct}} \right) \left( \frac{Q_{Gct}}{Q_{Gt}} \right) \left( \frac{Q_{Gt}}{Q_t} \right).$$

This expression guides us in defining the reweighting to construct relevant counterfactual wage distributions. Specifically, we construct the two counterfactual weighting schemes:

(CF1)

$$\omega_{iCF1} = \left( \frac{p_{i2011}}{Q_{Gc2011}} \right) \left( \frac{Q_{Gc2007}}{Q_{G2007}} \right) \left( \frac{Q_{G2007}}{Q_{2007}} \right),$$

(CF2)

$$\omega_{iCF2} = \left( \frac{p_{i2011}}{Q_{Gc2011}} \right) \left( \frac{Q_{Gc2011}}{Q_{G2011}} \right) \left( \frac{Q_{G2007}}{Q_{2007}} \right).$$

The reweighting scheme *CF1* is applied to the 2011 sample and preserves the 2011 density of wages conditional on  $(G, c)$ , while imposing the 2007 marginal distribution of  $(G, c)$ . Hence, the comparison of statistics computed on the actual 2007 distribution with those computed on the *CF1* counterfactual distribution returns the effect of changes between 2007 and 2011 in the wage schedules only, the *wage effect*; the difference between the wage effect and the overall change is the *composition effect*. The reweighting scheme *CF2* is applied to the 2011 sample and preserves the 2011 density of wages conditional on  $(G, c)$  and the marginal distribution of attributes  $c$  conditional on group  $G$ , while imposing the 2007 marginal distribution of employment between core and periphery. Therefore, the comparison of statistics computed on counterfactuals *CF1* and *CF2* returns the effect of changes only in the distribution of attributes within each group  $G$ . The difference between this effect and the overall composition effect returns the effect on the EA wage distribution of changes in the distribution of employees between core and periphery.

By using the estimated counterfactual distributions to decompose the deciles of the earnings distribution and denoting the  $d$ -th decile of MEGE computed on the distribution  $F^j$  by  $\theta^{d,j}$  where  $F^j(\theta^{d,j}) = d$  and  $j=(2007, 2011, CF1, CF2)$  it follows that:

- $\Delta^T = (\theta^{d,2011} - \theta^{d,2007})$  is the *total change* between 2007 and 2011;
- $\Delta^W = (\theta^{d,CF1} - \theta^{d,2007})$  is the *wage effect*;
- $\Delta^X = (\theta^{d,2011} - \theta^{d,CF1})$  is the *composition effect*;

- $\Delta^G = (\theta^{d,CF 2} - \theta^{d,CF 1})$  is the *composition effect net of changes in the distribution of employees between core and periphery*.

With a slight abuse of notation, in the following we use  $\Delta^h$ , with  $h = T, W, X, G$  to indicate the percentage differences rather than absolute differences of the deciles.

## 17.6 Decomposing changes in the earnings distribution in the EA

Table 17.3 shows the changes in the composition by sex, age, education, citizenship and country group of the EA employees between 2007 and 2011. The employment share of core countries increased by 1.9 percentage points; the weight of

younger employees fell in both core and periphery, although more markedly in the latter; the less educated suffered similarly in both country groups; the shares of females and natives declined only in the periphery. How did this different composition of salaried employment impact on the earnings distribution in the EA? And how did it interact with variations in the wage schedules?

Figure 17.4 displays the percentage change  $\Delta^T$  of each decile of the EA real MEGE distribution between 2007 and 2011 (orange line) and its decomposition. Between the 3rd and 8th deciles real wages grew by 1-2 percentage points, while the two bottom deciles and the top decile were almost unchanged. (The values discussed here may slightly differ from those reported in Table 17.2 because of the dropping of observations with missing values for individual characteristics.) The wage effect  $\Delta^W$  (dark green line) was consistently negative throughout the distribution, signalling

**Table 17.3: Changes in the socio-demographic composition of the full-time full-year equivalent employees between 2007 and 2011 in the EA (percentage points)**

Variable	Euro Area	Core	Periphery
<b>Sex</b>			
Male	-1.7	-0.1	-1.6
Female	1.7	2.1	-0.4
<b>Age class</b>			
20-29 years	-2.9	-0.8	-2.1
30-39 years	-1.4	-0.2	-1.2
40-49 years	0.2	-0.2	0.4
50-59 years	2.5	1.8	0.7
60-69 years	1.5	1.3	0.2
<b>Educational achievement</b>			
Compulsory schooling or less	-4.1	-1.8	-2.3
High school	0.6	0.6	0.0
College or more	3.4	3.1	0.3
<b>Citizenship</b>			
Native	-1.6	0.8	-2.4
Foreign-born	1.6	1.2	0.4
<b>Total</b>	-	1.9	-1.9

NB: Figures may not add up exactly because of rounding. For the list of Core and Periphery countries, see Figure 17.1.

Reading note: The table reports the change between 2007 and 2011 in the share of each socio-demographic group in the total EA salaried employment. The horizontal summation of the core and periphery figures yields the EA figures; the vertical summation by socio-demographic characteristic yields the figures in the last line for each country group.

Source: Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

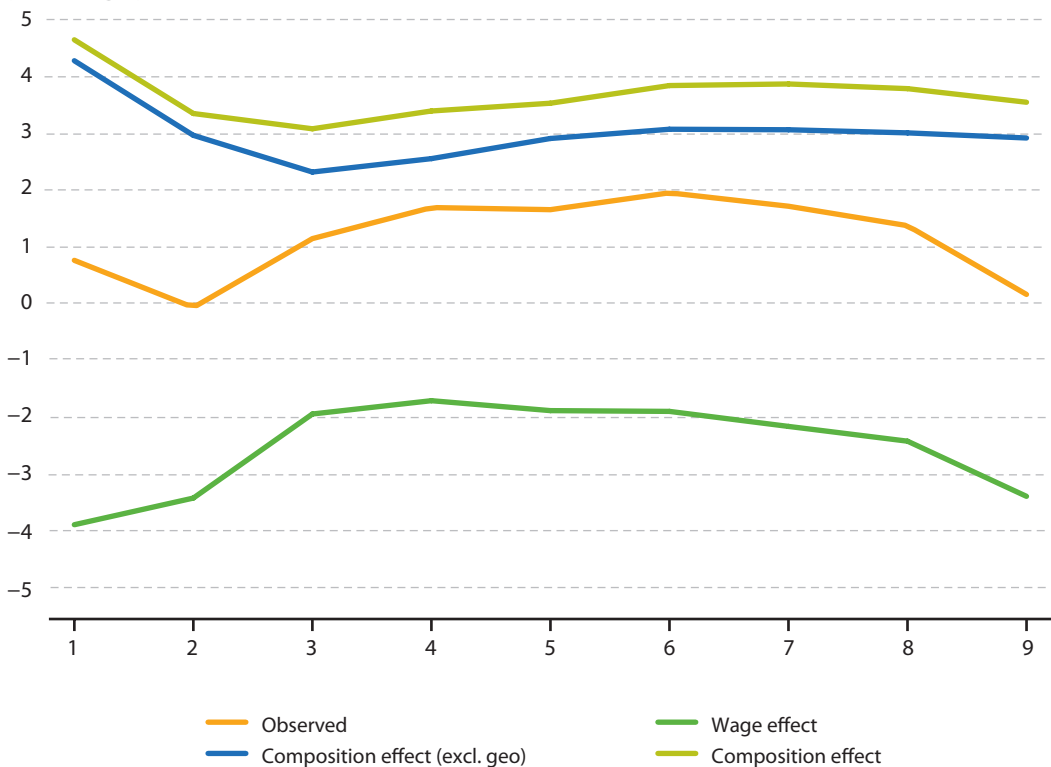


a widespread adjustment of real wages. However, it was smaller in absolute value between the 3rd and 8th deciles (about 2 %) and larger, almost double, at the bottom and top ends (around 4 %). On the contrary, the composition effect  $\Delta^x$  (light green line) was consistently positive and overall sustained real wages by 3-4 percentage points. These composition effects reflected only in part the different dynamics of employment among EA countries and the consequent reallocation of salaried employment across the area: the composition effect net of changes in the geographic distribution of employment  $\Delta^G$  (light red line) was less than one percentage point smaller than the total composition effect.

These results highlight a major adjustment of wage rates during the crisis in the EA as a whole, partly masked by significant changes in the composition of employment, especially across personal characteristics.

Although the geographic dimension seems to add little to the evolution of the EA earnings dispersion, the job reallocation across countries implied changes in their relative position. To show this, we compute the shares of employees of core and periphery countries that fell within each fifth of the EA earnings distribution. If residence in either country group did not matter, we would expect these shares to be roughly 20 %. Thus, the ex-

**Figure 17.4: Decomposition of the change of the deciles of the real MEGE distribution between 2007 and 2011**  
(percentage points)



*Reading note:* The figure shows the actual (observed) change of deciles between 2007 and 2011 and how it can be attributed to a wage effect, obtained holding sample composition constant at 2007, and a composition effect, obtained reweighting the 2011 sample with 2007 weights. The composition effect (excl. geo) is the part of the composition effect attributable to a change in the distribution across countries.

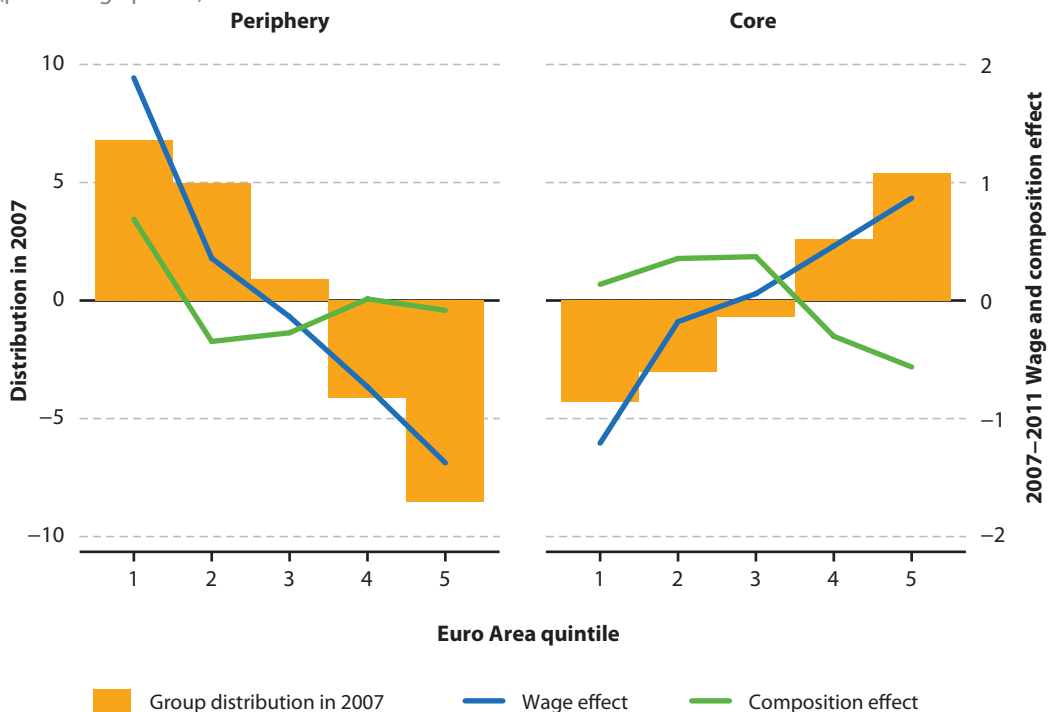
*Source:* Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

cess over 20 % (shortfall relative to 20 %) provides a measure of the extent to which the employees of the core and the periphery are over-represented (under-represented) in each EA fifth. This over- or under-representation is shown for 2007 by the positive and negative bars, respectively, in Figure 17.5. Unsurprisingly, periphery countries were over-represented in the bottom 40 % of the EA distribution, which contained more than half of the periphery employees, as a reflection of a substantial under-representation in the top fifth, which hosted little more than a tenth of periphery employees. Conversely, core employees were over-represented in the top 40 % of the EA distribution by about 8 percentage points. Figure 17.5 also shows how the over- or under-representation changed between

2007 and 2011 because of the wage and composition effects. The change in wage schedules accentuated the periphery-core divide: the dynamics of relative earnings further shifted periphery employees towards the bottom of the EA distribution, while pushing up core employees. The composition effects amplified the wage effect for periphery employees at the bottom, but mitigated the shift to the top fifths for core employees.

The above evidence captures the effect of the adjustment in the wage schedules, but is silent about the extent to which core and periphery contributed to this adjustment. We hence compute how the EA earnings distribution would have varied, had the only force in place been the wage adjustment in ei-

**Figure 17.5: The position of core and periphery employees in the EA earnings distributions in 2007 and 2011** (percentage points)



NB: For the list of Core and Periphery countries, see Figure 17.1.

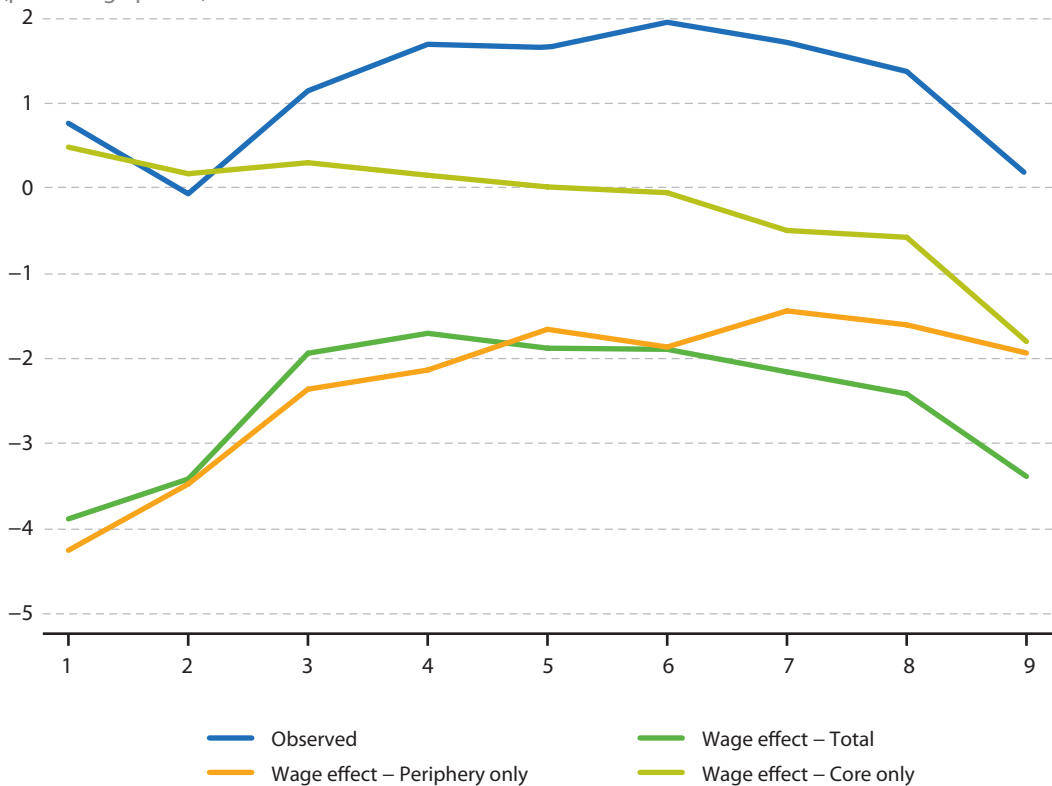
Reading note: The bars represent the excess over 20 %, if positive, and the shortfall relative to 20 %, if negative, of the shares of core and periphery employees in each fifth of the real MEGE distribution in the EA in 2007. If employees from the two areas were equally spread along the overall EA distribution, these shares would equal 20 % and the bars would vanish. The lines represent the changes in these shares between 2007 and 2011 due to the wage effects (blue) and composition effects (green).

Source: Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

ther the core or the periphery: a suitable counterfactual distribution is obtained by combining the actual 2007 distribution for one country group with the counterfactual *CF1* distribution for the other group. Figure 17.6 compares the observed change in deciles and the wage effect between 2007 and 2011 with the contributions to the wage effect attributable to core and periphery. Most of the EA wage adjustment is traceable to changes in the periphery wage schedules, which explain the whole drop in the bottom six deciles. If the wage adjustment in core countries had been the only one occurring, earnings would have fallen slightly only for the top three deciles, while remaining almost untouched in the other parts of the distribution.

This last exercise only shuts down the wage adjustment in either country group. However, it fails to explain whether the difference between the periphery and the core reflects a geographic effect or simply the adjustment of wage rates of professional profiles relatively more represented in either country group. To answer this question, we apply the decomposition technique put forth by Firpo, Fortin and Lemieux (2011). This method involves estimating Recentered Influence functions to quantify (under appropriate identification assumptions) the effect of a given observable variable on the unconditional quantile of the earnings distribution. In practice, we estimate a wage equation including dummies for education, sex and cit-

**Figure 17.6: The core and periphery contributions to the wage adjustment between 2007 and 2011 (percentage points)**



*NB:* The total wage effect is obtained by holding sample composition constant at 2007; the periphery wage effect is obtained by holding sample composition and wage schedule in core countries constant at 2007; the core wage effect is obtained by holding sample composition and wage schedule in periphery countries constant at 2007. For the list of Core and Periphery countries, see Figure 17.1.

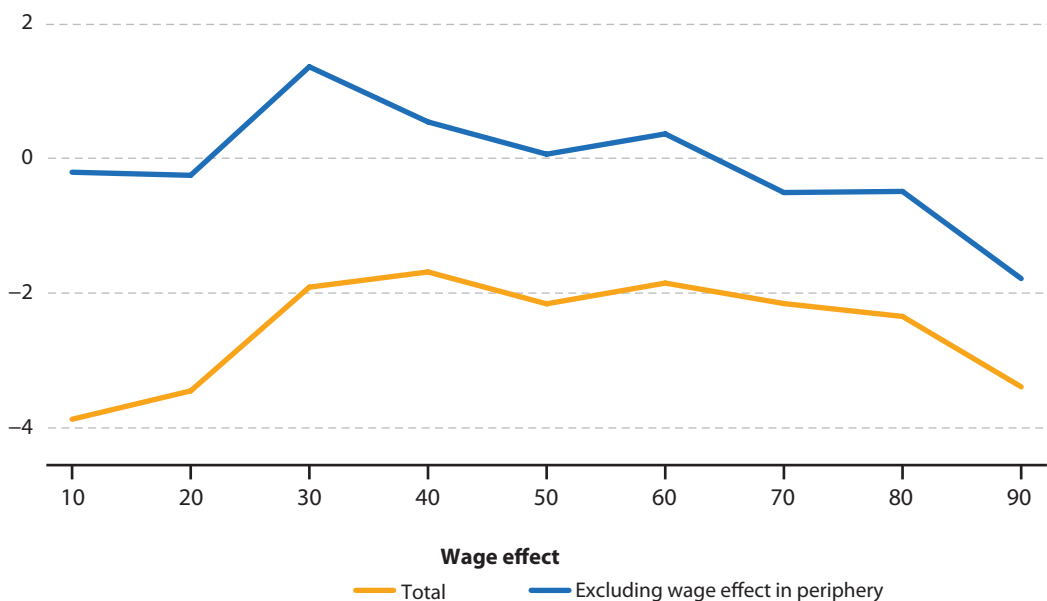
*Reading note:* The figure shows the actual (observed) change of deciles between 2007 and 2011 and how its variation due to the total wage adjustments was accounted for by wage adjustments in core countries and periphery countries.

*Source:* Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

izenship, a quadratic in age and a dummy for the country group. This equation is estimated for the actual 2007 weighting scheme and the counterfactual *CF1*. As by construction the average of the explanatory variables is the same for both weighting schemes, the comparison of the estimated coefficients for variable  $x_a$  gives the contribution of the returns of  $x_a$  to the total wage effect. Figure 17.7 displays the total wage effect, already shown in Figures 17.4 and 17.6, and the counterfactual wage effect obtained by neglecting the role of periph-

ery membership in the estimates of deciles, so that it only measures the effect of the changes in the returns to the other characteristics. Absent the adjustment in periphery countries, the overall wage effect would have been non-negative up to the 6th decile, suggesting that the adjustment in the periphery was wider than that caused by the profile-specific changes in returns. For example, the median wage would have been nearly unchanged against a 2 percentage point fall due to the wage effect in the periphery.

**Figure 17.7:** The total wage effect and the periphery wage adjustment, between 2007 and 2011 (percentage points)



*NB:* For the list of Core and Periphery countries, see Figure 17.1.

*Reading note:* The figure displays the total wage effect and the counterfactual wage effect obtained by neglecting the role of periphery membership in the estimates of deciles.

*Source:* Authors' computation from EU-SILC UDBs of January 2010 and May 2013.

## 17.7 Conclusions

In this chapter, we have explored the evolution of the distribution of the EA wage rates during the global financial crisis and the determinants of this evolution using data drawn from EU-SILC. From a methodological viewpoint, our results confirm that the microeconomic evidence can qualify, if not reverse, the conclusions about the functioning of labour markets drawn from aggregate data. However, despite their high quality, the EU-SILC data used here are far from ideal for our purposes. There is a pressing need to improve the information on the earnings distributions in European countries as well as to reconcile micro and macro sources.

The EU-SILC data show that the wage adjustment within the EA between 2007 and 2011 was substantially larger than that measured in national accounts. Real monthly full-time equivalent gross earnings in periphery countries decreased on average by over 4 % relative to levels in core countries, but differences across deciles of the core and periphery earnings distributions are significant. These differences imply that the wage adjustment was far more pronounced at the bottom: the relative costs of low wage labour fell in the periphery by some 6 to 8 %.

The changing composition of the pool of salaried employees boosted earnings growth along the whole EA wage distribution; only a minor part of these compositional effects are traceable to the relative shift of employment from periphery to core countries. Absent these compositional effects, the downward real wage adjustment would have been sizeable, and larger in absolute value at the low end of the wage distribution. The overall wage adjustment, net of compositional effects, reflected exclusively that of periphery countries until the 6<sup>th</sup> decile of the EA distribution, while from the 7<sup>th</sup> decile earnings fell in both country groups. The contribution of periphery to the overall EA wage adjustment does not simply reflect the changing wage rates of specific segments of the workforce more represented in the periphery, but a genuine 'country effect', that is an across-the-board drop in wage rates. Against this sizeable adjustment in the periphery, core countries have not displayed any upward pressure on their wage rates.

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# 18

## Household structure and risk of poverty or social exclusion

Maria Iacovou <sup>(153)</sup>

### 18.1 Introduction

This chapter examines the relationship between household structure and the three components of the 'at-risk-of-poverty-or-social-exclusion' (AROPE) measure which is the basis for one of the headline targets of the Europe 2020 strategy. The AROPE measure consists of three components: income poverty, severe material deprivation, and (quasi-)joblessness (on the AROPE measure, see Chapters 1 and 3 of this volume; see also Eurostat 2015).

This chapter asks the following questions:

- what is the relationship between household structure and the incidence of poverty, severe material deprivation and (quasi-)joblessness?
- how are the three measures of disadvantage distributed *within* the different household types?
- does the relationship between the three measures of disadvantage vary according to household type?

Of the three components of the AROPE indicator, it is the measure of (quasi-)joblessness which is the most recently implemented, and which has attracted the most criticism in terms of its ability to effectively identify households and individuals at

a high risk of disadvantage (Chapter 16 of this volume; Ward and Özdemir, 2013; Maître, 2013). Thus, an additional task of this chapter is to assess the usefulness of the (quasi-)joblessness measure.

### 18.2 AROPE and its three component subscales

The three component indicators of AROPE have been described in detail elsewhere in this volume (see *inter alia* Chapters 1 and 3 of this volume) and are briefly summarised here for reference.

#### At risk of poverty (AROP)

An individual is defined as being *at risk of poverty* if he or she lives in a household where the total equivalised disposable income is below 60 % of the national median equivalised disposable income. Because this indicator is benchmarked relative to the incomes of the general population in the country in question, it does not measure absolute levels of wealth or poverty, and thus may not be synonymous with a low standard of living. In this chapter, it is sometimes referred to as 'income poverty' or 'poverty'; these terms always refer to the AROP indicator. (See Chapter 3 of this volume.)

#### Severe material deprivation (SMD)

This indicator is defined on the basis of living in a household which cannot afford items which the majority of people would consider it necessary or at least desirable to own. *Severe material deprivation*

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(SMD) is defined as the inability to afford four or more of a list of nine items (see Chapter 10 of this volume).

The definition relates to the ability to afford the item, rather than whether or not a household chooses to own the item. In contrast to the AROP indicator, which is a relative measure, we expect the indicator of severe MD to be more directly associated with economic hardship, and we expect individuals living in less affluent countries and regions to report higher levels of MD than those in more affluent areas. All of the analysis which follows examines *severe* MD (SMD). In the text, this is sometimes referred to for the sake of brevity as ‘material deprivation’ or ‘deprivation’; these terms always refer to the SMD indicator used in the Euro 2020 social inclusion target.

### (Quasi-)joblessness

A household’s work intensity is defined as the total number of months worked during the preceding income reference year by all working-age members of the household (those aged 18-59 years, excepting students aged under 25), as a fraction of the total number of months which the working-age members of that household could potentially have worked during that year. Part-time work is weighted pro-rata, as a fraction of a nominal 35-hour full-time working week. Households with a very low work intensity (work intensity lower than 0.2) are defined as (quasi-)jobless households. Work intensity is not defined for households with no working-aged members, since the denominator of the calculation would be zero; members of such households are therefore omitted from this measure. Work intensity is, in fact, not defined for any individual aged 60 or over, even if they live in a household with one or more working-aged people. However, children aged under 18, and students aged 18-24, are allocated the work intensity of the other members of their household, even though they themselves have not been counted for the purposes of its calculation. (See Chapter 16 of this volume.)

## 18.3 Problems with the (quasi-)joblessness measure

Of the three component subscales of AROPE described above, the first two — the measures of income poverty and severe MD — have been in wide use for several decades as indicators of disadvantage. As such, their properties have been comprehensively investigated and their implementation refined. Neither constitutes a definitive measure of disadvantage, and both measures have their problems — income-based measures of poverty rely on the questionable assumption of income pooling between household members (see Chapter 9 of this volume; Jenkins, 1991; Alderman et al., 1995); they may be sensitive to the choice of equivalence scale used (Coulter et al., 1992; Jäntti and Danziger, 2000); and because they are relative measures, they do not necessarily imply a low standard of living. Measures of MD are arguably more closely linked to a household’s actual standard of living (see Chapters 10 and 21 of this volume; Fusco, Guio and Marlier, 2010; Guio, Gordon and Marlier, 2012; Guio, 2009), though they must be regularly updated to remain relevant through changing conditions.

The first two component subscales of the AROPE measure have stood the test of time, and to the extent that they present difficulties, these are well understood. The (quasi-)joblessness indicator, by contrast, has been introduced much more recently (in 2010), and has drawn criticism from a number of quarters. The various problems with the QJ indicator are discussed in Chapter 16 of this volume and it is not necessary to revisit all of the potential problems in this chapter. However, some of these issues are directly relevant to the work in hand, and these do need to be discussed here.

The first problem is the definition of all persons aged 60 and over as not of working age. Ward and Özdemir (2013) note that this is inconsistent with the arrangements relating to pensionable age in most EU countries, and that this inconsistency is particularly problematic in the light of legislative developments in many countries aimed at increasing the retirement age. A related but slightly different issue emerges in the analysis of the relationship between household structure and QJ, namely that all typolo-



gies of household structure in current use distinguish between some notion of 'prime-aged' and 'elderly' households, and that the dividing line between the two is typically set at age 65 (see, e.g., United Nations, 2006 and 2007). Thus, the mapping between the official definition of QJ and any useful typology of household structure is rather messy, with QJ not defined for large numbers of households which would for other purposes be considered to be 'prime-aged' households.

Additional, and related, problems are (a) that the measure will be unstable around certain ages, in terms of the estimates which it produces, and in terms of the individuals over whom these estimates are defined; and (b) that the QJ measure is based on data on household members' work histories over the preceding calendar year, and ages at the end of the reference year, while household structure would for most purposes be calculated using information collected on the number and ages of household residents at the time of the survey. This difference may mean that the work intensity measure does not 'fit' with the household structure measure. One possible solution, which I employ in this chapter, is to re-calculate a measure of household structure based on people's ages at the end of the income reference year. However, this creates a new potential problem (ignored in this chapter), that the newly defined household is in some cases a fictitious construct: not all the individuals who are currently living in a household may actually have been living together at the end of the reference year.

## 18.4 Data and methods

### 18.4.1 EU-SILC

Analysis is based on the most recent release of the EU-SILC cross-sectional data files at the time of writ-

ing: the 2012 Wave of EU-SILC cross-sectional data (UDB 2012 Version 2, microdata release of August 2014). The three AROPE component indicators are used as supplied in the data: HX080 for income poverty, RX060 for severe MD, and RX050 for (quasi-) joblessness. In addition, a number of alternatives to the QJ variable are tested, which extend the measure (a) to people between the ages of 60 and 64, and (b) to individuals for whom the official measure is not defined, because they are too old, but who live in a household with one or more individuals of working age. The features of EU-SILC relating to the calculation of household structure typologies are described in Iacovou and Skew (2011).

### 18.4.2 Weighting

All estimates presented in this chapter are weighted. The weights used are based on the cross-sectional weights provided with EU-SILC; however, some of the largest weights are 'trimmed', and in analysis where countries are grouped together (for example, regional or EU-wide averages), countries are weighted according to the square root of their population (see Chapter 4 of this volume for the rationale underlying these procedures).

### 18.4.3 Country clusters

We present some results broken down by individual countries, but in the interests of legibility, we present several results disaggregated by region rather than country. We use the same regional clusters as in Chapter 4 of this volume; these are derived via a combination of theoretical considerations (Esping-Andersen, 1990 and 1999; Ferreira, 1996) and empirical analysis, using a minimum distance algorithm. More details on the regional typology are presented in Chapter 4; the typology used is set out in Table 18.1.

**Table 18.1: Regional clusters used in the analysis**

Nordic	Denmark, Finland, Sweden
North-Western	Belgium, Germany, Ireland, France, Luxembourg, Netherlands, Austria, United Kingdom
Southern	Greece, Spain, Italy, Cyprus, Malta, Portugal
Eastern	Bulgaria, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia

### 18.4.4 A typology of household structures

Ten household types are defined, according to the number and ages of people living in a household, and the relationships between them. These household types are listed in Table 18.2 and follow the typology of Iacovou and Skew (2011).

Note that the 'other households' category includes some households where all the members are from the same family, i.e. which properly should be considered as extended families, but for whom this information cannot be recovered from the information available in EU-SILC, which does not provide a full household grid. As mentioned in Section 18.3, household structure is calculated not on the basis of the current ages of the individuals living in the household, but on the basis of their ages at the end of the income reference year. Thus, the distribution of household types is not identical to that used in Chapter 4 of this volume, though of course the two are very close.

The distribution of household types is shown in Table 18.3. The top two panels show the distribution of household types across all households and individuals in the sample, regardless of whether the QJ meas-

ure is defined. The two lower panels show the distribution of household types for those households or individuals for which QJ is defined. The two distributions are very different: there are no single-elderly households in the lower panel, while these account for 13 % of households and 5.3 % of individuals in the upper panel, and there are only very small numbers of elderly couple households in the lower panel, while these account for over 10 % of households and individuals across the whole sample.

## 18.5 Results

### 18.5.1 Eligibility for the measure of (quasi-)joblessness

As highlighted above, the measure of (quasi-)joblessness is unlike the other constituent measures of AROPE, in that it is not applicable to the entire population. In the case of households composed entirely of non-working-age individuals (children under 18, students aged 18-24, or people aged 60 or over) the measure is not applicable to anyone in the household. In the case of households composed of both working-age and non-working-age individuals, the measure is not defined for individu-

**Table 18.2: Definitions of household types**

Single person < 65	A single person under age 65
Single person > = 65	A single person aged 65 or over
Couple both < 65	A couple (married or cohabiting) both aged under 65
Couple, at least one > = 65	A couple (married or cohabiting), at least one of whom is aged 65 or over
Couple + child(ren) under 18	A couple with one or more of their own children, including at least one child aged under 18
Couple + adult child(ren)	A couple living with one or more of their own children, all of whom are aged 18 or over
Lone parent + child(ren) under 18	A single adult plus one or more of his or her own children, including at least one child aged under 18
One parent + adult child(ren)	A household consisting of one parent plus one or more of his or her own children, all of whom are aged 18 or over
Extended family	Non-nuclear households whose members all belong to the same family. Most of these are either three-generation families, or households including a parent and an adult child with a partner or spouse
Other households	Other households, including lodgers, unrelated sharers, etc.

*NB:* Children are defined as people under 18 years of age, regardless of educational or labour market participation.

*Source:* Iacovou and Skew (2011).

**Table 18.3: Distribution of household types by regional cluster, 2012**  
(row percentages)

	Single person aged under 65	Single person aged 65+	Couple both under 65	Couple, 1 or both aged 65+	Couple + child(ren)	Couple + adult child(ren)	Lone parent + child(ren)	One parent + adult child(ren)	Extended family	Other
<b>Households — all</b>										
Nordic	18.0	11.4	18.5	15.3	24.2	3.9	4.0	1.9	0.3	2.6
Western	20.1	12.6	15.5	13.4	21.0	6.5	4.9	3.2	1.0	2.0
Southern	12.0	12.5	9.7	12.8	22.5	14.2	2.7	6.3	3.6	3.7
Eastern	11.6	14.3	11.6	10.3	18.1	12.6	2.5	7.2	8.9	2.9
<b>Total</b>	<b>15.7</b>	<b>13.0</b>	<b>13.4</b>	<b>12.5</b>	<b>20.8</b>	<b>9.7</b>	<b>3.7</b>	<b>4.9</b>	<b>3.7</b>	<b>2.7</b>
<b>Households in which (quasi-)joblessness (QJ_59) is defined for any household member</b>										
Nordic	20.1	0.0	23.9	1.3	36.5	5.9	6.0	2.7	0.4	3.3
Western	23.7	0.0	19.8	1.1	30.8	9.4	7.1	4.5	1.3	2.4
Southern	13.9	0.0	12.0	1.0	31.9	19.9	3.8	8.5	4.8	4.3
Eastern	12.0	0.0	14.1	0.8	25.9	17.9	3.5	9.9	12.5	3.5
<b>Total</b>	<b>17.8</b>	<b>0.0</b>	<b>16.7</b>	<b>1.0</b>	<b>30.1</b>	<b>13.9</b>	<b>5.3</b>	<b>6.8</b>	<b>5.3</b>	<b>3.2</b>

NB: Derived using individuals' ages at the end of the income reference year. Estimates are weighted according to the procedure defined in Section 18.4.2.

Reading note: In the Nordic countries, 18 % of households consist of a single adult aged under 65; 20.1 % of households in which QJ\_59 is defined are of this type.

Source: Author's computation, UDB version 2012-2.

als aged 60 and over, but it is defined for the other non-working-age groups.

In practical terms, few children under the age of 18 (0.2 % of the whole sample, and under 0.6 % in every country) live in households with no working-age members. The percentage of students under 25 living in such households is higher (at 7.8 % overall), and varies more between countries (from under 1 % in Cyprus, Luxembourg, Malta and Slovakia, to 27 % in Finland and Sweden). This has implications for the comparability of the QJ measure between countries for this group.

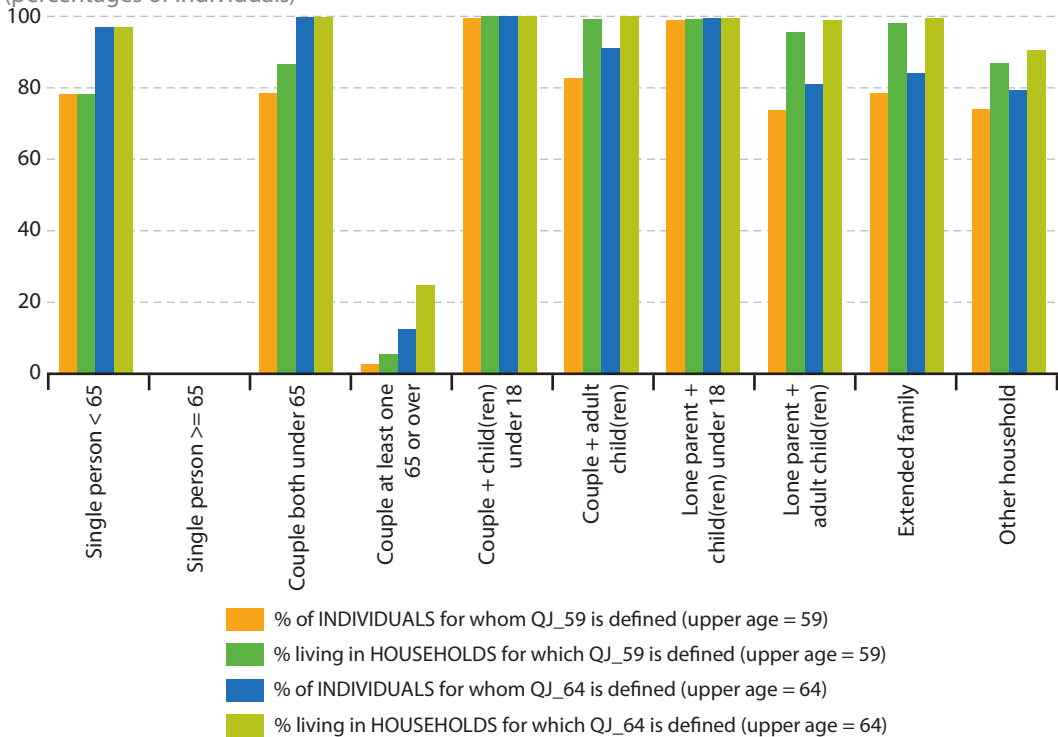
Figure 18.1 divides the sample into the ten household types described in Section 18.4., showing, for each household type, the percentages of individuals (a) for whom the QJ measure is defined, and (b) who live in a household in which the QJ measure is defined for at least one individual. Of the 2 %, (b) is always equal to or larger than (a). As well as showing these percentages for the official index which covers those aged up to age 59 (QJ\_59), we show

the same calculations for a measure which also defines those aged 60-64 as working-age (QJ\_64). The percentages of individuals for whom QJ\_64 is defined, or who live in households where QJ\_64 is defined for at least one individual, are always equal to, or larger than, the corresponding percentages calculated using QJ\_59.

For three household types, the definition of (quasi-) joblessness makes no difference at all: by definition, no adults over age 64 are covered under either measure, while virtually all those living in households consisting of couples and children, or lone parents and children, are covered under both measures. The biggest difference between the coverage of QJ\_59 and QJ\_64 is in the case of single-person and couple-only non-elderly households. Under QJ\_59, under 80 % of people in these households are covered; under QJ\_64, 97 % of persons in single non-elderly households are covered (the remainder being students) while virtually all persons living in non-elderly couple households are covered.

**Figure 18.1: Coverage of the (quasi-)joblessness measures (QJ\_59 and QJ\_64), by household type, EU-28, 2012**

(percentages of individuals)



*Reading note:* In households consisting of a couple where at least one member is aged 65 or over, 3 % of individuals are covered under the QJ\_59 measure; 5 % live in a household for which the QJ\_59 measure is defined; 12 % of individuals are covered under QJ\_64, and 24 % live in a household for which the QJ\_64 measure is defined.

*Source:* Author's computation, UDB version 2012-2.

Of the other household types (couples and lone parents living with children over age 18, extended families, and 'other' households), the major differences in coverage are not between the QJ\_59 and QJ\_64 indicators, but between coverage at the individual and household levels. For example, in households which consist of a lone parent and one or more children over 18 (but no children under 18), only 74 % of individuals are covered under QJ\_59, but 96 % of households are covered. Under QJ\_64, only 81 % of individuals but 99 % of households are covered.

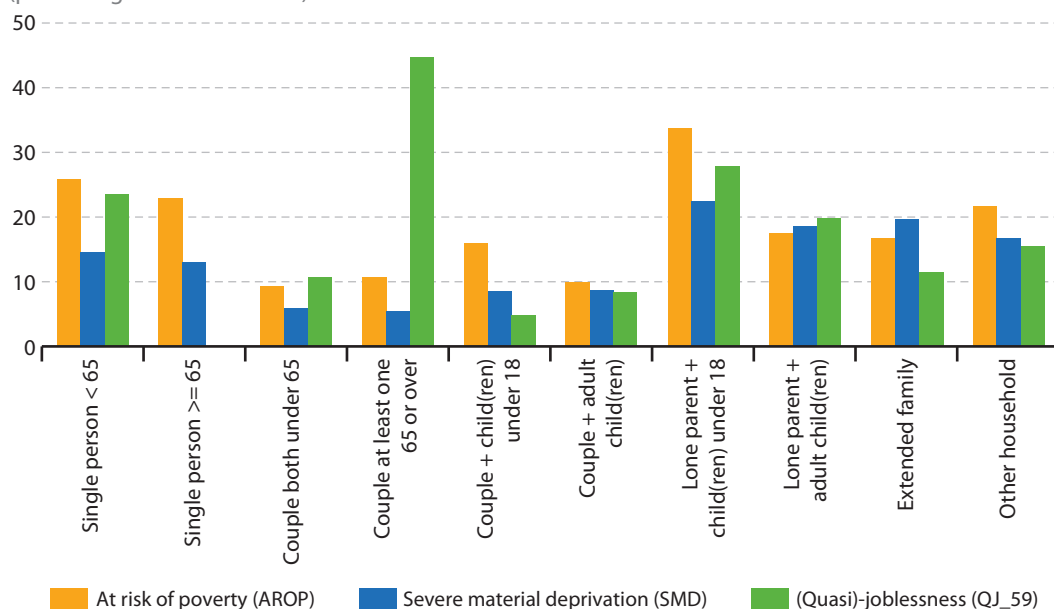
### 18.5.2 AROPE by household type

Figure 18.2 shows the incidence of the three AROPE measures by household type, aggregated

across the EU-28. There are two major differences between the measure of (quasi-)joblessness and the other two measures. First, QJ is not defined at all for single persons over age 65, though this is group at a relatively high risk of poverty. Second, those at the very highest risk of QJ are people living in couple households where one partner is age 65 or over (or rather, the minority of people in these households for whom work intensity is defined), whereas the risk of poverty or SMD for this household type is very low.

These differences aside, (quasi-)joblessness tends to be most prevalent among those household types where income poverty and SMD are also prevalent, namely single people under age 65, and lone parents with children. The rate of QJ is lowest

**Figure 18.2: The three measures of AROPE, by household type, EU-28, 2012**  
(percentages of households)



*Reading note:* Of households consisting of a lone parent plus child(ren) under 18, 34% are AROP, 23% suffer SMD, and 28% experience (quasi-)joblessness.

*Source:* Author's computation, UDB version 2012-2.

in couples with children; this is a group with relatively modest risks of income poverty and SMD, though the risk of QJ in this household type is lower than the risk of either income poverty or SMD.

### 18.5.3 Single-person and couple-only households under age 65

In this section, we examine the incidence of the AROPE measures among single-person and couple-only households under age 65; we analyse how these measures vary with age, and in the case of single people, by gender. The incidence of the three AROPE indicators by age is shown for both household types in Figure 18.3. Profiles for each of the indicators are shown for the EU-28 and for the four country clusters separately. The figures underlying these graphs (and those appearing in similar figures throughout the rest of the chapter)

were calculated on the basis of 2-year age bands, and smoothed using a simple variant of a Gaussian kernel smoother.

#### Single-person households

Figure 18.2 showed that in single-adult households the rates of (quasi-)joblessness and income poverty are similar. However, as the left-hand panel of Figure 18.3 shows, the three indicators have markedly different age profiles. Poverty is concentrated among those under age 30 (albeit with a slight increase at the upper end of the age range). (Quasi-)joblessness, by contrast, is concentrated among people at older ages, with the risk of QJ increasing after age 40, and much more steeply after age 50. The age profile for SMD is much flatter; in three of the four clusters of countries there is little variation in the risk of SMD with age; and variation with age is seen only in the Eastern European, where SMD increases after the age of 32).

In single-person households, the risk of QJ varies with age, but does not vary a great deal across clusters of countries. The Eastern European countries differ somewhat from the other regional clusters, in that the risk of QJ is particularly low for single people in their thirties, and particularly high for single people in their fifties, and there is some evidence that QJ is less prevalent among older people in the Nordic countries, but overall, the age profiles are reasonably similar. In terms of income poverty, the age profiles do differ between clusters of countries, but these differences are evident mainly in the case of younger adults. The risk of income poverty among single people in their twenties is particularly high in the Nordic countries, and to a lesser extent across Western Europe; the same pattern also holds in the Southern countries, though it is far less marked than in the Nordic and Western countries. Income poverty among single people in their twenties is lower in the Eastern countries than elsewhere in Europe, and higher among people in their forties and fifties; thus, the young in Eastern Europe are still at an elevated risk of income poverty, but this risk is only slightly higher than the risk for people in their fifties.

### Couple-only households

Households composed of couples under age 64 are displayed in the right-hand panel of Figure 18.3. Here, the contrasts between the age profiles of the three indicators are if anything even starker than they are in the case of single people. The risk of QJ is very low for couple-only households in their twenties, thirties and forties; however, the risk increases dramatically in all clusters of countries after the mid-fifties, showing that QJ is highly concentrated among older people. There are differences between regions, with this pattern being most pronounced in the Southern countries, and much less pronounced in the Nordic countries, but the overall picture is of a concentration of QJ among older people. QJ is clearly not synonymous with poverty: young adults have a low incidence of QJ but a high incidence of poverty, while the reverse is true for older adults; put another way, employment does not protect large numbers of young adults from poverty<sup>(154)</sup>, while many older adults are not catapulted into poverty because of a lack of employment.

<sup>(154)</sup> The relationship between poverty, (quasi-)joblessness and low wages for the young is discussed in Spannagel (2013) and Andress and Lohmann (2008).

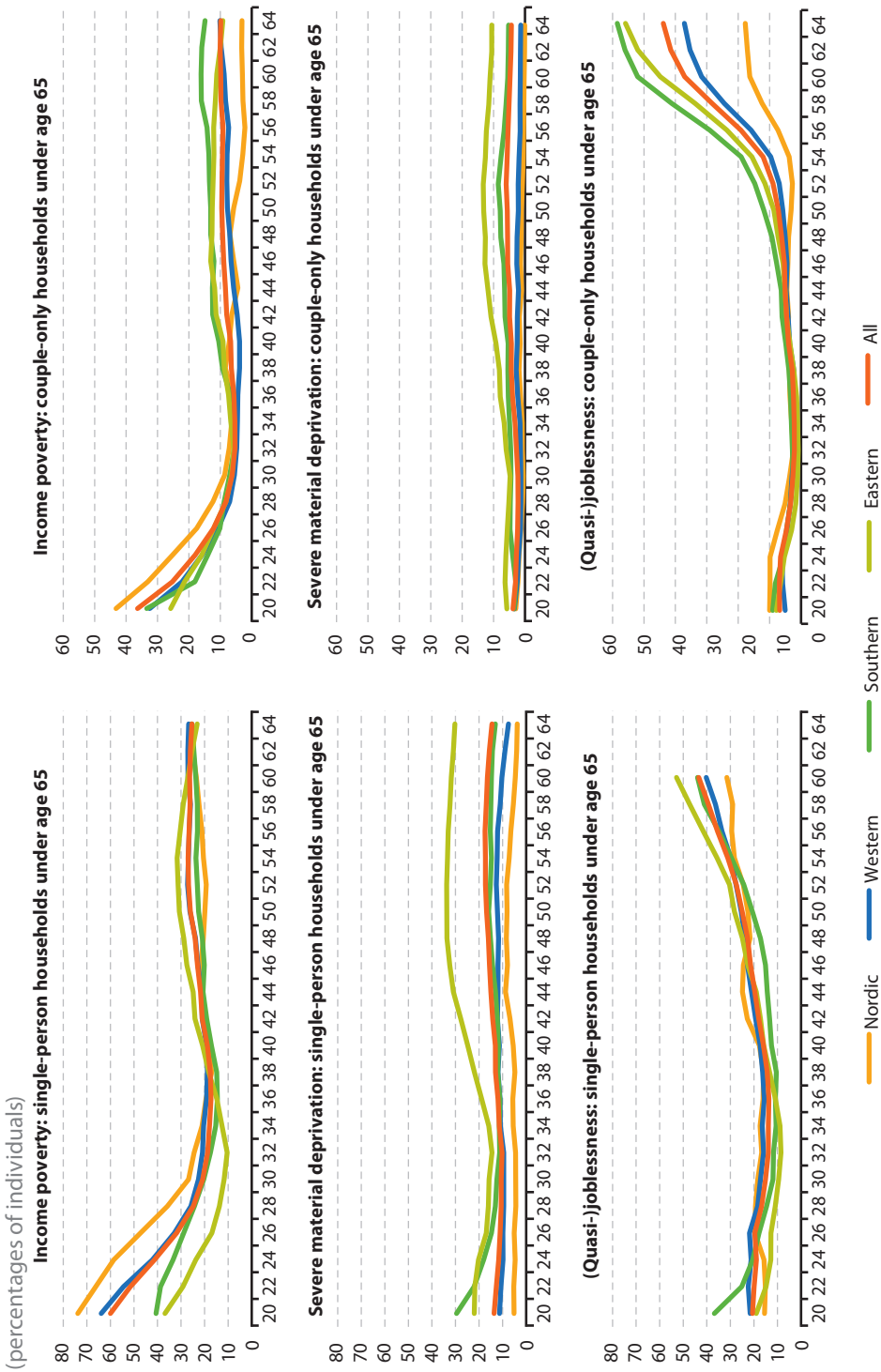
As with single-person households, income poverty is concentrated among younger couples, falling from around 35 % of 20-year-old couples to under 10 % of 28-year-old couples, and remaining essentially flat throughout the rest of the life course. There are some regional differences: in the Nordic countries, younger couples are at a higher risk of poverty, and older couples are at a lower risk, than in other regions, but these regional differences are relatively small. Again, as with single-person households, the risk of SMD is fairly flat for couples across the age range, standing at around 5 % of those in their twenties, and rising only to around 7 % for those in their fifties. Once again, those in Eastern Europe are most likely to report SMD, particularly at older ages.

### Gender in single-person households

As well as differing by age, we may wonder whether the incidence of disadvantage differs by gender. Because the three AROPE measures are household-based, and the majority of couples consist of one man and one woman, none of the AROPE component indicators will differ by gender<sup>(155)</sup> in couple households. However, they may of course differ by gender in single-person households. Figure 18.4 shows age profiles for the three AROPE component indicators, by gender, across the EU-28. The shapes of the three profiles are remarkably similar for men and women, and indeed, their SMD and (quasi-)joblessness profiles are virtually indistinguishable by gender. The risk of poverty, however, is 4-5 percentage points higher for women during the early to mid-twenties, and about 1-2 percentage points higher for men at older ages. Further investigations reveal that young women are more likely than young men to be poor in all regions, particularly in the Nordic and Eastern countries, where the difference between men and women is around 7 percentage points in the under-26 age group. The more modest gender difference in poverty risks at older ages is driven by the Nordic and Eastern clusters.

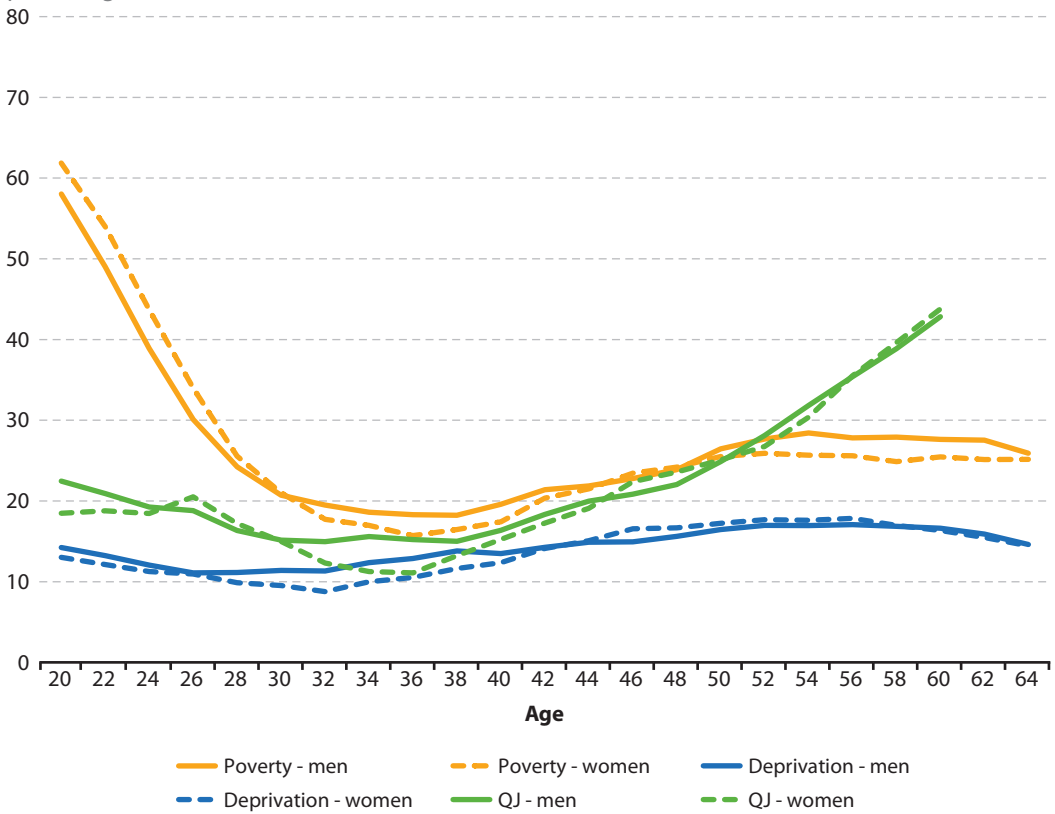
<sup>(155)</sup> In fact, this assertion is not 100 % true: since women tend to be younger than their male partners, slightly more women than men in couples are covered by the QJ indicator. However, any difference arising from this is an artefact of the indicator and therefore of limited interest.

**Figure 18.3:** The three measures of AROPE, by age: single-person households (left-hand panel) and couples under 65 (right-hand panel), 2012 (percentages of individuals)



*Reading note:* Of individuals living in single-person, non-elderly households, in the Nordic countries, 74 % of those aged 20 are living in income poverty; this declines to 36 % at age 28 and 21 % at age 34. Source: Author's computation, UDB version 2012-2.

**Figure 18.4: AROPE, by age and sex: single-person households under age 65, 2012**  
(percentages of individuals)



Reading note: At age 20, 58 % of men and 62 % of women are at risk of poverty.

Source: Author's computation, UDB version 2012-2.



### 18.5.4 Couples and lone parents with children under 18

In this section, we examine the incidence of the three AROPE component indicators in households consisting of couples with children aged less than 18, and lone parents with minor children (under 18). In the previous section we analysed variations in the AROPE indicators by age. It makes less sense to do this for families with children, since over 90 % of parents in these households are aged between 28 and 51, an age range across which there is little variation in risk for the AROPE subscales. To the extent that any variations were evident by parental age, these would likely relate more to the age of the children than the age of the parents. We therefore analyse variations in the three AROPE indicators by the number of children in the family, and by the age of the youngest. We base the analysis in this section on the subset of households which consist *only* of parents and children (under 18), since the presence of adult children may complicate the analysis and its interpretation.

When investigating variations in AROPE with the number of children in a family, we also include childless couples and single people in the analysis, as 'no-child' families. Members of the comparison group are selected to be comparable with parents on the basis of age: thus, for lone parents, the 'no-child' comparison group consists of women between the ages of 26 and 54 who live alone, and for couples, the comparison group consists of members of couple-only households aged between 27 and 51. These comparisons are included only for interest and should not be interpreted as having any meaning beyond this; the comparison group is matched with parents only by age, and may differ systematically from people with children in many important respects.

For couples with children, results are shown for families with one, two, three and four or more children; as there are few lone parents with four or more children, we combine these with three-child families. Figure 18.5 shows how the three AROPE measures vary with the number of children, for couples with children (left-hand panel) and lone parent households (right-hand panel). Across Europe as a whole, QJ is very uncommon for families with up to three

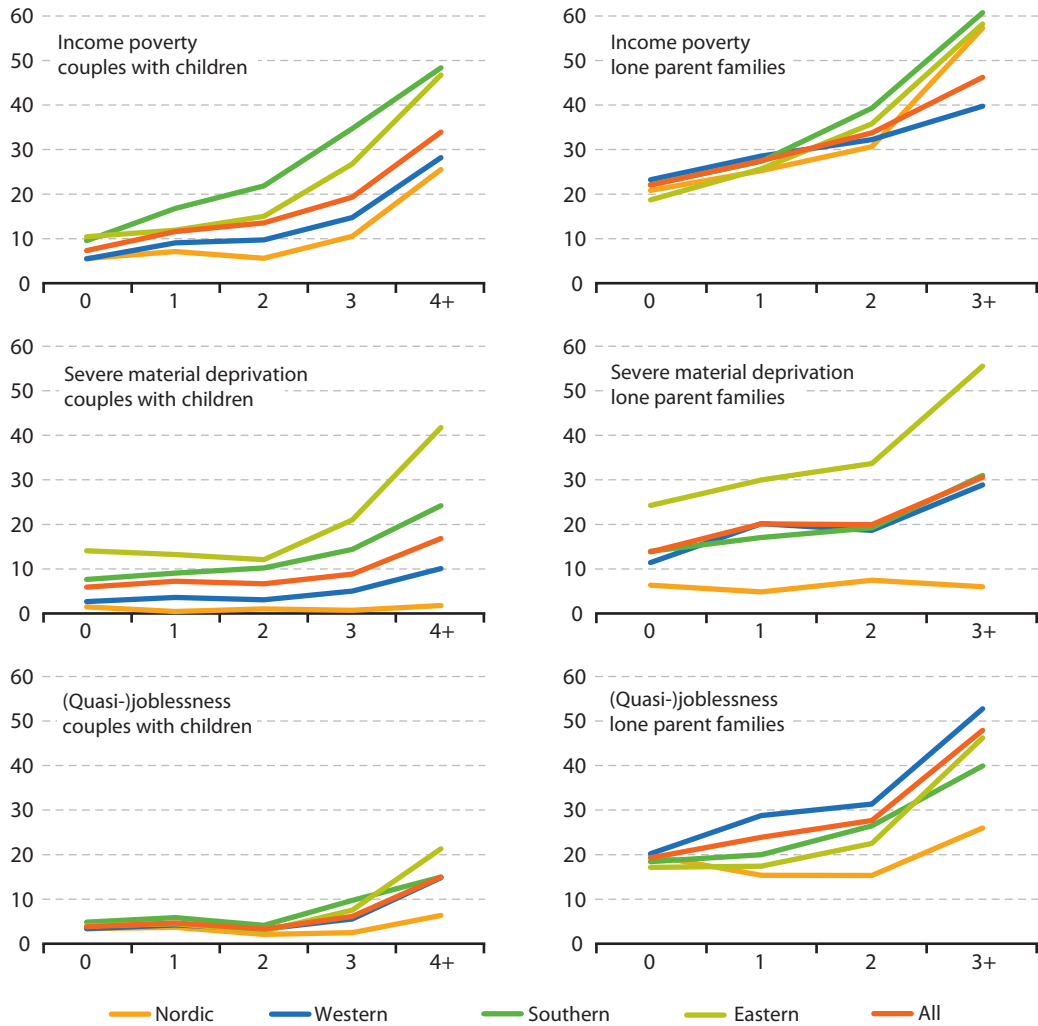
children; however, the risk is higher among larger families, at 15 % across the whole of Europe. There is little variation between regions for families with one or two children, but larger families in the Nordic countries have a lower probability of QJ, while those in Eastern Europe have a higher probability.

The risk of income poverty increases much more sharply with the number of children; across Europe, it increases from 14 % for couples with two children, to 34 % for couples with four or more children. This increase with the number of children is common across all regions, but is more marked in the Southern and (particularly) the Eastern countries, where poverty rates among couples with children are higher even among smaller families. Finally, we see that across Europe as a whole, the incidence of SMD across the number of children looks very similar to the incidence of QJ, albeit standing a couple of percentage points higher. However, the variation between regions is far higher than in the case of QJ: SMD rates among couples with children are extremely low in the Nordic countries for all family sizes; they are also low in the North/Western countries, rising to only 10 % for the largest families; but they are much higher in the Southern and Eastern countries, at almost 25 % and over 40 % respectively, for the largest families.

Among lone-parent families, the incidence of all three measures of disadvantage is higher than for couple families. The overall incidence of QJ increases from just under 25 % for lone parents with one child, to 48 % for lone parents with three or more children. QJ among lone parents is substantially higher in the North/Western countries than elsewhere; this, combined with the fact that lone parent families are more numerous in this cluster of countries than elsewhere in Europe, means that the North/Western cluster dominates the EU average. QJ among lone parents is lowest in the Nordic countries, standing at only 25 % even among lone parents with the largest families.

Income poverty also increases with the number of children in a lone parent family, rising from a little over 20 % for lone parents with one child, to over 45 % for lone parents with three or more children. Despite QJ being most common among lone parents in Western Europe, income poverty is less common among the largest lone-parent families in

**Figure 18.5: The three measures of AROPE, by number of children: couples with children (left-hand panel) and lone parent households (right-hand panel), 2012 (percentages of individuals)**



*Reading note:* The percentage of individuals at risk of poverty in the North-Western country cluster is 9 % in couples with one child, rising to 28 % in couples with four or more children.

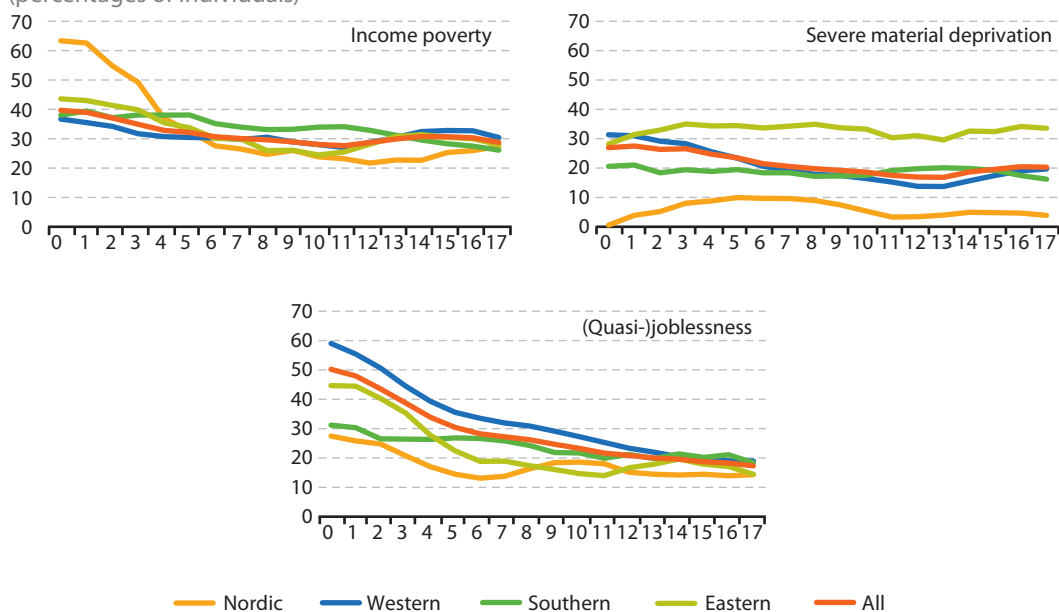
*Source:* Author's computation, UDB version 2012-2.

Western Europe than elsewhere: only 40 % of larger lone-parent families in Western Europe are poor, compared with around 60 % in all other regions. The greatest divergence among all the indicators is in the case of SMD: the rates are far higher in Eastern Europe, and far lower in the Nordic countries,

than they are in the other two country clusters. The Nordic cluster is notable in that not only are levels of SMD very low among lone parents, but they do not increase significantly with the number of children.

**Figure 18.6: AROPE, by the age of the youngest child: lone parent households, 2012**

(percentages of individuals)



*Reading note:* In lone-parent households, the incidence of income poverty in the Nordic countries is 63 % among individuals living in households where the youngest child is aged under 1.

*Source:* Author's computation, UDB version 2012-2.

### Variations by the age of the youngest child

We may expect the AROPE measures to vary according to the age of the youngest child in a family, on the grounds that mothers are more easily able to engage in paid work as their children grow up. In fact, for couples with children, there is very little effect: the profiles for all three AROPE measures vary hardly at all with the age of the youngest child. For the QJ measure, this may be because most couple families are not in a situation of (quasi-)joblessness even if the mother has no job; in the case of poverty, this argument may also be valid, in addition to which children load more heavily onto the family's equivalence scale when they turn 14, and the older is the youngest child in a family, the fewer children in total are still likely to be living at home.

For lone parent households, however (see Figure 18.6) the relationship is in the expected direction, with the risks of all three measures of disadvantage falling with the age of the youngest child. The reduc-

tion in the risk of QJ is particularly marked: across the EU-28 it falls from 50 % for mothers of the youngest children, to under 20 % for mothers with children aged 12 and over.

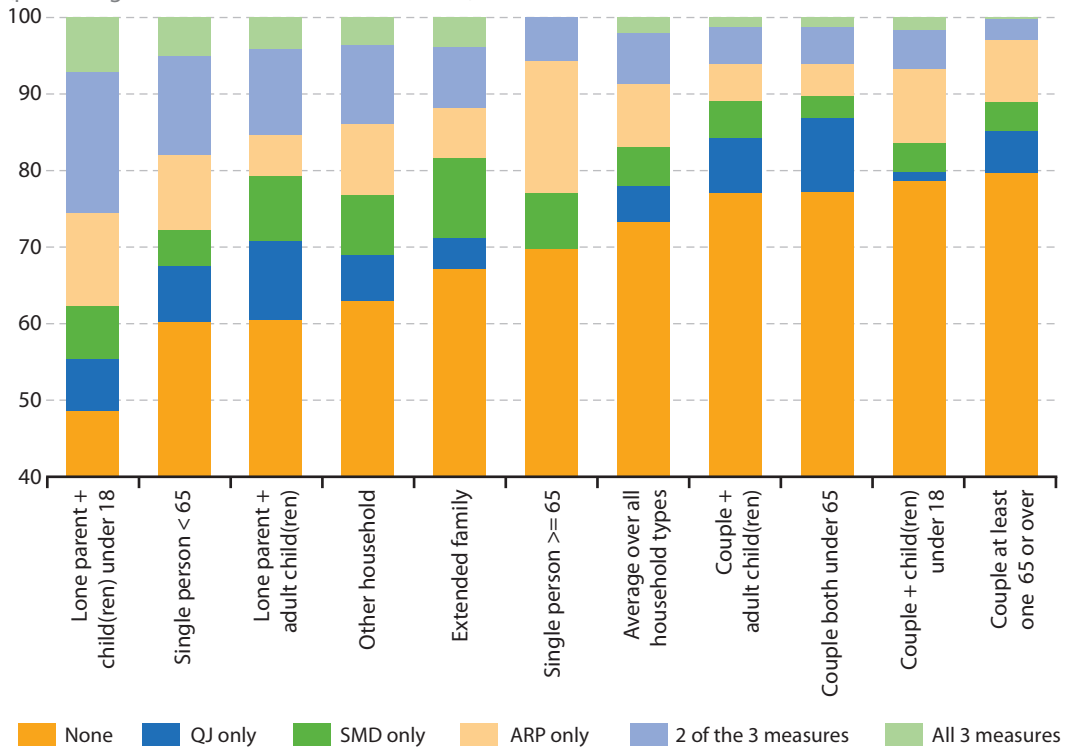
Among single-adult and couple households, the three measures of disadvantage tend to affect different groups, with poverty being concentrated among the young and QJ among the elderly. Among families with children, the three indicators tend to move together: families with more children tend to be at higher risk on all indicators, while lone-parent families with older children tend to have a lower risk on all three indicators, than those with younger children.

### 18.5.5 Multiple disadvantages

We have so far examined the three indicators of disadvantage separately; but it is, of course, possible to experience disadvantage on more than one dimension. Lelkes and Gasior (2012) examine the overlaps

**Figure 18.7: Single and multiple disadvantages, by household type, EU-28, 2012**

(percentages of households — stacked bars)



Reading note: Of lone-parent households with children under 18, 49 % report no disadvantage. 6.8 % report QJ only.

Source: Author's computation, UDB version 2012-2.

between the three AROPE indicators, finding the strongest links between poverty and QJ, and the weakest correlation between QJ and SMD. Figure 18.7 shows, for each household type, the percentage reporting hardship on combinations of indicators. In order for the QJ indicator to cover as many individuals as possible, the QJ\_64 indicator is used, and is extended to all those living in households where the QJ\_64 indicator is defined for any household member. For members of ineligible households, the QJ\_64 indicator is set to zero<sup>(156)</sup>. Over all household types, almost three quarters suffer no hardship on any of the indicators; this ranges from only 49 % of lone parents to 79 % of couples with children, and 80 % of couples over age 65 (note, though, that for

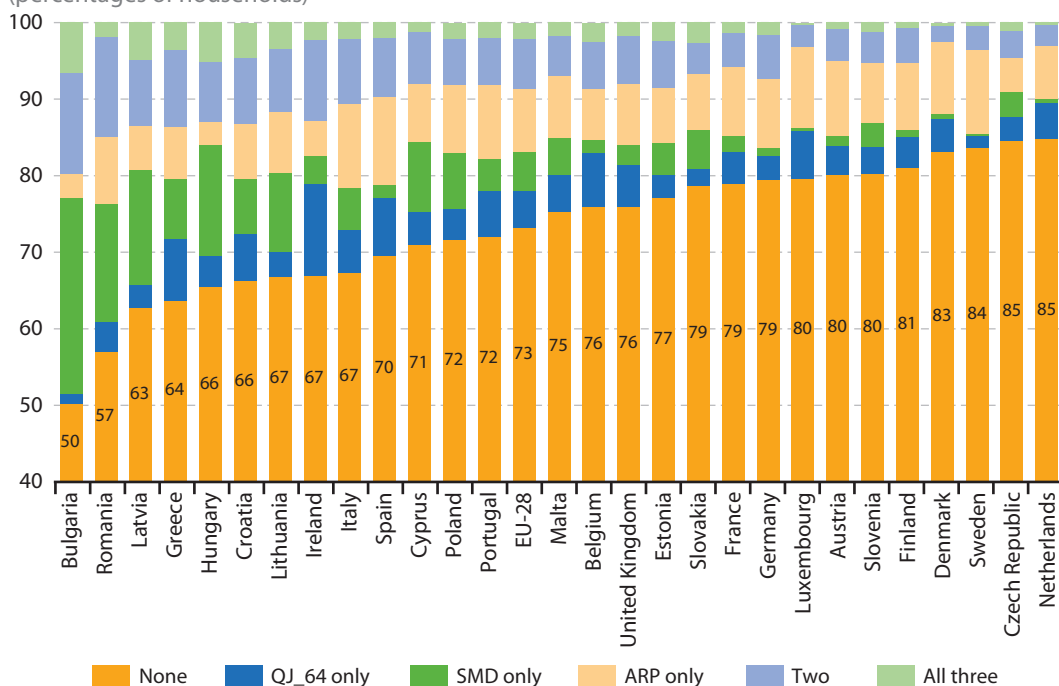
this latter category, the analysis may be complicated by the fact that the QJ indicator is only applicable to a minority of individuals). As well as being the least likely to suffer no hardship on any of the three indicators considered, lone parents with children are also the most likely of any household type to suffer hardship on all three indicators, and to suffer disadvantage on two of the three measures.

Figure 18.8 uses countries instead of household types as the unit of analysis. The percentage suffering none of the three hardships is highest in the Netherlands, the Czech Republic, Sweden, Denmark and Finland (all over 80 %). It is lowest in Bulgaria (at 50 %) followed by Romania and Latvia (57 % and 63 %). Bulgarians are also the most likely to suffer all three dimensions of hardship (6.6 %), the most likely to suffer on two of the three dimen-

<sup>(156)</sup> Another option would be to code the variable differently for households not covered by the QJ measure, but this would greatly complicate the presentation of results.

**Figure 18.8: Single and multiple disadvantages, by country, 2012**

(percentages of households)



Reading note: In Bulgaria, 50 % of households report no disadvantage on any of the dimensions; 1 % report QJ only.

Source: Author's computation, UDB version 2012-2.

sions (13 %), and by far the most likely to suffer SMD (25 %, in addition to those who have already been counted among those suffering from two or three deprivations).

In general, the percentages suffering on two or three dimensions of hardship are highest towards the left of the graph. Of those experiencing only a single dimension of hardship, more people suffer material hardship in the countries towards the left of the graph, where levels of hardship are generally higher, while more people suffer income poverty in the countries towards the right of the graph, where levels of hardship are generally lower. This broadly reflects the findings of Lelkes and Gasior, which was carried out using data from 2009, though some countries which have fared badly in the Great Recession, for example Greece and Spain, are by 2012 among the countries with the highest levels of disadvantage and multiple disadvantage.

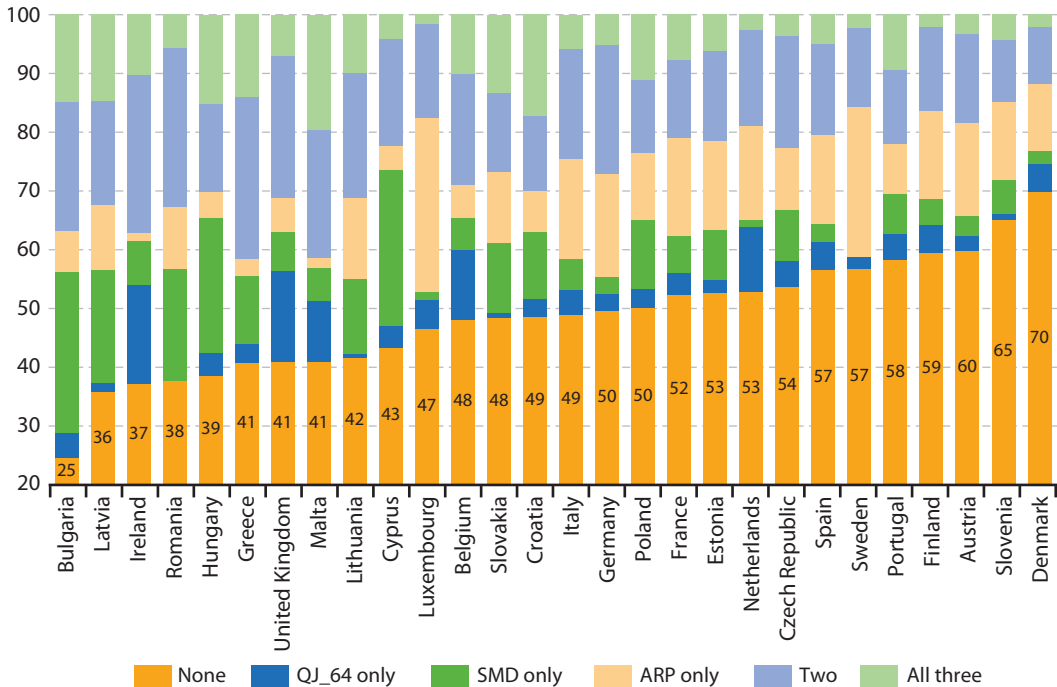
Figure 18.9 repeats this exercise for lone parents, showing that in general, in the countries where the risks of hardship are higher in general, this is also the case for lone parents, and vice versa. However, this is not universally true: Croatia has high levels of disadvantage among the population in general, but its lone parent families are only moderately disadvantaged, and indeed less disadvantaged than lone parents in Luxembourg, which is at the upper end of the distribution for the population in general.

### 18.5.6 The composition of the poor, severely deprived and QJ populations

The final analysis in this chapter relates to the composition of the three disadvantaged populations defined by the three measures considered in this chapter; the results in Figure 18.10 are analogous to those in Figure 4.3 of Chapter 4 of this volume.

**Figure 18.9: Single and multiple disadvantages, lone parents, by country, 2012**

(percentages of households)



*Reading note:* Of lone-parent households with children under 18, in Bulgaria, 25% of households experience none of the three deprivations considered, while 4% experience QJ only.

*Source:* Author's computation, UDB version 2012-2.

Figure 18.10 consists of four panels. The top left-hand panel shows household composition for the entire (weighted) sample. The top right-hand panel shows household composition for individuals living in households defined as income-poor (this information is also shown in Figure 4.3). The bottom left- and right-hand panels show household composition for individuals living in households defined as severely deprived, and as (quasi-)jobless (using the QJ\_64 measure defined earlier, in order to conform better to the household composition typology).

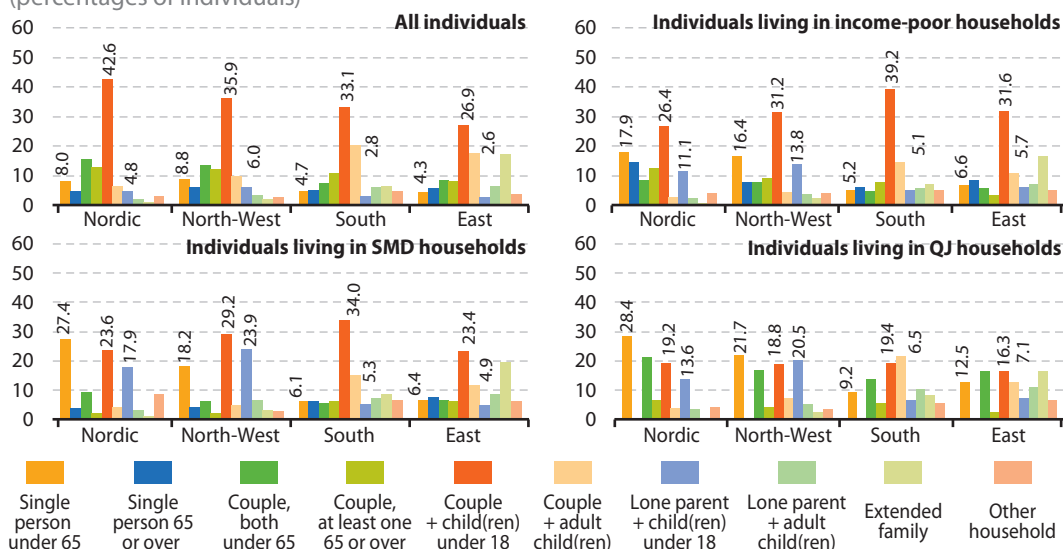
One difference between the QJ and the other two measures is immediately obvious, namely that the QJ measure is not defined for any households containing a single adult aged 65 or over. The QJ measure is also not comparable with the other measures for elderly couples, since it is defined for very few individuals living in such households. The QJ meas-

ure also behaves differently from the other measures in another respect: in all four country groups, non-elderly couples form a much higher proportion of the QJ population than of the general population, even though they form a very low proportion of the income-poor and severely deprived populations.

The explanation for this may be found in Figure 18.3 of this chapter, which noted an increase in the incidence of QJ in the mid-fifties and early sixties, which is not accompanied by an increase in the other two measures of disadvantage. The mean age of people living in QJ couples is over 55, compared to a mean age of under 47 for those in non-QJ couples. By contrast, there is little variation in age between couples defined as disadvantaged or not disadvantaged, on the other two indicators.

Other differences between the three indicators include the fact that couples with children form a far

**Figure 18.10: The distribution of household types among the whole sample, and individuals living in a) income-poor, b) severely deprived, and c) QJ households, 2012**  
(percentages of individuals)



NB: Percentages in each regional block add up to 100 %.

Reading note: In the North-Western countries, 6 % of all individuals live in a lone-parent household; 13.8 % of individuals living in income-poor households live in a lone-parent household; 23.9 % of individuals living in severely deprived households are part of a lone-parent household, and 20.5 % of individuals living in QJ\_64 households are part of a lone-parent household.

Source: Author's computation, UDB version 2012-2.

smaller proportion of people in QJ households than in the general population, or indeed in the other types of disadvantaged household. In the Northern and North/Western countries, couples with children form a smaller percentage of the income-poor and severely deprived population than of the general population, while in the Southern and Eastern countries, couples with children are more heavily represented in the poor population than in the general population. Aside from these differences, the three indicators move broadly in the same direction, with single adults under 65 and lone parents with dependent children being represented more highly among the disadvantaged populations than the general population. These two groups, together with couples living with dependent children, make up a large share of the income-poor, severely deprived and QJ populations (especially in the Nordic and the North-West regions); however, couples both under 65 are also important in the composition of the QJ population.

## 18.6 Conclusions

The analysis in this chapter has demonstrated that all three components of AROPE vary by household type, with lone parent households being at a substantially higher risk of disadvantage on all three components. As well as being at an elevated risk of hardship on all indicators separately, lone parents are also at the highest risk of suffering disadvantage on multiple dimensions. Single-person households are also at a relatively high risk of hardship, particularly income poverty, while couples, and couples living with their children, enjoy a relative degree of protection.

The incidence of disadvantage varies greatly within, as well as between, household types. In single-person and couple households, the three AROPE component indicators impact differently on different demographic groups, with income poverty being concentrated among the young, and (quasi-)joblessness being more common at

older ages. Among couples with children and lone parent households, by contrast, the indicators tend to move together, with all types of disadvantage more common among those with more children, and among lone parents with younger children.

One of the aims of this chapter was to assess the usefulness of the QJ indicator, which was adopted in 2010 as a target indicator in the Europe 2020 strategy. The fact that in some cases, the QJ indicator 'picks up' a very different demographic than either of the other AROPE indicators is not necessarily indicative of problems; after all, if all the indicators were highly correlated for all demographic groups, one or more of them would be redundant. Two distinct problems emerge with the QJ indicator. The first, as highlighted by Ponthieux in Chapter 16 of this volume, is that the indicator appears to be picking up some individuals who cannot in any sense be said to be poor or socially excluded; the finding in this chapter that QJ is particularly prevalent among couples in their late fifties, who have a very low incidence of hardship on the other indicators, supports this. The second issue which emerges in this chapter relates to the fact that many individuals are not covered by the QJ measure. This does not matter if the aim is simply to add individuals in QJ households to a headcount total of disadvantaged people in Europe, but it introduces difficulties in analysing hardship together with other socio-demographic indicators (such as household type), and it also means that indicators of multiple disadvantage are more difficult to analyse and interpret.

Extending the measure of QJ to those aged up to 64 years would improve matters somewhat from the analytical perspective, and would make the QJ measure line up better with social policy. However, this would not entirely solve the problem of incomplete coverage and of the anomalies which may as a result be inherent in the measure. It may be worth retaining QJ as a component of the headline AROPE indicator, if it can be shown convincingly that it is a good proxy for a degree of current distress which is not picked up by measures of income poverty or material deprivation, or that it is a good predictor of difficulties in the future which are not predicted by the other two measures. This should be a priority for research efforts over the remainder of the decade.

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# 19

## Nowcasting risk of poverty in the EU

Chrysa Leventi, Olga Rastrigina, Holly Sutherland and Jekaterina Navicke <sup>(157)</sup>

### 19.1 Introduction

The recent crisis has highlighted the importance of having timely and reliable data in order for policy-makers to be able to assess the impact of the economic downturn on poverty and income distribution (Atkinson, 2013; Stiglitz, 2012). In March 2010, the alleviation of income poverty became officially part of the EU's long-term strategy, by constituting one of the three components of the Europe 2020 target for the reduction of poverty and social exclusion (see Chapter 1 in this book for the definition of the target). Since that year EU-SILC has been used for monitoring the progress of Member States towards the achievement of these targets.

However, due to the complexity of micro-data collection and processing, relevant income data only become available after a considerable delay. For instance, micro-data from EU-SILC collected in year  $n$ ,

reporting incomes received in year  $n-1$ , is released in March in year  $n+2$  and Eurostat normally publishes indicators using these data about 6 months earlier. This results in the EU-SILC data being used predominantly for *ex post* analysis, which is not sufficient in the context of high public concern about growing income inequality. This perspective was given special impetus by the then President-elect of the European Commission Jean-Claude Juncker in his July 2014 statement to the European Parliament when he proposed that '... in the future, any support and reform programme [should go] not only through a fiscal sustainability assessment; but through a social impact assessment as well. The social effects of structural reforms need to be discussed in public.' <sup>(158)</sup>

The aim of this chapter is to present a microsimulation-based methodology for nowcasting changes in the distribution of income over a period for which EU-SILC statistics are not yet available, and assess the implications of these changes for the proportion of the population at risk of poverty (for a definition of this EU indicator, see Chapter 3 in this book). The term 'nowcasting' here refers to the estimation of current indicators using data on a past income distribution together with various other sources of information, such as macroeconomic statistics. This research builds on previous work on nowcasting indicators of poverty risk (Navicke et al., 2013; Navicke et al., 2013a; Rastrigina et al., 2015) <sup>(159)</sup>. It attempts to explain the rationale for embarking on such an exercise and illustrates its potential by

<sup>(157)</sup> Olga Rastrigina, Chrysa Leventi and Holly Sutherland are based at ISER, University of Essex. Jekaterina Navicke is based at Vilnius University, Faculty of Philosophy. The authors are grateful to Nuno Alves, Anthony B. Atkinson, Anne-Catherine Guio, Eric Marlier and Sophie Ponthieux for valuable comments and suggestions. We also wish to acknowledge the contribution of all past and current members of the EUROMOD consortium. The process of extending and updating EUROMOD is financially supported by the Directorate General for Employment, Social Affairs and Inclusion of the European Commission (Progress grant no. VS/2011/0445). This chapter uses EUROMOD version G2.0. For Germany, Estonia, Greece, France, Latvia, Lithuania, Poland, Portugal, Romania and Finland we make use of micro-data from EU-SILC made available by Eurostat under contract EU-SILC/2011/55 and contract EU-SILC/2011/32; for Spain and Austria we make use of the national EU-SILC data made available by respective national statistical offices. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [hollys@essex.ac.uk](mailto:hollys@essex.ac.uk).

<sup>(158)</sup> [http://ec.europa.eu/about/juncker-commission/docs/pg\\_en.pdf](http://ec.europa.eu/about/juncker-commission/docs/pg_en.pdf)

<sup>(159)</sup> In Rastrigina et al. (2015), very low work intensity (i.e. quasi-) joblessness) was also nowcasted. However, the nowcasting of this indicator falls outside the scope of this chapter.

presenting estimates of the direction and size of the change in the at-risk-of-poverty (AROP) indicator since the date of the most recently available official estimates <sup>(160)</sup>.

The analysis makes use of EUROMOD, the micro-simulation model based on EU-SILC data which estimates in a comparable way the effects of taxes and benefits on the income distribution in each of the EU Member States. For the purposes of the nowcasting exercise standard EUROMOD routines, such as simulating policies and updating market incomes, are enhanced with additional adjustments to the input data in order to capture changes in the employment characteristics of the population since the EU-SILC data were collected.

To illustrate the method it is applied to EU-SILC 2010 data (2009 incomes) and AROP rates are estimated up to 2013. The method is evaluated by comparing nowcast and Eurostat estimates for incomes in the period 2010 to 2012, when both are available. The twelve EU countries that are included in the analysis are Germany, Estonia, Greece, Spain, France, Latvia, Lithuania, Austria, Poland, Portugal, Romania and Finland. Over the period in question, these countries experienced divergent economic conditions: some of them have suffered a serious reduction in economic activity and employment, some have entered the path to recovery, and some have been affected relatively little.

The most important results can be summarised as follows. First of all, median incomes in 2013 are estimated to be significantly different (in the statistical sense) from their 2012 levels in all countries studied, with the exception of Spain and Austria. A substantial reduction in the median household disposable income is expected in Greece (-10 %), while in the Baltic countries, Poland and Romania median incomes are projected to grow by between 3 and 7 %. Moderate changes are predicted in Germany and Finland (+1 %) as well as in France and Portugal (-1 %).

Despite substantial changes in the median, the changes in the overall AROP rates are found to be small and non-significant in most countries. Only in Germany and Latvia the AROP rate is predict-

ed to fall (significantly at the 90 % level). Greece is the country where the rise in income poverty is predicted to be the highest (although statistically non-significant). Changes in the AROP rates by age group are more pronounced. The elderly seem to be significantly improving their relative position in terms of income in Spain, France, Austria and Finland. The opposite is the case in the remaining countries, except of Germany. Latvia is the only country where a significant reduction in child poverty is expected. On the other hand, child poverty is expected to rise in Austria. Income poverty in the working-age population is expected to decline in Latvia, Estonia and, to a lesser extent, Germany.

The structure of the chapter is the following: in Section 19.2 the nowcasting methodology is explained. Section 19.3 presents and discusses the predictions of the AROP rates. Section 19.4 reflects on the possible sources of divergence between the EUROMOD and Eurostat estimates for the period in which both are available. Finally, Section 19.5 concludes by summarising the most important findings and policy implications of this research.

## 19.2 Methodology

With an increasing demand for *ex ante* evaluation of the distributional and poverty impacts of policy reforms and broader economic developments, a number of different methodological approaches to estimate timely poverty and inequality indicators have been developed.

The methods based on econometric techniques (e.g. Isaacs and Healy, 2012; Monea and Sawhill, 2009) suggest using macro-level data, such as unemployment levels, aggregate social benefit receipt/expenditure, historical trends of poverty and GDP, as explanatory variables to predict income poverty in the US. In the European context where the standard at-risk-of-poverty threshold depends on median income, developments affecting the whole of the bottom half of the income distribution must be modelled so such methods are unlikely to give satisfactory results. More generally such econometric techniques do not allow the distinct effects of changes in income and household

<sup>(160)</sup> Note that the core analysis for this chapter was completed by January 2015. Hence, it does not include any Eurostat estimates published after that date.

circumstances at different points in the income distribution to be captured.

Microsimulation models have been widely used for assessing the distributional impact of current and future tax-benefit policy reforms, as well as the impact of the evolution of market incomes, changes in the labour market and in the demographic structure of the population <sup>(161)</sup>. Using microsimulation techniques based on representative household data enables changes in the distribution of market income to be distinguished and the effects of the tax-benefit system to be identified taking into account the complex ways in which these factors interact with each other (Peichl, 2008; Immervoll et al., 2006).

Combined macro-micro modelling has also been used for analysing the impact of macroeconomic policies and shocks on poverty and income distribution. A detailed review is provided in Bourguignon et al. (2008) and Essama-Nssah (2005). In these studies the construction of the necessary macro-level data is usually based on Computable General Equilibrium models. These data are then fed into a microsimulation model.

Several national statistical offices, such as the Czech, the Danish and the Portuguese, have also tested a range of techniques that have the potential of improving the timeliness of EU-SILC based poverty estimates. These include the usage of provisional income data (Šustová, 2014; Lauritsen and Quitzau, 2014) or the use of EU-SILC variables on current employees' earnings and self-defined current economic status combined with microsimulation techniques (Junqueira et al., 2014).

The nowcasting methodology presented in this chapter is based on microsimulation techniques used in combination with the latest macro-level statistics. It differs from other country-specific approaches as it aims to develop a generic approach that can be applied to all EU countries in a straightforward, flexible and transparent way. By doing so, it ensures the comparability and consistency of results both across countries and through time.

<sup>(161)</sup> Some examples include Brewer et al. (2013) for the UK, Keane et al. (2013) for Ireland, Brandolini et al. (2013) for Italy, Matsaganis and Leventi (2013) for Greece and Narayan and Sánchez-Páramo (2011) for Bangladesh, Mexico, Philippines and Poland.

The microsimulation model EUROMOD is used to simulate changes in the income distribution within the period of analysis. The main advantage of using EUROMOD is its capacity to estimate in a comparable way the effects of changes in taxes and benefits on income distribution for each of the EU Member States. Income elements simulated by the model include universal and targeted cash benefits, social insurance contributions and personal direct taxes. Income elements that cannot be simulated mostly concern benefits for which entitlement is based on previous contribution history (e.g. pensions) or unobserved characteristics (e.g. disability benefits). These are read from the data and adjusted for changes in average level over time. Detailed information on EUROMOD and its applications can be found in Sutherland and Figari (2013).

Changes in labour market characteristics are accounted for by explicitly simulating the transitions between labour market states (Figari et al., 2011; Fernandez Salgado et al., 2014; Avram et al., 2011). Individuals are selected for transitions based on their conditional probabilities of being employed rather than being unemployed or inactive. The dependent variable is derived from the self-defined current economic status reported in the EU-SILC data (PL031) <sup>(162)</sup>. A logit model is used for estimating probabilities for working age (16-64) individuals. In order to account for gender differences in the labour market situation, the model is estimated separately for men and women. Students, individuals with permanent disability or in retirement and mothers with children aged below 2 are excluded from the estimation, unless they report employment income in the underlying data. Explanatory variables include age, marital status, education level, country of birth, employment status of partner, unemployment spells of other household members, household size, number of children by age group, region of residence and urban (or rural) location. The exact specification of the logit model and the estimated coefficients are presented in Rastrigina et al. (2015).

The total number of simulated labour market transitions and their direction are determined by changes in employment observed in other availa-

<sup>(162)</sup> This variable is chosen because it is the most recent information on economic status available in EU-SILC.

ble data: the net changes in employment rates by age group, gender and education (a total of 18 strata) as shown in the Labour Force Survey (LFS) <sup>(163)</sup>. Macro level LFS statistics are used as the most up-to-date source of information on employment which is synchronised across the EU countries.

Changes from short-term to long-term unemployment are modelled based on a similar selection procedure using LFS figures on the share of long-term unemployment (12 months or more) in total unemployment <sup>(164)</sup>. This transition is critical due to its implications for eligibility and receipt of unemployment benefits. Transitions to and from inactivity are accounted for implicitly through restricting eligibility for unemployment benefits, according to the prevailing rules.

Labour market characteristics and sources of income are adjusted for those observations that are subject to transitions. In particular, employment and self-employment income is set to zero for individuals moving out of employment; for individuals moving into employment, earnings are imputed by setting them equal to the mean among those already employed within the same stratum.

After modelling employment transitions, the next step for nowcasting poverty indicators with EUROMOD involves two tasks: updating non-simulated income beyond the income data reference period and simulating tax and benefit policies. Updating incomes is carried out in EUROMOD using factors based on available administrative or survey statistics or forecasts (if other sources of information are not available). Specific updating factors are derived for each income source, reflecting the change in their average amount per recipient between the income data reference period and the target year.

All simulations are carried out on the basis of the tax-benefit rules in place on the 30th June of the given policy year. EUROMOD uses market incomes, labour market status, other individual and household characteristics, and the tax and benefit rules in order to simulate cash benefits, social insurance

<sup>(163)</sup> Eurostat web-database: codes *lfsa\_ergaed* and *lfsq\_ergaed*, employment rates by sex, age and highest level of education attained (%), annual and quarterly.

<sup>(164)</sup> Eurostat web-database: codes *lfsa\_upgan* and *lfsq\_upgal*, long-term unemployment (12 months or more) as a percentage of the total unemployment, by sex and age (%), annual and quarterly.

contributions and personal direct taxes. An effort has been made to address issues such as tax evasion and benefit non take-up in countries where these phenomena are known to be prevalent. However, such adjustments are not possible to implement in all countries due to data limitations <sup>(165)</sup>.

The last methodological step aims at accounting for differences between EUROMOD and EU-SILC estimates. AROP rates that are calculated using simulated incomes from EUROMOD may diverge from those calculated by Eurostat for the same income data reference year. The main reasons for this are related to precision of tax-benefit simulations when information in EU-SILC is limited, issues of benefit non take-up and tax evasion, small differences in income concepts, as well as the possibility that some income components are under-reported in EU-SILC (Figari et al., 2012; Jara and Leventi, 2014).

In order to account for these discrepancies, a calibration factor is calculated for each household which is equal to the absolute difference between the value of equivalised household disposable income in the 2010 EU-SILC (variable HX090) and the EUROMOD estimate for the same period and the same income concept. The calibration factors are applied to all later policy years. This is based on the assumption that the discrepancy between EUROMOD and EU-SILC estimates remains stable over time. Clearly, for any individual household this is not realistic but there is no obvious alternative approach that is both transparent and not arbitrary. It is likely that calibration will perform better if applied to countries or time periods with greater economic stability <sup>(166)</sup>.

## 19.3 The nowcast

We test the nowcasting methodology for twelve EU countries using the EU-SILC 2010 data (2009 incomes) as a starting point. We nowcast the AROP rates up to 2013 (i.e. what the EU-SILC 2014 will

<sup>(165)</sup> Detailed information on the scope of simulations, updating factors, non-take-up and tax evasion adjustments is documented in the EUROMOD Country Reports (see: <https://www.euromod.ac.uk/using-euromod/country-reports>).

<sup>(166)</sup> For more information on the calibration procedure, see Navicet et al. (2013a).

show once it becomes available). At the time of writing the latest available EU-SILC indicators available from Eurostat were for 2013, referring to 2012 incomes. Thus, in this illustrative exercise, the indicators are predicted 1 year ahead, referring to 2013 incomes. Using relatively old EU-SILC data for this exercise allows us to validate our method by comparing our estimates with actual EU-SILC estimates for a number of years. In principle it would be possible to apply the same methodology to the latest available EU-SILC micro-data to predict indicators 2 years ahead of the indicators available from Eurostat, i.e. to use EU-SILC data from year  $n$  (incomes for  $n-1$ ) to nowcast year  $n+2$  at a point in time when Eurostat is publishing estimates for incomes in year  $n$ , assuming that uprating factors, macro-level LFS statistics and simulated policies are available for the nowcasted year <sup>(167)</sup>.

Table 19.1 shows the nowcasted changes in equivalised household disposable income and AROP rates between income years 2012 and 2013. The table also reports initial levels for 2012 incomes based on EU-SILC 2013.

The reason for focusing on changes in indicators rather than their absolute values is mainly due to sampling and other errors that may lead to wide confidence intervals around point estimates of the AROP rates in EU-SILC (see Goedemé, 2010; Goedemé, 2013). Hence, the nowcasts of direction and scale of change are likely to be more reliable than the point estimates for each particular year. Using one dataset for microsimulation across all years, which is the case for the simulations in this chapter, involves a reduction in the standard errors due to covariance in the data (Goedemé et al., 2013). Changes in the value of indicators between 2012 and 2013 that are statistically significant, taking into account the covariance in the data, are marked in Table 19.1.

The results show that both mean and median incomes in 2013 are significantly different from their 2012 levels for the majority of countries. The exceptions are Spain and Austria where the changes in the median equivalised household disposable

income are very small and non-significant. A substantial reduction in the median income is expected in Greece (-10 %). The median income is also expected to decline slightly in France and Portugal (by 1 %). In the Baltic countries, as economies recover from the crisis, nominal median incomes seem to be growing fast: by between 4 and 7 %. Growth in median incomes is also predicted in Poland and Romania and, to lesser extent, in Germany and Finland.

On the other hand, changes in the total AROP rate are relatively small and not statistically significant in most countries. The only cases where the overall AROP rate in 2013 is found to be significantly different from its 2012 level are Germany and Latvia. In both countries relative poverty is expected to fall (by 0.1 and 0.6 percentage points respectively). The country where relative poverty is predicted to increase the most in this period is Greece, by almost 0.8 percentage points. However, this increase is not statistically significant.

Contrary to the overall AROP rates, the AROP rates by age group reveal important developments for certain population categories. The nowcasted estimates show that the changes in the poverty risk of elderly people are expected to be substantial in all countries except Germany. In the Baltic countries, as well as in Poland, Portugal and Romania, AROP rates among the elderly are predicted to rise. This finding suggests that, while the incomes of those close to the 60 % poverty line are generally keeping pace with growth at the median, this does not apply to pensions' indexation, as captured in EUROMOD. The gender differences in relative poverty observed in the three Baltic countries are also most likely to be related to the increased poverty rates observed among elderly women, especially widows. Relative poverty for those aged more than 65 is also expected to rise in Greece, despite the substantial drop in the median income. Worryingly enough, it seems that the welfare state is unable to compensate for people's losses and act as a safety net of last resort.

In Spain, Austria, Finland and France the elderly are expected to improve their relative position in terms of income. In Finland growth in wages was relatively slow, while pensions and some basic benefits were indexed favourably (in order to compensate for an

<sup>(167)</sup> For example, it should be possible to nowcast AROP rates for income year 2017 using EU-SILC 2015 (2014 incomes) when Eurostat is publishing estimates based on EU-SILC 2016 (2015 incomes).

**Table 19.1: Eurostat levels and nowcast change in mean income, median income and AROP rates, 2012-2013 income years**

(mean and median in euros per year, unless otherwise specified; nowcast change in mean and median income in percent; nowcast change in AROP in percentage points)

	Household income		At risk of poverty					
	Level and change in %		Rate and change in percentage points					
	Mean	Median	All	Male	Female	Children (<18)	Adults (18-64)	Elderly (65+)
<b>Germany</b>								
Eurostat level 2012	22 471	19 582	16.1	15.0	17.2	14.7	16.9	14.9
Nowcast change 2012-2013	1.2***	1.2***	-0.1*	-0.2*	-0.1	0.1	-0.3**	0.1
<b>Estonia</b>								
Eurostat level 2012	7 846	6 579	18.6	17.2	19.9	18.1	17.3	24.4
Nowcast change 2012-2013	6.5***	6.9***	0.0	-0.6**	0.6*	-0.5	-0.6**	2.9***
<b>Greece</b>								
Eurostat level 2012	9 303	8 371	23.1	22.4	23.8	28.8	24.1	15.1
Nowcast change 2012-2013	-10.1***	-10.0***	0.8	0.7	0.8	0.3	0.6	1.8**
<b>Spain</b>								
Eurostat level 2012	15 635	13 524	20.4	20.9	19.9	27.5	20.4	12.7
Nowcast change 2012-2013	-0.2*	-0.5	0.1	0.3	-0.1	0.1	0.4*	-1.3***
<b>France</b>								
Eurostat level 2012	24 773	20 954	13.7	13.0	14.3	18.0	13.6	8.7
Nowcast change 2012-2013	-2.3***	-1.0***	-0.1	0.1	-0.3	0.0	0.1	-1.3***
<b>Latvia</b>								
Eurostat level 2012	4 028	3 279	19.4	18.9	19.8	23.4	18.8	17.6
Nowcast change 2012-2013	4.2***	4.1***	-0.6†	-0.8*	-0.4	-1.4*	-1.0**	1.8***
<b>Lithuania (in LTL)</b>								
Eurostat level 2012	19 500	16 223	20.6	19.4	21.6	26.9	19.0	19.4
Nowcast change 2012-2013	4.5***	4.9***	0.4	0.1	0.6*	0.2	0.0	2.3***
<b>Austria</b>								
Eurostat level 2012	24 366	22 073	14.4	13.5	15.2	18.6	12.9	15.4
Nowcast change 2012-2013	0.7***	0.3	0.4	0.6*	0.2	0.8*	0.5*	-0.5†
<b>Poland (in PLN)</b>								
Eurostat level 2012	25 007	21 610	17.3	17.3	17.3	23.2	16.7	12.3
Nowcast change 2012-2013	5.8***	5.6***	0.2	0.2	0.2†	0.1	0.2†	0.4**
<b>Portugal</b>								
Eurostat level 2012	9 897	8 170	18.7	18.8	18.6	24.4	18.4	14.6
Nowcast change 2012-2013	-2.4***	-1.1*	0.2	0.3	0.2	0.4	0.1	0.7*
<b>Romania (in RON)</b>								
Eurostat level 2012	10 560	9 213	22.4	22.3	22.5	32.1	21.5	15.0
Nowcast change 2012-2013	4.5***	3.5***	-0.2	-0.1	-0.3	-0.5	-0.3	0.6***
<b>Finland</b>								
Eurostat level 2012	25 901	23 272	11.8	11.3	12.3	9.3	11.3	16.1
Nowcast change 2012-2013	1.1***	1.2***	-0.1	0.0	-0.1	0.4	0.0	-1.1***

NB: Eurostat levels for 2012 income reference period based on EU-SILC 2013. Estimated changes between 2012-2013 are statistically significant at the: † 90 % level, \* 95 % level, \*\* 99 % level, \*\*\* 99.9 % level. Significance is tested using the DASP module for Stata. Information on the sample design of EU-SILC 2010 is derived following Goedemé (2010) and using do files Svysset EU-SILC 2010 provided at: <http://timgoedeme.com/eu-silc-standard-errors/>. Only sampling error is taken into account.

Reading note: In 2012, mean household disposable income in Germany was 22 471 euros per year. Between 2012 and 2013 it is predicted to grow by 1.2 %. Overall AROP rate was 16.1 % in 2012 and it is expected to decline by 0.1 percentage points in 2013.

Source: Eurostat web-database, codes *ilc\_li02* and *ilc\_di03* (accessed on Jan 19, 2015), EUROMOD Version G2.0.



increase in VAT rate). In Spain small pensions (below 1 000 EUR) were indexed with a preferential rate in 2013. In France, the AROP rate among the elderly is falling, but in the context of a falling median. This does not seem to have an effect on the AROP rate for working age and children, suggesting that pensions are being maintained relative to other incomes.

Latvia is the only country where a significant reduction in child poverty is expected (by 1.37 percentage points). This is likely to be related to the introduction of a more generous childcare benefit and the removal of ceilings on parental leave benefits in 2013. In Austria, in contrast, child poverty is expected to rise (by 0.84 percentage points). A plausible explanation for this development is the fact that child-related benefit amounts have been kept nominally constant over this period, causing the

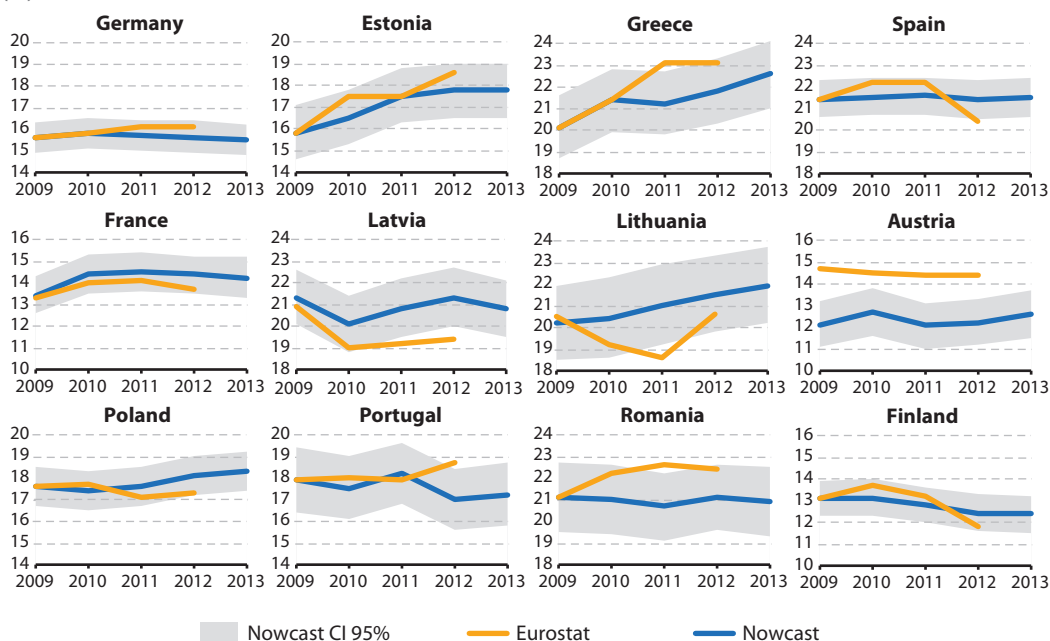
value of the benefits to erode both in real terms and relative to other incomes. Finally, income poverty in the working-age population is expected to decline in Latvia, Estonia and, to a lesser extent, Germany.

## 19.4 Discussion

The accuracy of the nowcasts depends on a number of factors. This section attempts to clarify these factors and describe the micro and macroeconomic developments that the nowcasting estimates are meant to capture.

Figure 19.1 presents the nowcasted AROP estimates for income years 2009-2013 together with the actual EU-SILC indicators for income years 2009-2012. It can be seen that in most cases the two estimates

**Figure 19.1: At-risk-of-poverty rates (threshold: 60 % of median): Eurostat and nowcasted estimates 2009-2012/2013 income years** (%)



NB: Nowcasted estimates are obtained using EUROMOD with employment adjustments and calibration. Eurostat series for Spain contain a structural break in 2012 income year. The vertical scale covers a range of 6 percentage points in all countries, starting from three different initial points: 10 %, 14 % and 18 %. Information on the sample design of EU-SILC 2010 is derived following Goedemé (2010) and using do files Svysset EU-SILC 2010 provided at: <http://timgoedeme.com/eu-silc-standard-errors/>. The 95 % confidence intervals are estimated using the DASP module for Stata.

Source: Eurostat web-database, code *ilc\_li02* (accessed on Jan 19, 2015), EUROMOD Version G2.0.

follow the same trends and fall within the boundaries of the nowcasted confidence intervals. In some countries where this is not the case (most notably in Latvia, Lithuania and Austria), the discrepancies are most likely to have been caused by backward revisions in the EU-SILC data. This is also the reason for the discrepancies between the nowcasted and the Eurostat level of AROP in 2009. These revisions were performed by the national statistical offices in order to smooth out the effects of the structural breaks that occurred in the data series. EUROMOD does not include such revisions as the input data are usually based on early releases of EU-SILC. In these cases the estimates show the evolution of income poverty had the breaks not occurred.

The method that we have adopted attempts to account for the transitions that are likely to explain a major part of changes in the income distribution over the period 2009-2013: into and out of employment, and from short-term to long-term unemployment. The total number of simulated labour market transitions in the (EU-SILC based) EUROMOD input data and their direction are determined by changes in employment as shown in the LFS. As noted in Rastrigina et al. (2015), employment dynamics do not always move in the same way over time in the LFS and EU-SILC. There are several reasons for the discrepancies between employment measures in the two surveys, such as differences in definitions, imputations, survey methodology, as well as operational differences that may affect the nature of non-response and sampling errors. The magnitude of changes differs significantly in the case of Greece and Spain, and is considered as one of the main reasons for the observed discrepancies between the nowcasted and the Eurostat AROP estimations. In the case of Germany, Estonia, Lithuania, Austria, Romania, and Finland employment dynamics in the two surveys move in a consistent way.

While changes in the labour market are carefully taken into account, no similar adjustments are made to account for demographic changes or changes in the composition of households. Usually such changes are less critical within a short-term time frame, as major shifts are unlikely to happen. However, in Latvia and Lithuania (where the recent financial crisis has led to large emigration flows) and in Greece and Spain (where the composition of households has

shifted towards the formation of larger households in order to share resources) the nowcast estimates have to be interpreted with caution.

Using a tax-benefit microsimulation model allows us to simulate the distributional effects of tax-benefit policy changes with a high degree of accuracy. And yet, for all the effort put into capturing as much detail as possible, aspects remain which may still be too simplified. For example, an important factor that needs to be captured in a detailed way is the change in the distribution of market income, especially earnings. During periods of crisis wages might follow different trends across regions, sectors, occupations, firms, etc. However, statistics on wage dynamics at such level of detail are usually not available or are available with a significant delay. This limits the potential to model changes in the distribution of market income in EUROMOD. Thus, there is a strong case for improving the level of detail and timeliness of macro-level statistics on the evolution of earnings, and for investing in the harmonisation of such statistics at the EU level.

Finally, for the purposes of nowcasting EUROMOD results are calibrated to better match the poverty estimates from EU-SILC. As already discussed, AROP rates that are calculated using simulated incomes may diverge from those calculated by Eurostat for reasons of precision of tax-benefit simulations, benefit non take-up and tax evasion, small differences in income concepts and definitions, under-reporting of income in EU-SILC, etc. (Figari et al., 2012; Jara and Leventi, 2014). Calibration factors are calculated for 2009 and are then applied to all later years based on the assumption that EUROMOD estimates for disposable income deviate from the equivalent EU-SILC estimates in a fixed way across time. This assumption does not necessarily hold for all households. However, in most cases the predicted *changes* in the AROP rates shown in Table 19.1 are not affected by the calibration procedure.

## 19.5 Conclusions

The aim of this chapter has been to illustrate how microsimulation can be used to estimate more timely indicators of income distribution for all EU countries in a comparable setting. As a demonstra-

tion of this method, AROP rates were estimated for 2009-2013 for a total of 12 EU countries. The performance of the method was assessed by comparing the predictions with actual EU-SILC indicators for the years for which the latter are available.

The microsimulation model EUROMOD was used to simulate direct tax and benefit policies in each country and year that is considered. Building on Navicke et al. (2013a) and Rastrigina et al. (2015), changes in the labour market were taken into account by simulating transitions between labour market states. A logit model was used for estimating probabilities for working age individuals in the EU-SILC based EUROMOD input data. The total number of individuals that were selected to go through transitions corresponds to the relative net change in employment levels by age group, gender and education as shown in the LFS macro-level statistics.

The most important nowcasted results can be summarised as follows. With the exception of Spain and Austria, both mean and median incomes in 2013 are significantly different (in the statistical sense) from their 2012 levels in all countries studied. Some of the highest increases in mean and median incomes are predicted for the three Baltic countries, Poland and Romania. For the Baltics, this development is mostly related to the return of the region to the path of economic growth. At the other extreme, the biggest reduction in the median income is expected in Greece (-10 %). Whereas changes in the total AROP rate are relatively small and not statistically significant in most of the countries, relative poverty rates by age group change considerably for certain population categories. Relative poverty for those aged more than 65 is expected to rise in the Baltic countries, Greece, Poland, Portugal and Romania and child poverty is expected to increase in Austria. These findings might serve as an indication for country and population-specific policy interventions.

The accuracy of predictions depends on the reliability of employment adjustments, the precision of tax-benefit policy simulations, and the comparability of external macroeconomic indicators to the actual trends observed in the EU-SILC data. While the first two are under the direct influence of the authors, the latter depends critically on the consistency of different sources of statistics within countries. Structural breaks in the EU-SILC data

series also affect the comparability of statistics. The existence of transparent documentation on the methodological changes in the EU-SILC data would contribute to a better understanding of the discrepancies observed between the nowcasted and EU-SILC results and would enhance the trustworthiness of the EU-SILC estimates.

There is scope to improve the nowcasting methodology by, e.g. experimenting with different ways of modelling employment changes: altering the underlying econometric model, selection logics and transition types. This is a further step that should be undertaken in combination with comprehensive validation of results in a wider range of countries, economic conditions and over a larger number of indicators.

Despite certain limitations, nowcasting the main income related poverty indicators has the potential to facilitate monitoring of the effects of the most recent changes in tax-benefit policies and macroeconomic conditions on poverty risk. Given the relevance of these issues to evidence-based policy-making, we believe that this approach constitutes a sound alternative to waiting until official statistics are made available and can provide valuable *ex ante* information on potential distributional effects of contemporary economic and policy-related developments.

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# Dynamics of poverty and social exclusion







# 20

## Evolution of material deprivation over time: the impact of the great recession in EU countries

Anne-Catherine Guio, Eric Marlier and Marco Pomati <sup>(168)</sup>

### 20.1 Introduction

The EU portfolio of social indicators includes material deprivation (MD) measures <sup>(169)</sup> which have been endorsed by EU Member States and the European Commission as a response to the need to complement EU income poverty and social exclusion indicators with indicators that better reflect differences in actual standards of living across the EU. Based on the limited information available from EU-SILC and building on the work by Guio (2009), the ‘standard’ EU MD rate is currently defined as the proportion of people living in households who cannot afford at least three out of nine items. (See Chapter 10 in this book for a presentation of these items and a discussion of their robustness; see also Guio et al. (2012) for more elaborate discussion and analysis.)

The importance of EU MD indicators has grown considerably since 2010, when EU leaders launched

the Europe 2020 strategy and set in this context an EU social inclusion target (see Chapter 1 in this book for a short presentation of the target). Indeed, one of the three indicators this target is based on is a measure of ‘severe’ MD (SMD), which is built exactly in the same way as the EU ‘standard’ measure agreed in 2009 but with a threshold set at four rather than three *enforced* lacks (for the concept of ‘enforced lack’, see Chapter 10). The two other indicators used in the EU target are the standard EU indicator of income poverty (AROP) and the EU measure of (quasi-)joblessness.

The Great Recession in 2007-2008 had a dramatic impact on the living conditions of EU citizens. The total number of people at risk of poverty or social exclusion in the EU-27 decreased by around 10.4 million between 2005 and 2009 and then increased by 8 million between 2009 and 2012. During the same periods, the changes in the level of severe MD were even more impressive: first a decrease by 12.2 million between 2005 and 2009 due to general living conditions improvements (mainly in Eastern countries) and then an increase by 8.7 million between 2009 and 2012 as a result of the economic and financial crisis. (See Chapter 1 in this book (Figure 1.1) for these and also more recent data that were not available at the time of writing the present chapter.)

The key objective of this chapter is to analyse the evolution of MD over time across the EU and to explore the impact of the Great Recession on this

<sup>(168)</sup> Anne-Catherine Guio and Eric Marlier are from LISER (Luxembourg) and Marco Pomati from Cardiff University (UK). This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. We would thank Anthony B. Atkinson, Björn Halleröd, Céline Thévenot, Guillaume Osier, Paola Serafino and Richard Tonkin for fruitful discussions and interesting comments. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. Email address for correspondence: [anne-catherine.guio@liser.lu](mailto:anne-catherine.guio@liser.lu).

<sup>(169)</sup> On the EU portfolio of social indicators used by Member States and the European Commission for monitoring progress towards the EU social protection and social inclusion objectives, see Chapter 1 of this volume. And on the use of EU social indicators as well as the methodological EU framework under which these are developed, see: Atkinson et al. (2002), Marlier et al. (2007) and Social Protection Committee (2015).

evolution. Both the cross-sectional and longitudinal EU-SILC data are used. The chapter looks at the changes in national trajectories of MD (before and during/after the Recession) — considering in turn incidence, severity and persistence aspects. To better capture the dynamics of MD, it analyses the national flows of people entering into/exiting from MD each year. Finally, it also explores the impact of different ‘trigger events’ as well as individual and household characteristics on entry rates into MD.

## 20.2 National trends in incidence and severity of material deprivation

The overall EU evolution hides a large diversity of national evolution of living conditions — as illustrated in Figure 20.1, which presents the 2005-2012 evolution of the standard MD measure (i.e. people lacking at least three items out of the nine items considered) in the EU-27 Member States. In this figure, countries are grouped into four clusters according to the (broad) shape of their MD trend:

1. The first cluster consists of four Central/Eastern countries, national MD rates decrease during the whole period, quite sharply in Poland and Slovakia, and more smoothly in Romania and the Czech Republic.
2. The second cluster includes six Eastern/Southern countries, with MD rates that decrease sharply before the crisis and then increase, sometimes quite dramatically, with the crisis (Estonia, Cyprus, Latvia, Lithuania and to a lesser extent Bulgaria and Hungary).
3. The third cluster includes ten countries; all of them are ‘old’ Member States except for Slovenia. The general trends are relatively flat. Although there may have been annual changes, there are no clear increase/decrease during the whole period. All these countries have low MD rates.
4. The seven countries in the fourth cluster witness relatively flat trends in the pre-crisis period,

but MD rates increase sharply with the crisis. Except for Malta, these countries are ‘old’ Member States, whose living standards decreased dramatically as a result of the crisis (Ireland, Greece, Spain, Italy, Portugal, United Kingdom).

The MD indicator presented in Figure 20.1 provides very useful evidence on the incidence of MD but does not inform on its severity. One way of capturing the severity of MD is to look at the proportion of people severely deprived (i.e. those lacking at least four items (SMD)) among those deprived (i.e. those lacking at least three items) <sup>(170)</sup>.

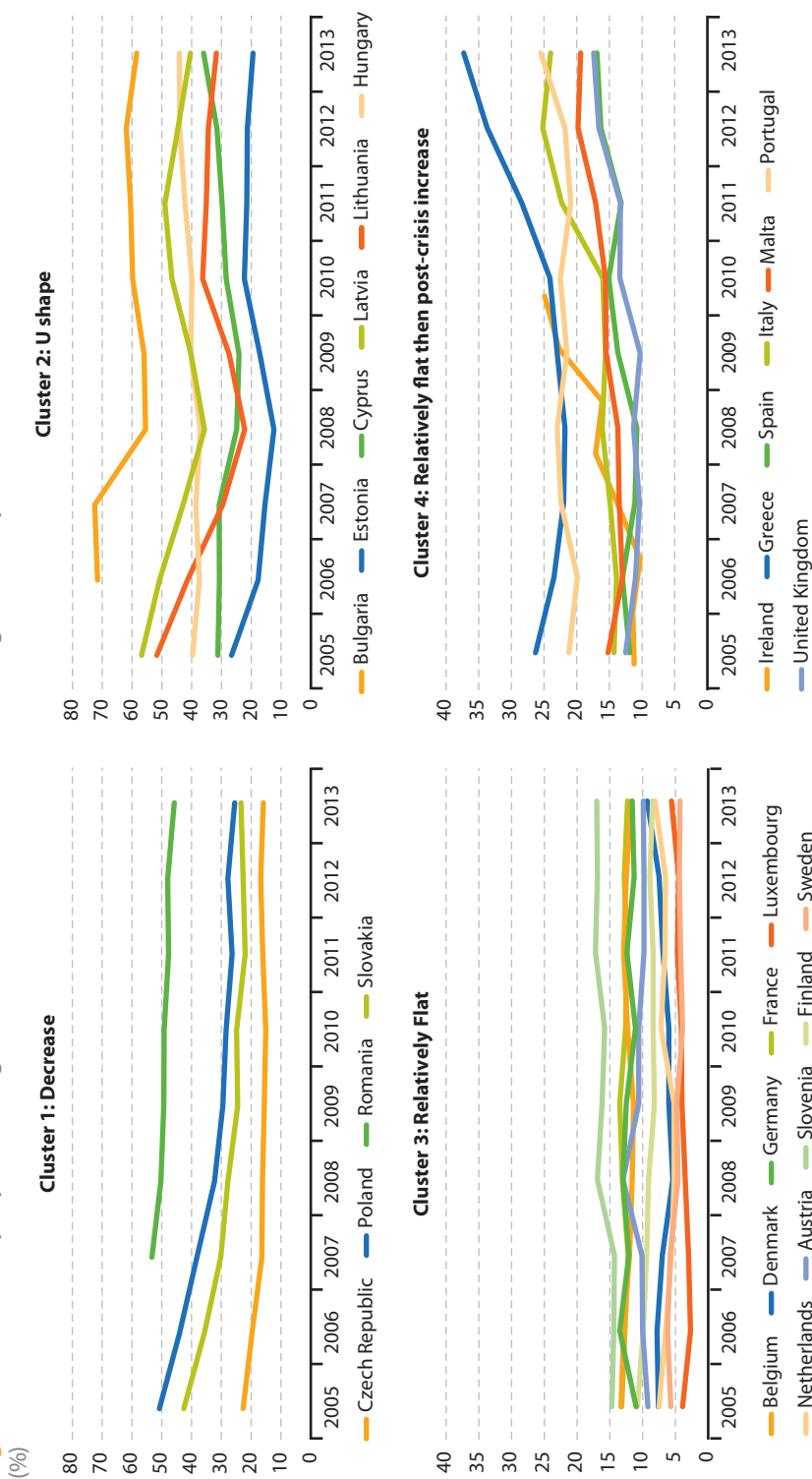
Figures 20.2a and 20.2b decompose each national trend into the trend in the proportion of people lacking at least four items (SMD) and the changes in the proportion of people lacking exactly three items. As can be seen from these numbers, during the 2005-2008 period, in five out of the nine countries where MD decreases by at least 4 percentage points (Lithuania, Latvia, Poland, Slovakia, Czech Republic), this trend is mainly driven by a decrease in SMD. In Estonia, the trend is driven equally by a decrease in SMD and in the proportion of those experiencing exactly three deprivations. In Hungary, the proportion of people suffering from SMD decreases whereas that of those suffering from exactly three deprivation items increases.

In the 2008-2013 period, in countries where MD increases dramatically, both the proportion of SMD and that of people lacking exactly three items increase — except (again) in Hungary (where SMD increases sharply whereas the percentage of people lacking exactly three items decreases slightly) and in Latvia (and to a lesser extent Malta) where the percentage of people lacking exactly three items did not change. In many countries (Bulgaria, United Kingdom, Latvia, Italy, Malta, Cyprus, Hungary and Greece), the severity of deprivation increases: SMD increases more than the proportion of people suffering from three deprivations.

In this section, we looked at MD incidence and severity at one point in time, making use of EU-SILC cross-sectional data. The next section introduces dynamic analyses, taking advantage of the longitudinal component of EU-SILC.

<sup>(170)</sup> See also Calvert and Nolan (2012).

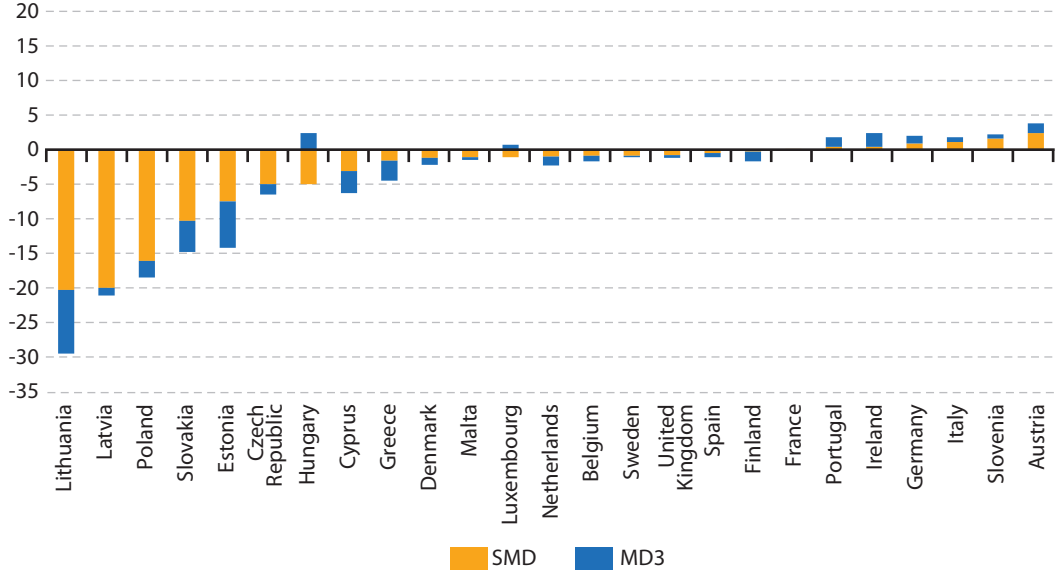
**Figure 20.1:** Shares of people suffering from MD, countries clustered according to the shape of their MD trend, 2005-2013



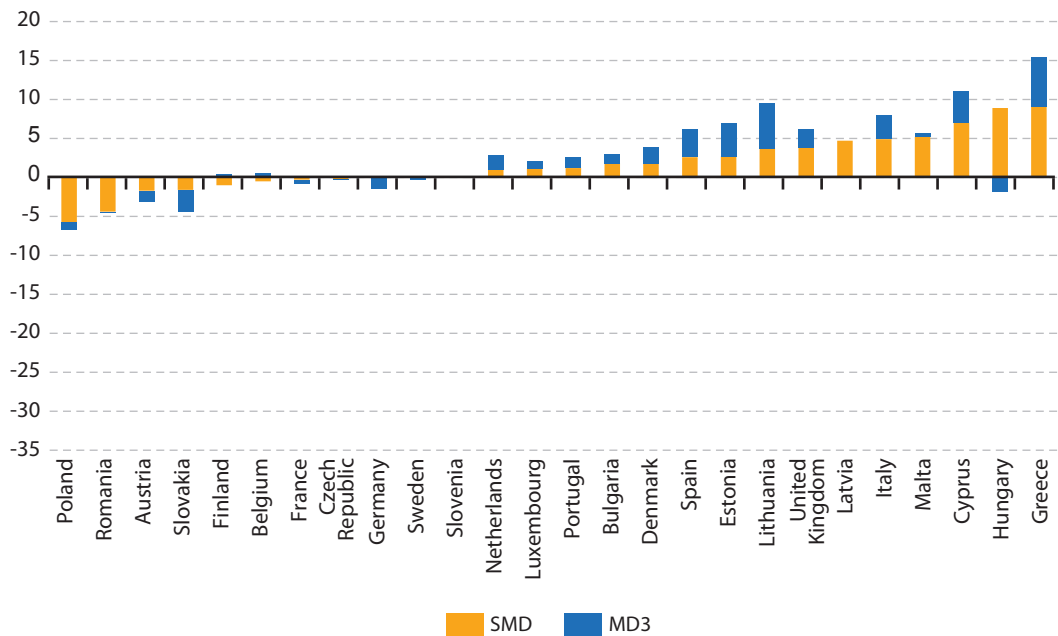
*NB:* Break in series in Bulgaria (2008), Estonia (2008), Spain (2009), Cyprus (2008), Lithuania (2008), Latvia (2008), Luxembourg (2008), Slovenia (2008), Austria (2008), Poland (2008) and the United Kingdom (2012). No data available for Bulgaria in 2005, for Romania in 2005 and 2006 and for Ireland in 2013. Important: The Y-axis scale range for countries with large changes in rates (clusters 1 and 2) is twice the scale range for countries with small changes in rates (clusters 3 and 4).  
*Reading note:* In Slovakia (top-left pane), the MD rate attained 42.6 % in 2005 and decreased by around 20 percentage points between 2005 and 2013 (23.4 % in 2013).  
 Source: Eurostat web-database, code *ilc\_sip8*.

**Figure 20.2:** Change in national MD levels, decomposed in variation of proportion of people severely deprived and of proportion of people lacking exactly 3 items, 2005-2008 and 2008-2013 (percentage points)

a) 2005-2008



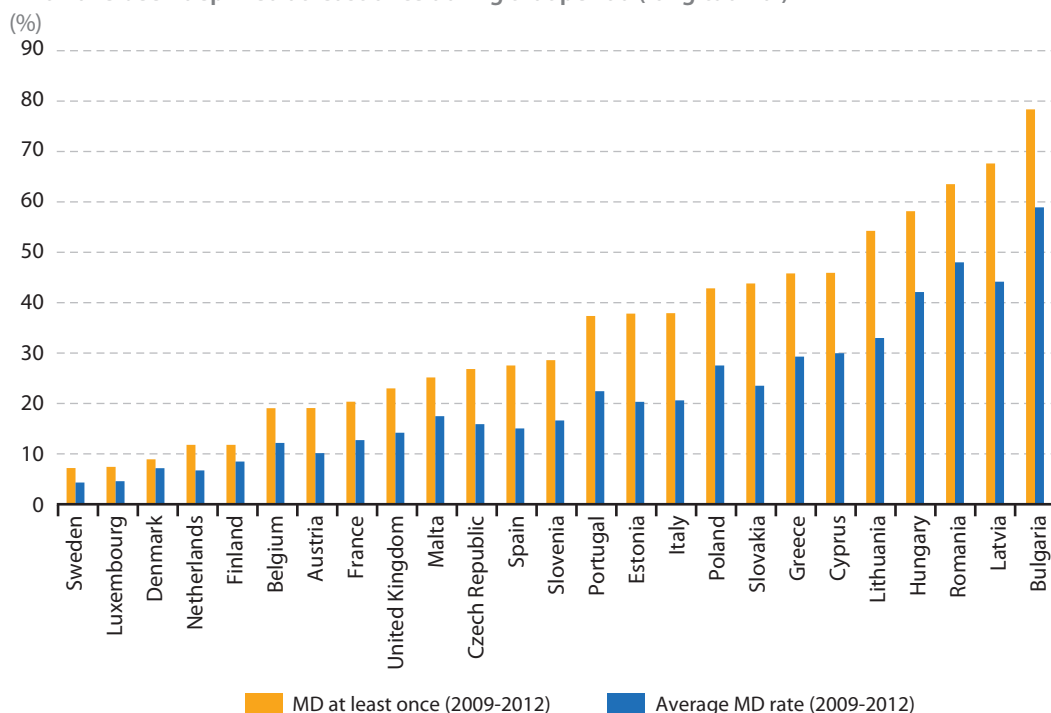
b) 2008-2013



*Reading note:* In 2005-2008, the MD rate in Latvia decreased by 21.1 percentage points (pp) which can be split into a decrease in severe MD by 19.9 pp. and a decrease in exactly three deprivation items by 1.2 pp.

*Source:* Eurostat web-database, code *ilc\_sip8*. No data for Bulgaria and Romania in 2005.

**Figure 20.3: Average (standard) MD rate in 2009-2012 (cross-sectional) and proportion of people who have been deprived at least once during that period (longitudinal)**



NB: No data for Ireland and Germany. In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database.

Reading note: In Latvia, the average MD rate during the period 2009-2012 is 44 % (EU-SILC cross-sectional dataset). During the same period, the proportion of people who were deprived at least once reaches 68 %, i.e. around 50 % more (EU-SILC longitudinal dataset).

Source: Authors' computation, UDB September 2014.

## 20.3 Dynamic analysis of material deprivation

### 20.3.1 Stock versus flux

Material deprivation is not a static phenomenon. Some people are persistently deprived whereas others suffer from transient/ recurrent MD episode(s). In this section, we start by analysing MD on the basis of the most recent EU-SILC longitudinal data available at the time of writing, i.e. the 2009-2012 Waves. We look at people who have been deprived at least once during these 4 years and those who have been 'persistently deprived' throughout the period. For the latter, we use the same concept as the one used at EU level for the indicator of at-persistent-risk-of-poverty, i.e. people persistently deprived are people living in

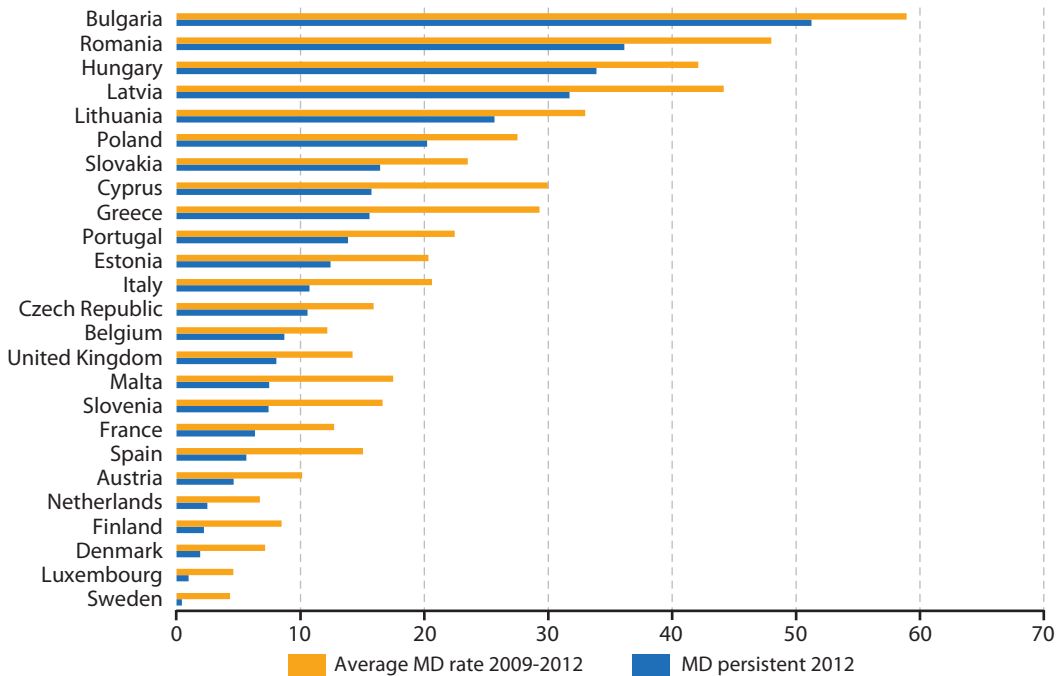
households that are deprived in year  $N$  as well as in at least 2 out of the preceding 3 years ( $N-1$ ,  $N-2$  and  $N-3$ ). Figure 20.3 compares for each Member State the average proportion of people deprived during the period 2009-2012 and the share of people deprived at least once during this period. On average, the latter is 1.6 times the former.

Among these people who were deprived at least once during the period 2009-2012, some went through a transient episode of MD whereas others were 'recurrently' deprived or 'persistently' deprived (see for example Muffels et al. (1999)). These different situations can have different consequences on people's lives.

Figure 20.4 presents for each EU country the proportion of people persistently deprived in 2012, and compares this proportion with the average

**Figure 20.4: Average MD rate in 2009-2012 (cross-sectional) and proportion of people who have been persistently deprived during that period (longitudinal)**

(%)



NB: People persistently deprived are people living in households who are deprived in 2012 and also in at least two of the three preceding years (2009-2011). In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database. No data for Ireland and Germany.

Reading note: In Bulgaria, the average MD rate during the period 2009-2012 is 59 % (EU-SILC cross-sectional dataset). During the same period, the proportion of people who are persistently deprived is 51 % (EU-SILC longitudinal dataset).

Source: Authors' computation, UDB September 2014.

cross-sectional MD rate (2009-2012). Both series are strongly correlated (correlation coefficient of 0.98) <sup>(171)</sup>. Table 20.1 presents the confidence intervals of the persistent MD rate (2009-2012). (For a discussion of the precision and reliability of the persistent poverty indicator, see Chapter 22 in this book.)

As in Jenkins and Van Kerm (2014) for income poverty, we find a quasi-linear relationship between the persistent MD indicator and the current MD

<sup>(171)</sup> It is important to keep in mind that the MD rate computed on the basis of the EU-SILC cross-sectional dataset differs from the one calculated from the EU-SILC longitudinal dataset. The degree of divergence between these two rates varies between countries and between years. Figures on the degree of divergence are available on demand. See also Glaser et al. (2015) for a discussion of the coherence between longitudinal and cross-sectional poverty rate.

indicator. Furthermore, we find that the level of persistent MD is proportionally higher in highly deprived countries. This means that countries with higher MD level also tend to suffer from a proportionally higher level of persistent MD (see Figure 20.5). However, this relation varies between countries. So, for example, with similar levels of MD, the share of persistently deprived among those deprived is much higher in Slovakia than in Estonia, Malta or Italy, higher in Netherlands than in Denmark, in Luxembourg than in Sweden, in Belgium than in France, etc. To better understand the relationship between annual and persistent MD levels and what has been the impact of the crisis on these indicators, we need to look at the transitions between years, i.e. the probability of entering into or exiting from MD.

**Table 20.1: Confidence interval of the MD persistent rate, 2012**  
 (%)

	Belgium	Bulgaria	Czech Republic	Denmark	Estonia	Greece	Spain	Italy	Finland	Hungary	Italy
Persistent MD rate	8.7	51.2	10.6	0.9	12.4	15.6	5.6	10.7	2.2	33.9	10.7
Lower bound	6.2	47.3	8.4	0.2	9.8	12.8	4.3	8.7	1	30.9	8.7
Upper bound	11.2	55.1	12.8	1.6	15	18.4	6.9	12.7	3.4	36.9	12.7
	Cyprus	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Austria	Poland	Portugal	Slovenia	United Kingdom
Persistent MD rate	15.7	31.7	25.7	1	7.6	2.5	4.6	20.2	14	7.4	8.1
Lower bound	11.9	28.3	22	0.6	5.5	1.3	3	17.9	11	6.1	6
Upper bound	19.5	35.1	29.4	1.4	9.7	3.7	6.2	22.5	17	8.7	10.2

*NB:* No data for Germany, Ireland, Romania, Sweden and Slovakia. The confidence intervals have been computed following the ultimate cluster approach (see Chapter 26 in this book), with the very kind statistical guidance of Guillaume Osier.

*Reading note:* In Belgium, the persistent MD rate in 2012 attains 8.7 %; the value of the true estimate is between 6.2 % and 11.2 %, with a probability of 95 %.

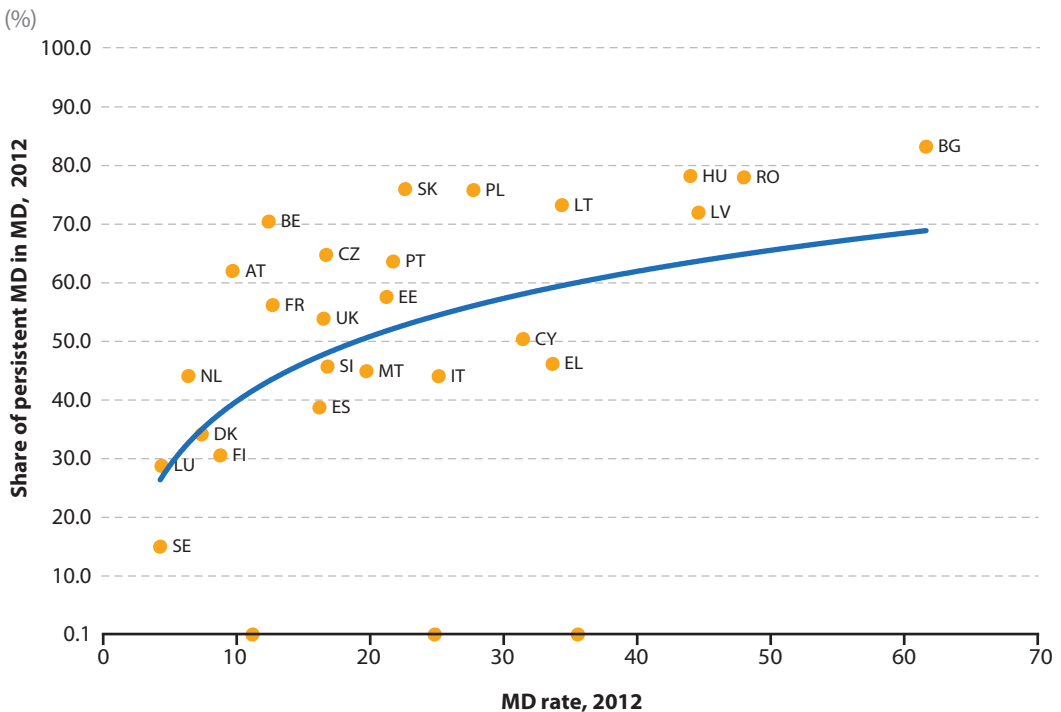
*Source:* Authors' computation, UDB September 2014.

### 20.3.2 Entry rates into MD and exit rates from MD

To better capture the dynamics of MD, we now look at the flow of people entering into/exiting from MD each year during the period considered (2009-2012). Exit rates are defined as the proportion of people not deprived in year  $N$  among those who were deprived in year  $N-1$ ; and entry rates are defined as the proportion of people deprived in year  $N$  among those not deprived in year  $N-1$ . Figure 20.6 presents the average entry rates and exit rates for the EU countries available in the Septem-

ber 2014 EU-SILC UDB (all 28 Member States except Germany, Ireland and Croatia), for the pooled national data covering the period 2009-2012; countries are grouped according to their level of MD. On average for the EU-27 as a whole, during this period, 6.7 % of people not deprived in one year fall into MD the following year whereas 33.6 % of those suffering from MD manage to escape from MD. Exit and entry rates are negatively correlated (0.7), meaning that countries with high entry rates tend to have low exit rates, but this association varies substantially between countries, as highlighted in Figure 20.6. (See Chapter 23 in this book for a similar analysis of income poverty.)

**Figure 20.5: MD rate in 2012 (cross-sectional) and share of people persistently deprived (2009-2012) among those deprived in 2012 (longitudinal)**



NB: See Figure 20.4. The 2012 share of persistent MD in MD is the ratio between the percentage of people persistently deprived during the period 2009-2012 and the MD rate computed on the basis of the EU-SILC longitudinal dataset (2012).

Reading note: In the United Kingdom, the MD rate is 17 % and the share of persistent MD in MD is 54 %.

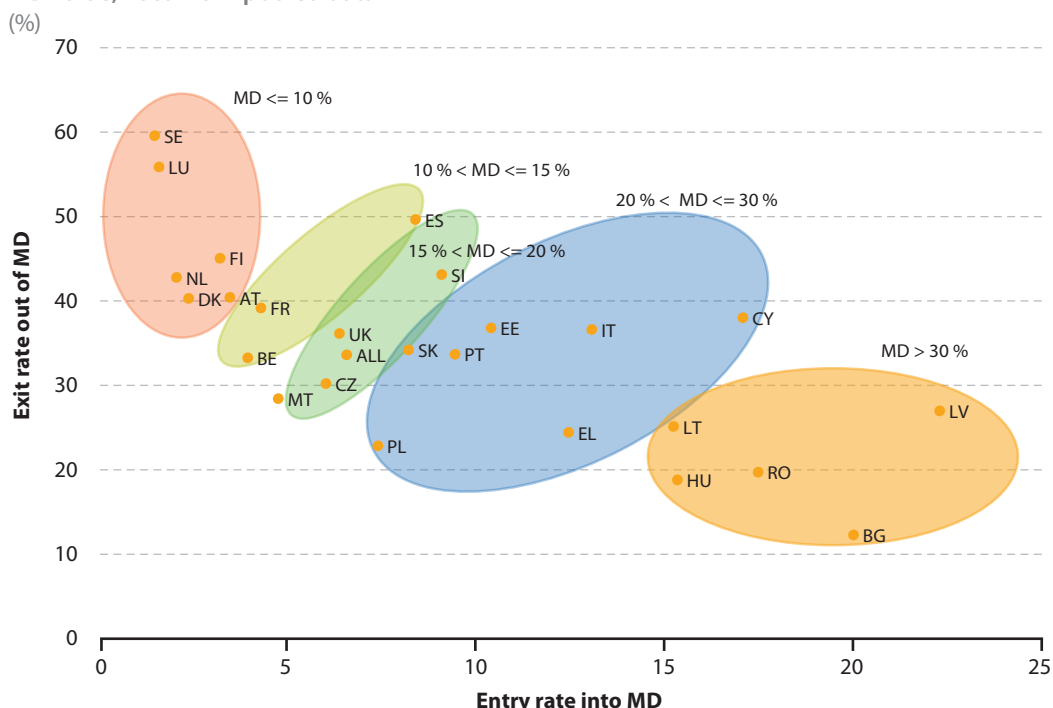
Source: Authors' computation, UDB September 2014.

Figure 20.7 clearly shows the negative correlation between the average exit rates (2009-2012) and the shares of persistent MD in MD (2012). Figure 20.8 shows the positive relationship between the average entry rate (2009-2012) and the average cross-sectional MD rate computed for the same period. As shown previously in Figure 20.5, Bulgaria, Latvia, Romania and Hungary combine very high average MD rates and shares of persistent MD in MD. Figures 20.7 and 20.8 show that this is due to a very high proportion of people falling into MD combined with a very low probability of escaping this situation for those suffering from MD. Lithuania and Poland are in the same group as these four countries in Figure 20.7 (very low exit rates and

very high shares of persistent MD in MD). When comparing Lithuania and Latvia, the difference in MD rates between the two countries is explained by the lower entry rate in Lithuania, whereas exit rates are similar. Poland is in an intermediate situation, with very low exit rates and 'medium' entry rates, leading to very high share of persistent MD in MD but only 'relatively high' average MD rates. If we now compare Cyprus with France, the United Kingdom, Italy and Estonia, we see that exit rates are relatively high in these five countries (Figure 20.7). But the much higher entry rate in Cyprus (higher than in Lithuania) leads to a much higher average MD rate in this country compared with France, United Kingdom, Italy and Estonia.



**Figure 20.6:** Rates of entry into and exit from MD, countries grouped according to the average MD value, 2009-2012 pooled data



*NB:* In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database. No data for Ireland and Germany. Countries are grouped according to their level of MD.

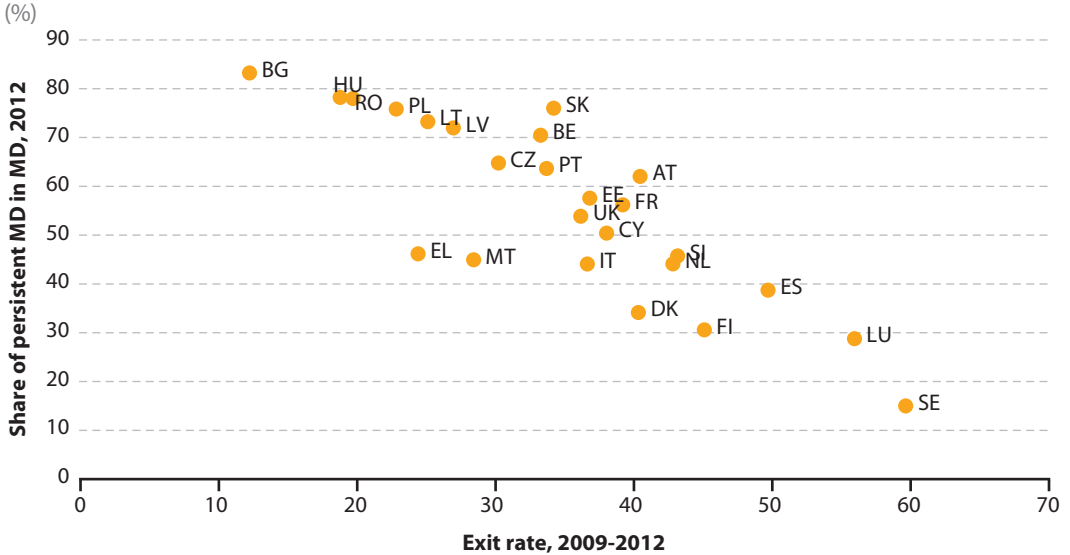
*Reading note:* In Bulgaria, the entry rate attains almost 20% and the exit rate 12%. With an average MD rate close to 60% (see Figure 20.4), Bulgaria is in the group of countries with the highest level of MD (together with Hungary, Romania, Lithuania and Latvia).

*Source:* Authors' computation, UDB September 2014.

This provides concrete examples of the added value of panel data — by looking at both entry into/exit from MD, they allow for a better understanding of national differences in the levels of annual MD and persistent MD; and can explain in particular why countries with similar annual MD rates can have different persistent MD rates.

Let us now explore further the entry/exit dynamics, by looking at their evolution over time.

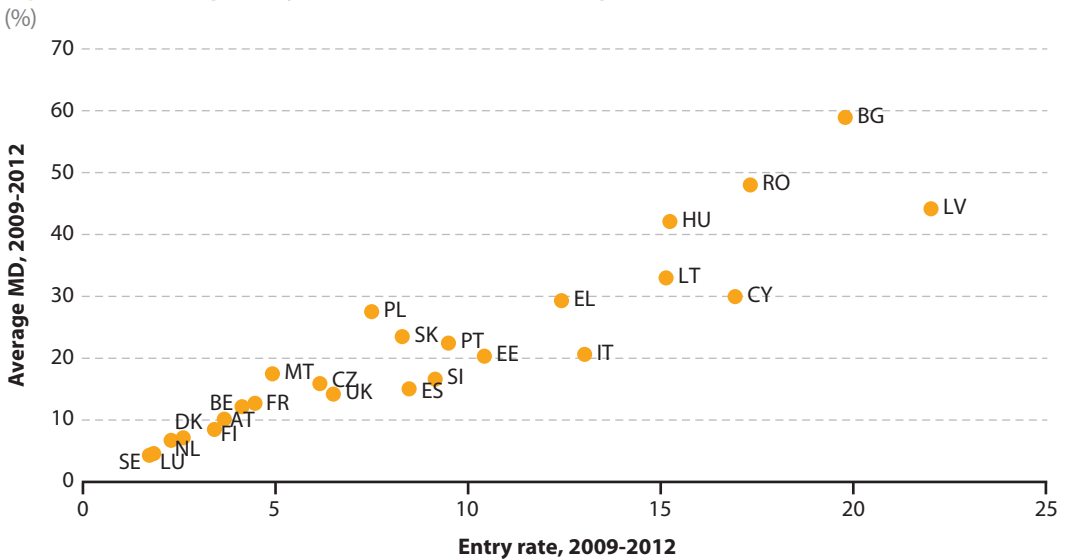
**Figure 20.7: Average exit rate (2009-2012) and share of persistent MD in MD (2012)**



NB: The 2012 share of persistent MD in MD is the ratio between the percentage of people persistently deprived during the period 2009-2012 and the MD rate computed on the basis of the EU-SILC longitudinal dataset (2012). In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database. No data for Ireland and Germany.  
 Reading note: In Bulgaria, the share of persistent MD is 83 % and the exit rate 12 %.

Source: Authors' computation, UDB September 2014.

**Figure 20.8: Average entry rate (2009-2012) and average cross-sectional MD rate (2009-2012)**



NB: No data for Ireland and Germany. In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database.

Reading note: In Bulgaria, the entry rate is almost 20 % and the average MD rate 59 %.

Source: Authors' computation, UDB September 2014.

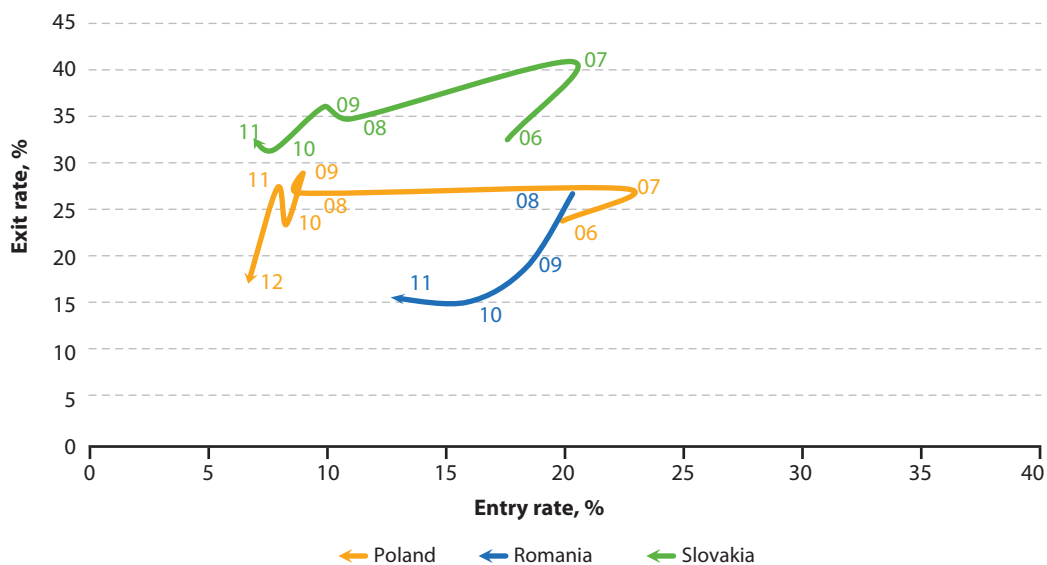
### 20.3.3 Evolution of entry and exit rates

An increase in MD over time may result from an increase in the percentage of people who fall into MD and/or a decrease in the shares of people who manage to exit from MD. Figure 20.9 illustrates this evolution for a subset of countries. The countries presented belong to the different clusters presented in Figure 20.1, based on the shape of the recent national MD trends. Figure 20.9a presents the evolution of exit/entry rates for Poland, Romania and Slovakia, i.e. countries which had a positive trend (decrease in MD) throughout the period, even though this trend has slowed down since the crisis. This positive trend is mainly explained by a decrease in entry rates, as exit rates were quite stable in Poland and Slovakia and were decreasing in Romania (i.e. the risk of being trapped into MD for those in this situation increases but the risk to fall into MD decreases in Romania). This is an important result, indicating that in countries where MD decreased a lot during the last years, the

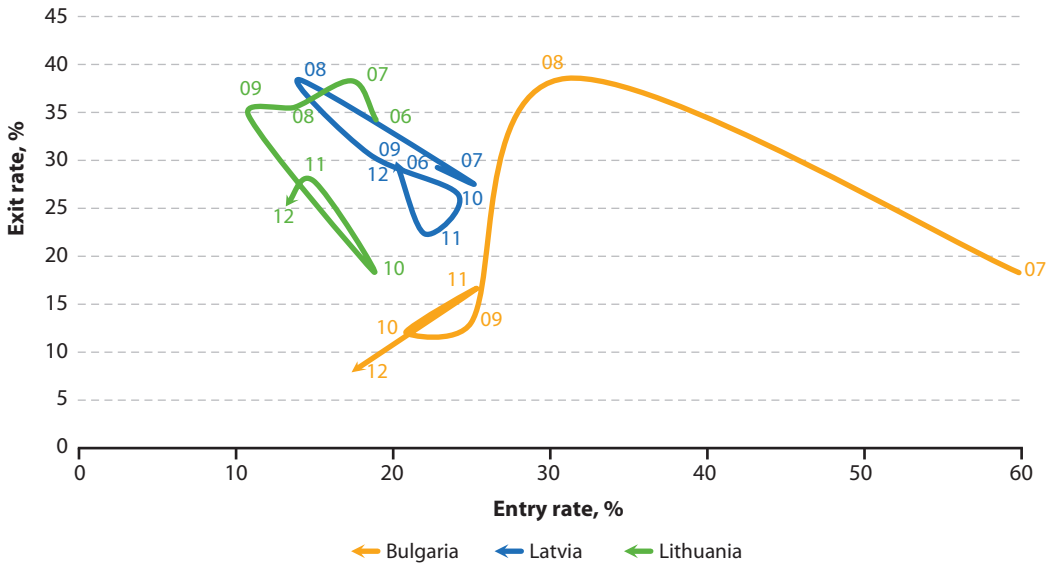
risk of being trapped into MD did not fall, hence the high risk of persistent MD. Figure 20.9b presents the evolution of exit/entry rates for Bulgaria, Lithuania and Latvia, i.e. countries where trends in annual MD levels followed a U-shape. In Bulgaria and Latvia, the pre-crisis improvement was mainly due to a diminution in entry rates, but also an increase in exit rates. In Bulgaria, the crisis had a major negative impact on exit rates and in Latvia on both exit and entry rates (which in 2010 were back to their 2007 levels). In Lithuania, before the crisis, the main trend is a decrease in the entry rate; after the crisis, the entry rate increases back to its 2006 level and the exit rate decreases substantially (at a lower level than in 2006). To sum up, in Lithuania and Latvia the major pre-crisis improvements in exit rates (Latvia) or in entry rates (Lithuania and Latvia) have been lost as a result of the crisis. Figure 20.9c illustrates the case of countries where the crisis resulted in an increase in MD levels after a relatively flat trend (Italy, Greece). The crisis led to increases in entry rates, and a decrease in exit rates in the last years.

**Figure 20.9:** Evolution of the entry and exit rates, 2006-2012 (%)

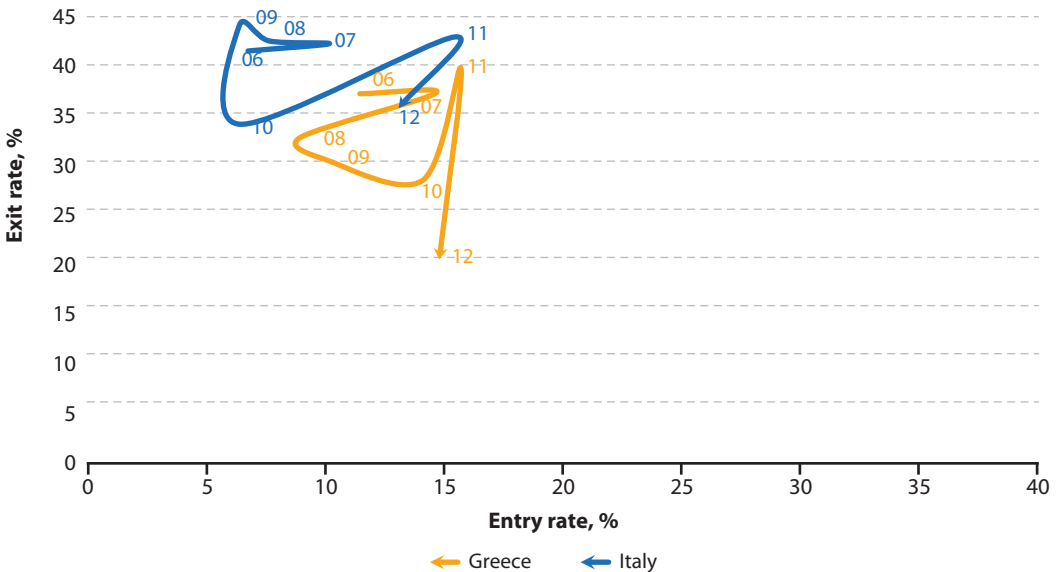
a) Examples of countries where MD levels decrease during the whole period (cluster 1 in Figure 20.1)



**b) Examples of countries where MD levels decrease before the crisis and then increase (cluster 2 (U shape) in Figure 20.1)**



**c) Examples of countries where MD levels increase during the crisis after a relatively flat trend (cluster 3 in Figure 20.1)**



NB: In Romania and Slovakia, there are no data in the longitudinal 2012 database.

Reading note: In Poland, the entry rate diminishes during the period (2006-2011, i.e. '06' and '11' in the figure) whereas the exit rate remains quite constant.

Source: Authors' computation, UDB September 2014.

It is, however, important to keep in mind that the confidence intervals for the entry and exit rates may be very large, depending on the sample sizes of the deprived group in the country (see Table 20.2).

To avoid over-interpreting erratic annual evolutions, we present in Table 20.3 the average exit/entry rates for two sub-periods: the pre-crisis period (2005-2008) and the post-crisis period (2008-2012). Countries are ranked according to the evolution between 2008 and 2012 of the cross-sectional national MD rates. Figures highlighted in green depict favourable evolutions (a diminution of cross-sectional MD rates during the crisis or a diminution of average entry rates or an increase in average exit rates) whereas figures highlighted in red show unfavourable trends.

Important results from Table 20.3 are as follows:

- in countries where MD increases most (Latvia, Estonia, Italy, Greece and Lithuania), both entry and exit rates have deteriorated.
- at the other extreme, in Slovakia, Poland, Austria and (though to a lesser extent) Romania, the decrease in MD seems to be due to a decrease in entry rates rather than an increase in exit rates.
- there are a number of countries with highly varying MD levels, where exit rates diminish during the crisis by more than 5 percentage points (see last column of the table, cells in red or orange) and where persistent MD therefore increases.

**Table 20.2: Confidence intervals for the exit and entry rates, 2012**  
(%)

	Confidence interval			Confidence interval		
	Exit Rate	Lower bound	Upper bound	Entry rate	Lower bound	Upper bound
Belgium	33.9	28.3	39.5	4.3	3.4	5.2
Bulgaria	7.9	6.4	9.4	17.4	15.0	19.8
Czech Republic	29.8	25.8	33.8	5.9	5.0	6.8
Denmark	33.0	21.9	44.1	3.1	2.2	4.0
Estonia	35.7	31.2	40.2	9.7	8.3	11.1
Greece	19.8	16.4	23.2	14.7	12.6	16.8
Spain	48.3	43.5	53.1	9.1	8.1	10.1
Finland	46.5	40.1	52.9	3.6	3.0	4.2
Hungary	16.3	14.6	18.0	14.6	13.3	15.9
Italy	35.5	31.9	39.1	13.0	11.7	14.3
Cyprus	34.3	30.0	38.6	17.5	15.4	19.6
Latvia	29.9	27.4	32.4	20.2	18.0	22.4
Lithuania	25.2	22.1	28.3	13.2	11.4	15.0
Luxembourg	58.2	47.8	68.6	1.7	1.0	2.4
Malta	26.6	21.8	31.4	4.7	3.8	5.6
Netherlands	38.3	29.7	46.9	2.6	1.9	3.3
Austria	35.9	29.8	42.0	3.5	2.8	4.2
Poland	17.0	15.8	18.2	6.7	6.3	7.1
Portugal	30.3	26.5	34.1	9.9	8.6	11.2
Slovenia	43.3	39.9	46.7	8.7	7.8	9.6
United Kingdom	32.2	27.0	37.4	6.7	5.7	7.7

NB: See Table 20.1.

Reading note: In Denmark, the estimated exit rate in 2012 attains 33 %; the value of the true estimate is between 21.9 % and 44.1 %, with a probability of 95 %.

Source: Authors' computation, UDB September 2014.

- specifically, Bulgaria combines a major improvement in its entry rate and a major deterioration in its exit rate, meaning that even though fewer people enter into MD, those who are deprived have less chance to escape from it.

**Table 20.3: Average exit/entry rates for two sub-periods (2009-2012 and 2005-2008) and cross-sectional evolution of MD rate (2008-2012)**

(%)

	Cross sectional MD rate			Entry rate			Exit rate		
	2008	2012	Difference	2005-2008	2009-2012	Difference	2005-2008	2009-2012	Difference
Slovakia	27.8	22.7	-5.1	12.2	8.3	-3.9	38.2	34.2	-4.0
Poland	32.3	27.8	-4.5	9.3	7.5	-1.8	26.1	22.9	-3.3
Austria	13.7	9.8	-3.9	6.3	3.7	-2.6	49	40.4	-8.6
Romania	50.3	48.0	-2.3	20.2	17.3	-2.9	26.7	19.7	-6.9
Portugal	23.0	21.8	-1.2	9.1	9.5	0.4	35.9	33.7	-2.2
France	13.1	12.8	-0.3	5.0	4.5	-0.5	40.2	39.2	-1.1
Finland	9.1	8.9	-0.2	3.1	3.4	0.3	45.4	45.1	-0.3
Sweden	4.6	4.4	-0.2	2.2	1.8	-0.5	56.5	59.6	3.1
Slovenia	16.9	16.9	0.0	9.8	9.2	-0.6	40.3	43.1	2.8
Czech Republic	16.2	16.8	0.6	5.2	6.2	1.0	32.0	30.2	-1.8
Belgium	11.6	12.5	0.9	3.9	4.1	0.2	37.4	33.3	-4.1
Luxembourg	3.5	4.5	1.0	1.7	1.9	0.1	56.4	55.9	-0.5
Netherlands	5.2	6.5	1.3	2.1	2.3	0.2	42.7	42.8	0.1
Denmark	5.4	7.5	2.1	2.2	2.6	0.4	57.2	40.3	-16.9
United Kingdom	11.3	16.6	5.3	4.7	6.5	1.9	45.7	36.2	-9.5
Spain	10.8	16.3	5.5	5.2	8.5	3.3	55.5	49.7	-5.8
Malta	13.7	19.8	6.1	n.a.	4.9	n.a.	n.a.	28.4	n.a.
Cyprus	24.9	31.5	6.6	11.9	16.9	5.0	41.7	38.0	-3.6
Bulgaria	55.0	61.6	6.6	32.7	19.8	-12.9	30.1	12.3	-17.8
Hungary	37.1	44.0	6.9	16.4	15.2	-1.1	29.6	18.8	-10.8
Latvia	35.7	44.6	8.9	13.9	22.0	8.1	31.3	27.0	-4.4
Estonia	12.4	21.3	8.9	6.2	10.4	4.2	50.6	36.8	-13.8
Italy	16.1	25.2	9.1	6.7	13.0	6.3	41.5	36.6	-4.9
Greece	21.8	33.7	11.9	8.2	12.4	4.2	34.6	24.4	-10.2
Lithuania	22.2	34.4	12.2	12.3	15.1	2.8	36.0	25.1	-10.9

NB: Countries are ranked according to national cross-sectional MD rates. No data for Ireland and Germany. In Romania, Sweden and Slovakia: the 2011 data are used instead of the 2012 data, due to non-availability of data for these countries in the longitudinal 2012 database. The colour of the cells varies between dark green (strong improvement) and dark red (strong deterioration); no colour means status quo. 'n.a.' means not available.

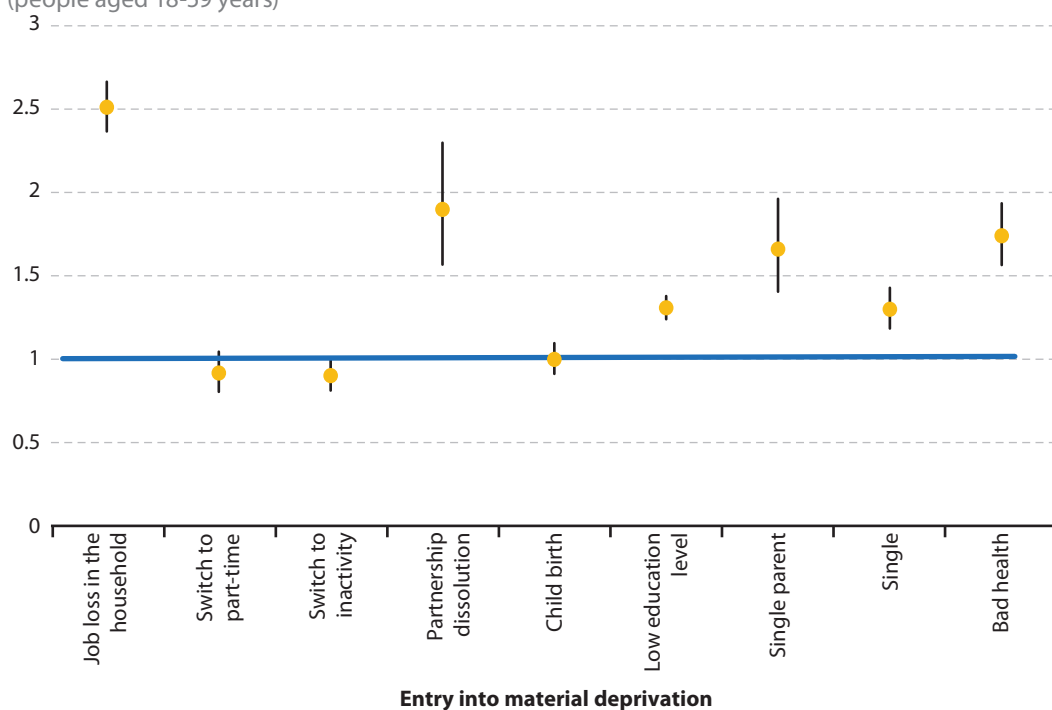
Reading note: In Latvia, the MD rate increased by 8.9 percentage points (pp) between 2008 and 2012 (from 35.7 % to 44.6 %). The average entry rate increased by 8.1 pp. between the 2005-2008 and 2008-2012 periods. The average exit rate declined by 4.4 pp. These three figures are highlighted in red to show a deterioration.

Source: Authors' computation, UDB September 2014.

Figure 20.10 illustrates the impact of different ‘trigger events’ as well as individual and household characteristics on the entry rate into MD. It presents odds ratios, which are one of the main ways of quantifying how strongly the presence or absence of an event/ characteristic A is associated with the presence or absence of an event/ characteristic B in a given population. If the odds ratio is significantly greater (in the statistical sense) than one, then the event/ characteristic ‘A’ is considered to be positively associated with the event/ characteristic ‘B’, in the sense that experiencing ‘A’ raises (relative to not experiencing ‘A’) the odds of experiencing ‘B’. In Figure 20.10, the loss of employment appears as the main risk factor (odds ratio of around 2.5). Other job-related factors, such as change to part-time hours or inactivity are not clearly associated with

immediate experience of MD. Partnership dissolution also increases the risk of entering into MD (see Vandecasteele, 2010). Bad health also increases this risk — this confirms previous results (see Fusco, Guio, Marlier, 2010) showing that the presence of at least one person in bad health in the household seems to have no statistically significant impact on the risk of income poverty but is associated with higher risk of MD. Low educational level and being a lone parent or living alone also impact on the risk of entering into MD. Other factors are also likely to shape the relationship between unemployment and MD and were not tested: for example, the income of other household members, the length of unemployment and the degree of income replacement via social transfers may prevent the experience of MD.

**Figure 20.10: Impact of different ‘trigger events’ as well as individual and household characteristics on the entry rate into MD, odds ratio, logistic regression, robust standard error, EU-27, 2008-2011**  
(people aged 18-59 years)



*Reading note:* People who lost their job have 2.5 times more risk of entering into MD than those who did not. When a vertical bar (black vertical line) crosses the blue horizontal line, this indicates that the variable has no statistically significant effect on the MD entry risk.

*Source:* Authors’ computation, UDB August 2013.

## 20.4 Conclusions

The Great Recession had a dramatic impact on the level of material deprivation in a number of EU countries. At EU level, after an impressive decrease of MD by 12.2 million between 2005 and 2009 due to general living conditions improvements (mainly in Eastern countries), MD increased by 8.7 million from 2009 to 2012 as a result of the crisis.

In this chapter, we identified four clusters of countries that differ in terms of MD levels and evolutions:

- Cluster 1: in these four Central/Eastern countries (Czech Republic, Poland, Romania and Slovakia), national MD rates decrease during the whole period covered, even if this improvement slowed down during the crisis.
- Cluster 2: in these six Eastern/Southern countries (the three Baltic States, Cyprus and to a lesser extent Bulgaria and Hungary), MD rates decrease sharply before the crisis and then increase significantly, sometimes back to very high levels registered a few years before the crisis.
- Cluster 3: in these ten countries, all of them 'old' Member States except for Slovenia, the general trend is relatively flat; there are no clear increase/decrease during the whole period. All these countries have low MD rates.
- Cluster 4: these seven countries witness relatively flat trends in the pre-crisis period, but MD rates increase sharply with the crisis. Except for Malta, these countries are 'old' Member States, whose living standards decreased dramatically as a result of the crisis (Ireland, Greece, Spain, Italy, Portugal, United Kingdom).

In terms of MD national trends, the severity of MD increased with the crisis in many countries, i.e. the percentage of people lacking at least four items grew more than that of those lacking three items.

We showed that overall the share of persistent MD in MD is high in highly deprived countries: In countries with higher MD levels, a greater proportion of materially deprived people experience persistent MD. There are, however, countries with similar MD rates which have different persistent MD share

among the deprived. To better capture the dynamics of MD, we then looked at the national flows of people entering into/ exiting from MD each year, showing again the large diversity of national situations in the EU. Our results highlight that entry and exit rates are crucial to better understand the diversity in cross-sectional and persistent MD rates across the EU. In particular, they show the strong (negative) correlation between the share of persistent deprived (among the deprived) and the national exit rate, as well as between the cross-sectional MD rate and the national entry rates.

Regarding the impact of the crisis, our results show that in countries where (cross-sectional) MD increased most (Latvia, Estonia, Italy, Greece and Lithuania), both entry and exit rates have deteriorated during the crisis. At the other extreme, in Slovakia, Poland, Austria and (though to a lesser extent) Romania, the decrease in MD seems to be due to a decrease in entry rates rather than an increase in exit rates. There are also a number of countries with highly varying MD levels, where exit rates diminish during the crisis by more than 5 percentage points and where persistent MD therefore increases. Specifically, Bulgaria combines a major improvement in its entry rate and a major deterioration in its exit rate, meaning that even though fewer people enter into MD, those who are deprived have less chance to escape from it.

Finally, exploring the impact of different trigger events and various individual and household characteristics on the entry rate into MD, we showed that a job loss is an important risk factor of falling into MD. Living alone (with/without children), suffering from a bad health or having a low educational level are also factors that increase MD risk.

Our analysis was constrained by the panel duration: the current 4-year rotational panel is too short to adequately follow people after shocks or to take into account censoring, and extending the duration from 4 to 6 years would be highly valuable (on this, see also Chapter 27). It was also limited by the small sample size, which prevented us from studying in details the annual transitions by sub-groups. Yet, we believe that this chapter has highlighted the added value of panel data. Looking at both entry into/exit from MD allows for a better understanding of national differences in the lev-



els of annual and persistent MD; in particular, the reason why countries with similar annual MD rates can have different persistent MD rates and how the increase in entry rates and the decrease in exit rates came into play to explain MD increases in the countries most affected by the crisis. Adding to the current EU portfolio of social indicators, measures related to the persistence of MD, as well as context information on the national entry and exit rates would help to better capture the dynamics and the evolution of living standards in the EU.

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# 21

## How do European citizens cope with economic shocks? The longitudinal order of deprivation

Anne-Catherine Guio and Marco Pomati <sup>(172)</sup>

### 21.1 Introduction

The literature on budgeting strategies adopted by households on low income reveals a mixture of inventiveness and experience of mild to severe material deprivation (MD). Households on low income often rely on formal (such as state benefits) but also informal sources of financial/social assistance and reciprocity exchange (Dean and Shah, 2002) to maintain at least some elements of their usual lifestyles, ranging from borrowing money and exchanging favours with friends and relatives to moving back with one's parents and in-laws (Orr et al., 2006). However, despite the resilience of many of these households, there is considerable evidence that as formal resources such as income drop, MD tends to increase (Yeung and Hofferth, 1998; Saunders et al., 2006; Berthoud and Bryan, 2011) <sup>(173)</sup>. Orr et al. (2006) argue that reductions in resources caused by job loss or illness are easily absorbed only among high income households. At medium income levels, households begin to cut back on items such as holiday and rely on help from fami-

lies and friends; through minimal changes in living standards, physical assets and customary activities. However, as available resources drop even further, social capital is stretched to the limit, items previously taken for granted become unaffordable and eventually even food consumption is reduced to a minimum and a warm house becomes an unaffordable luxury. Hence, qualitative evidence shows similar MD patterns across households with similar levels of resources (Smith, 2005). Similarly, large-scale expenditure studies also suggest that as income rises among those who suffered from MD, commodity expenditure patterns converge with those of higher-income households (Farrell and O'Connor, 2003; Gregg et al., 2005).

Questions on MD available in surveys such as EU-SILC provide information on the types of goods and activities that many households go without because they cannot afford them. However, despite the large availability of MD data, little attention has been given to the order in which certain spending curtailment strategies are adopted across the EU.

Understanding how households cope with economic constraints is important to assess claims that poverty is the result of erratic spending or inefficient household budgeting: if this was the case one would for example find a substantial amount of individuals declaring that they can afford to go on holiday away from home but cannot afford two pairs of properly fitting shoes or to keep their houses warm.

Understanding the order in which deprivations are experienced also helps to establish a common language across European welfare states to describe the severity of MD. Overall, focusing on patterns of

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<sup>(173)</sup> Although there is a statistically significant negative relation between MD and income, the relation is far from perfect, due to measurement errors and the influence on MD of non-income factors, such as costs (health, housing, childcare, etc.), accumulated capital/debt, social and private transfers in kind, etc. (see Fusco et al, 2010).

curtailment in the different EU countries also enables MD research to move towards a better understanding of some of the key aspects of living conditions and the underlying processes of curtailment shared across the EU. This is in line with the Council of the European Union's definition of poverty (1985), which following Townsend (1979) defines the poor as those excluded from the minimum acceptable way of life in the country where they live.

The main contribution of this chapter is to assess the most frequent deprivation sequence at the EU and national levels, using the longitudinal component of EU-SILC. By definition, curtailment is a process that happens over time and whose study ideally requires following up the same individuals as they become more or less deprived across time. By proposing a longitudinal methodology, we extend the methodology proposed in previous papers which used cross-sectional data to determine the deprivation order, by comparing the deprivation patterns of people with different MD levels at one point in time (see Deutsch and Silber, 2008 and Deutsch et al., 2015). The use of longitudinal EU-SILC data has a cost in terms of data availability, as only a subset of MD items is available in the longitudinal dataset at the time of writing <sup>(174)</sup>. However, longitudinal data allow the assessment of the fit of different deprivation sequences by using information on how MD evolves for each individual across time. The longitudinal methodology developed in this chapter allows one to ascertain if the cross-sectional order can be considered a good proxy of the longitudinal order.

The chapter is organised as follows: Section 21.2 presents the dataset and the MD items used in the analysis. Section 21.3 aims to explain the sequencing methodology using simple descriptive statistics as well as an Item Response Theory model, which confirms and aids the interpretation of both cross-sectional and longitudinal Deprivation Sequence results. Section 21.4 concludes.

<sup>(174)</sup> We opted to use three waves of the longitudinal data set, instead of the four waves available in order to increase the sample size. Indeed EU-SILC is a rotational panel, i.e. each wave a quarter of the sample quit the panel. Following people during 3 years instead of 4 years allows working with 50 % of the sample, instead of 25 %.

## 21.2 Data

In order to estimate the order in which different items and activities are curtailed in different countries, both cross-sectional (2009) and longitudinal (2009-2011) components of EU-SILC are used.

The cross-sectional analysis is conducted on a set of 13 MD items available in the 2009 EU-SILC cross-sectional data, collected through a thematic module on MD. These 13 items were proposed by Guio, Gordon and Marlier (2012) as robust MD measures at the EU level in each individual Member State and have been advocated as candidates for a revised version of the commonly agreed current EU indicator. (See also Chapter 10 of this book and Guio et al. (2016) for more details about this amended indicator.)

The longitudinal analysis is estimated on six items because only six items (out of the 13-item list) are available in EU-SILC longitudinal data at the time of writing <sup>(175)</sup>. The MD items are listed in Table 21.1. The last column indicates which MD items are available in the longitudinal dataset.

Using the six items available, Table 21.2 divides the pooled sample according to individual MD trajectories across 2 consecutive years (2010 and 2011). The table shows that among those deprived in both 2010 and 2011 (3rd to 6th columns from the left), the majority experience an increase or decrease in the number of deprivations, although a non-negligible minority experience exactly the same number and the same types of deprivations (around 8 % of the sample for Austria) or experience the same number but different types of deprivations (2 % in Belgium). Overall, Table 21.2 suggests that for the vast majority of countries there is a substantial amount of change in MD profiles across just 2 years, and this chapter outlines a methodology aimed at exploring this longitudinal variation. Moreover, when looking at individual trajectories Table 21.2 suggests that a small minority of cases

<sup>(175)</sup> These six items are currently collected annually in the core EU-SILC. The seven additional items proposed by Guio, Gordon and Marlier (2012) were collected in 2009 for the first time, in 2013 on a voluntary basis for a subset of countries and in 2014 in the ad hoc module on MD for all the EU countries. In this chapter, the 2009 data are used, as the 2013 and 2014 data are not yet available.

**Table 21.1:** Deprivation rates for items used in cross-sectional and longitudinal analysis (based on 2009 EU-SILC data)

(%)

Material deprivation	% (2009)	Availability in the longitudinal analysis (2009-2011)
<b>'Household items', i.e. items collected at household level. The household MD information is assigned to all household members (including children) when the household cannot afford to:</b>		
Have 1 week annual holiday away from home	38	Yes
Face unexpected expenses	35	Yes
Replace worn-out furniture (but would like to replace (i.e. the lack is an <i>enforced</i> lack not a choice; see Chapter 10 of this book))	31	No; only available in 2009 ad hoc module
Avoid arrears (mortgage or rent, utility bills or hire purchase instalments)	12	Yes
Have a meal with meat, chicken, fish or vegetarian equivalent every second day	10	Yes
Keep home adequately warm	10	Yes
Have access to a car/van for personal use (but would like to have)	9	Yes
Have a computer and an Internet connection (but would like to have)	5	No; only available in 2009 ad hoc module
<b>'Adult items', i.e. items collected at individual adult level ('adults' are people aged 16 and above). The adult MD information is assigned to all household members (including children), when at least half the adults in the household cannot afford to:</b>		
Have regular leisure activities (but would like to have)	18	No; only available in 2009 ad hoc module
Spend a small amount of money each week on oneself without having to consult anyone (pocket money), but would like to have	17	No; only available in 2009 ad hoc module
Get together with friends/family for a drink/meal at least monthly (but would like to have)	13	No; only available in 2009 ad hoc module
Replace worn-out clothes by some new (not second-hand) ones (but would like to have)	12	No; only available in 2009 ad hoc module
Have two pairs of properly fitting shoes, including a pair of all-weather shoes (but would like to have)	3	No; only available in 2009 ad hoc module

*NB:* All the items collected at the adult level as well as the capacity to replace worn-out furniture and the availability of an Internet connection at home are not available in the longitudinal dataset.

*Reading note:* In 2009, 3 % of EU-27 citizens lack two pairs of properly fitting shoes.

*Source:* Authors' computation, UDB August 2011.

experiences the same number of deprivations and switches between items. To fully tackle the role of consumer choice and relative prices much more detailed data on the quality and price of goods owned and not owned by respondents, together with international market prices would be needed. We briefly return to these issues in the conclusion.

In the next sections, we open the black box of the MD transitions and see whether we can identify a shared pattern of curtailment across countries and methodologies. For doing so, we focus on people lacking at least one item in one of the last 3 years of the panel (2011, 2010 and 2009).

**Table 21.2:** Distribution of EU-SILC respondents according to the number/type of items lacked (out of six items available in the longitudinal data) in 2010 and 2011 (%)

	Not deprived of any item in 2010 and 2011	Deprived of the same item(s) in 2010 and 2011	Deprived of more/fewer/different items in 2011 (compared with 2010)		
			More items	Fewer items	Equal number but different items
Belgium	63	10	13	12	2
Bulgaria	8	22	27	35	9
Czech Republic	39	21	18	18	4
Denmark	75	5	10	8	2
Estonia	27	21	23	23	5
Spain	42	13	17	23	4
Italy	37	7	31	20	4
Cyprus	26	16	30	23	5
Latvia	8	23	33	29	8
Lithuania	12	23	26	31	9
Luxembourg	71	7	11	11	1
Hungary	12	35	27	22	4
Malta	31	34	11	23	1
Netherlands	74	8	8	8	2
Austria	61	8	10	18	2
Poland	25	36	17	19	3
Portugal	25	21	25	25	5
Romania	12	45	20	21	3
Finland	63	9	13	12	2
United Kingdom	54	10	16	17	4

*Reading note:* Among the people present in the panel in 2010 and 2011 in Austria, 61 % do not lack any of the six items in both years, 8 % lack exactly the same items in both years, 10 % lack more items in 2011 than 2010, 18 % lack fewer items in 2011 than in 2010, and 2 % lack the same number of items but some or all these items are different.

*Source:* Authors' computation, UDB August 2013.

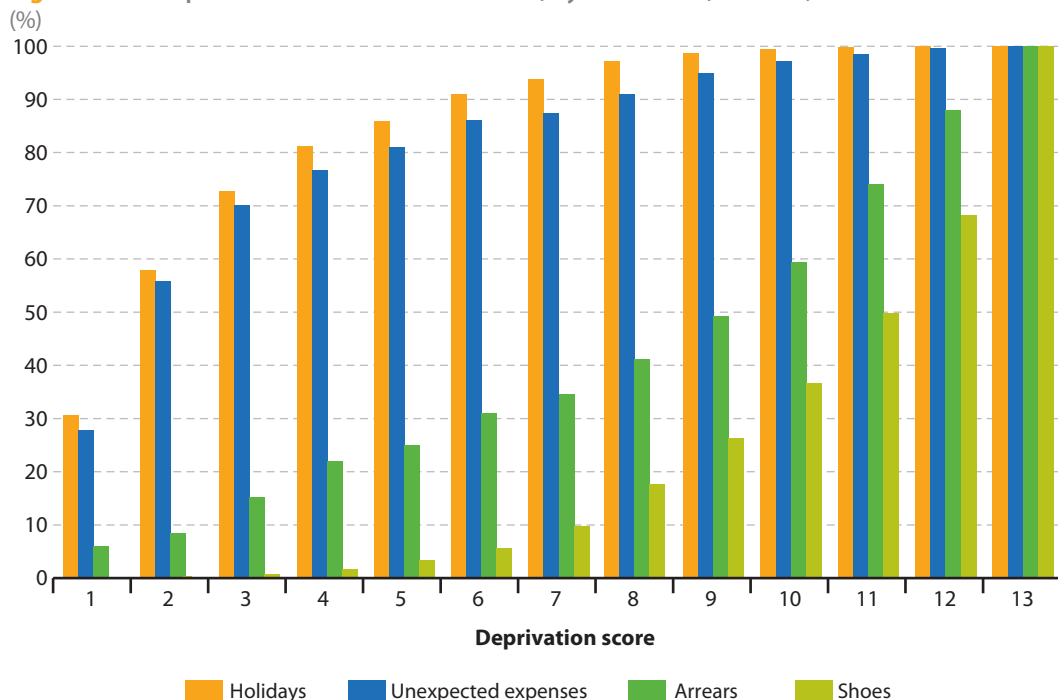
## 21.3 Deprivation sequence

### 21.3.1 Visual analysis

In the previous section, Table 21.1, based on the cross-sectional incidence of the 13 MD items available in EU-SILC 2009, suggests that the lack of two pairs of properly fitting shoes is only experienced by a small minority (3 %), particularly when compared to more common deprivations such as the lack of

1 week holiday away from home. Our analysis also shows that around 90 % of those who cannot afford two pairs of properly fitting shoes also cannot afford a holiday, while fewer than 10 % who cannot afford the latter cannot afford shoes (EU-SILC 2009, results not presented here). This would suggest that people tend to curtail their holidays first and it is only when their deprivation is extremely high that they lose the ability to afford even very basic goods like shoes. One way to corroborate this claim

**Figure 21.1: People who cannot afford each item, by level of MD, EU level, 2009**



*Reading note:* More than half of those who cannot afford two of the thirteen items considered here cannot afford holidays.  
*Source:* Authors' computation, UDB August 2011.

visually is to divide respondents according to how many MD items they cannot afford (number of deprivations out of the list of 13 items proposed by Guio et al., 2012) as shown in Figure 21.1. For illustrative purposes, this figure presents the percentage of people lacking four items (holidays, shoes, inability to face unexpected expenses, arrears), by the number of items lacked. It shows that the lack of holidays and the difficulty to face unexpected expenses are much more widespread than problems of arrears and shoes deprivation across the deprivation scale. More than half of those who cannot afford two of the thirteen items covered in the figure cannot afford holidays or unexpected expenses, and this proportion grows gradually with the number of deprivations. In contrast, only a small proportion cannot afford to pay arrears or two pairs of properly fitting shoes. However, this proportion grows gradually with the number of deprivations. Most importantly, the order (first holidays, then

unexpected expenses, arrears and finally shoes) is constant across the MD scale.

This order is nevertheless probabilistic: although on average respondents will conform to this pattern, it does not necessarily apply perfectly to all respondents. Similarly to a model prediction, there is always some degree of difference between observed and predicted order: even when considering the four items above there is a small minority of people who cannot afford to pay arrears nor afford two pairs of shoes but who are able to afford holidays. This could be the result of misreporting, unique individual factors and/or particular resources which set this rare group of cases apart from the vast majority of the population. As the number of MD items increases the relative frequency order becomes more uncertain and the number of cases that do not confirm exactly to the best order of curtailment increases. As shown in Figure 21.2,

the order for holidays, unexpected expenses and shoes remains constant across the MD scale, while the order is less clear for other items (such as the lack of a car/van and the incapacity to avoid arrears) across the MD scale.

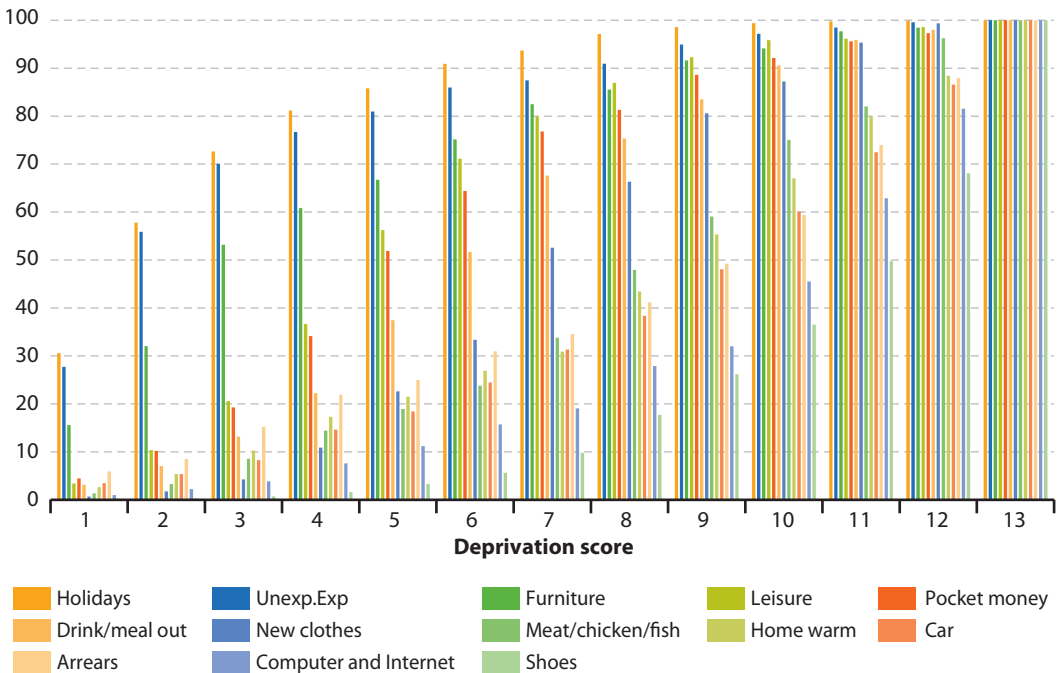
It is obviously not possible to identify visually the most representative order of curtailment for all 13 MD items in all EU countries, and more advanced methods are therefore needed.

### 21.3.2 Deprivation sequence: methodology

Understanding the determinants of the individual consumption level and the relative shares of its components is a long standing issue in economics (Engel, 1895; Working, 1943; Leser, 1963). According to classical microeconomic theory of consumption behaviour, consumers are supposed to allocate their income to the purchase of products so as to

maximize utility, given a set of prices for a group of products. Econometric studies usually use detailed individual data from household budget surveys to estimate systems of demand equations, where the share of expenditures depends on the relative prices of different goods, disposable income and individual characteristics (see among others the model proposed by Deaton and Muellbauer (1980)). Some research focuses specifically on how consumers prioritise their acquisition of durables over time as their income increases, and on whether people tend to have similar priority of acquisition patterns (Roos and Von Szelisk, 1943; Paroush, 1965, 1973; McFall, 1969; Hebden and Pickering, 1974). Deutsch and Silber (2008) use the same approach as that proposed by Paroush (1965, 1973) and Guttman (1950), but to look at the mirror image, namely to assess whether individuals facing the threat of poverty curtail their consumption of various goods in a given order. This methodology compares the deprivation order of each case in a dataset to all the possible orders and

**Figure 21.2:** Proportion of people who cannot afford the item, by level of MD, EU level, 2009 (%)



NB: See Table 21.1 for the detailed description of items.  
Source: Authors' computation, UDB August 2011.



selects the best order as the order with the smaller aggregated error.

For example, if a questionnaire contains only two MD items, say a 1-week holiday a year and two pairs of shoes, there are two possible orders of curtailment. As MD increases, households could decide to curtail holidays first and then two pairs of shoes; or they could curtail two pairs of shoes but still go on holiday. Assuming that data are collected on only these two items, and that being able to afford an item or not wanting it is scored as 0 and being deprived (unable to afford) is scored as 1, it is possible to test which order best approximates the one found among all cases in our sample.

If holidays are curtailed first followed by shoes, there are three possible patterns consistent with this order (see Table 21.3). We can then compare each case in our dataset to these three patterns, allocate errors to each case that does not follow any of the three patterns, and aggregate the total number of errors for each possible order. There are  $K!$  possible orders, where  $K$  is the number of items. In this simple example, there are only  $2!=2$  possible patterns. Respondents are either able to afford both holidays and shoes (as in the first row), or unable to afford holidays and able to afford shoes (second row), or unable to afford either (third row). Respondents who cannot afford shoes but can afford holidays (pattern: 0,1) are in this case not consistent with the considered order and would need one

change (one error) to be converted to the closest expected pattern (from 0,1 to 1,1). An error of 1 (or a residual in modelling terms) would then be allocated to this case.

If the expected order is the opposite of the one above (shoes are curtailed first), the three possible patterns in the data consistent with this order are the ones shown in Table 21.4.

Longitudinal data allow the extension of this *Deprivation Sequence* methodology by looking at information over multiple waves for the same person. Each individual MD pattern found in the data is scored against the possible patterns consistent with a given order (e.g. holiday, shoes). The main difference is that the expected patterns also allow change in MD scores across time. Each case is therefore compared against the expected patterns and allocated an error. As already mentioned, an error is the smallest change between the MD pattern of a given dataset case and an expected pattern. All cases that match any of the expected patterns of a given order are allocated an error of 0. Table 21.5 shows the longitudinal extension of order 1 shown in Table 21.3.

Similarly to the cross-sectional methodology, an aggregate error is calculated at the national/EU level, and the order with the smallest aggregated error is selected as the 'best' national/EU order.

**Table 21.3: Possible patterns for order 1**  
(holidays are curtailed first)

Holidays	Shoes
0	0
1	0
1	1

**Table 21.4: Possible patterns for order 2**  
(shoes are curtailed first)

Shoes	Holidays
0	0
1	0
1	1

**Table 21.5: Possible longitudinal patterns for order 1**  
(holidays are curtailed first)

WAVE 1		WAVE 2	
Holidays	Shoes	Holidays	Shoes
0	0	0	0
0	0	1	0
1	0	0	0
0	0	1	1
1	0	1	0
1	1	0	0
1	0	1	1
1	1	1	0
1	1	1	1

### 21.3.3 Deprivation sequence: results

#### Best EU order

Using the six items available in the longitudinal dataset (see Table 21.1), the best EU order is as follows (see Table 21.6 for national results):

1. holidays
2. unexpected expenses
3. meat/chicken/fish/vegetarian equivalent
4. home warm
5. arrears
6. car/van.

Households on average tend to first cut back on their annual holidays and then use up their savings (resulting in inability to face unexpected expenses). As their deprivation increases further they are unable to afford a meal with proteins, a warm house and paying bills, and finally a car/van. The results from the longitudinal analyses show a substantial amount of overlap with those based on cross-sectional data (see Deutsch et al. (2015) for a discussion of the cross-sectional results). At the

national level, the hierarchies show either a perfect or very close match. This suggests that the cross-sectional 13-item order can be considered a (very) good predictor of the longitudinal deprivation sequence. At EU level, this order is (see Table 21.7 for national results):

1. holidays\*
2. unexpected expenses\*
3. furniture
4. pocket money
5. leisure
6. drink/meal out
7. clothes
8. meat/chicken/fish/vegetarian equivalent\*
9. home warm\*
10. arrears\*
11. car/van\*
12. computer/internet
13. shoes.

\*Items available in the longitudinal data set (see Table 21.1).

**Table 21.6:** Best order of curtailment, longitudinal (2011) and cross-sectional data (2009)

		EU	BE	BG	CZ	DK	EE	ES	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	FI	UK
Holidays	CS	1	1	2	1	2	1	1	1	1	2	2	2	2	1	2	2	1	1	1	2	2
	LONGI	1	1	2	1	2	1	1	1	1	2	2	2	2	1	2	2	1	1	1	1	2
Unexpected expenses	CS	2	2	3	2	1	2	2	2	2	1	1	1	1	2	1	1	2	3	3	1	1
	LONGI	2	2	3	2	1	2	2	2	2	1	1	1	1	2	1	1	2	3	2	1	1
Meat/chicken/fish/vegetarian equiv.	CS	3	5	4	3	4	4	6	4	5	3	3	4	3	3	6	3	3	5	4	4	4
	LONGI	3	5	4	4	4	4	5	5	5	3	4	4	3	3	5	3	3	6	6	5	5
Home warm	CS	4	4	1	5	6	6	4	3	3	6	4	5	6	4	5	6	4	2	5	6	3
	LONGI	4	4	1	5	5	6	4	4	3	6	3	5	6	6	4	6	4	2	5	6	4
Arrears	CS	5	3	5	6	3	5	3	5	4	5	6	3	4	5	3	4	5	6	6	3	5
	LONGI	5	3	5	6	3	3	3	3	4	5	6	3	4	4	3	4	5	5	4	3	3
Car/van	CS	6	6	6	4	5	3	5	6	6	4	5	6	5	6	4	5	6	4	2	5	6
	LONGI	6	6	6	3	6	5	6	6	6	4	5	6	5	5	6	5	6	4	3	4	6

NB: CS refers to the cross-sectional orders and LONGI to the longitudinal orders. The cross-sectional orders are based on the original results from Deutsch et al. (2015) calculated on the full 13-item list. The seven items not available in the longitudinal dataset were omitted and the rank reallocated to the six remaining items. The longitudinal order was in contrast estimated directly on the six items. All cases with no deprivation (a sum score of 0) and the few cases who suffered from all deprivations (sum score of 6) were excluded during estimation, as they provide no information for the purposes of this model.

Reading note: In both the cross-sectional and longitudinal orders, the first item curtailed in Austria is the capacity to face unexpected expenses, and the last one is the capacity to keep one's home adequately warm.

Source: Authors' computation, EU-SILC 2009 cross-sectional data (UDB August 2011) and EU-SILC 2011 longitudinal data (UDB August 2013).

### Homogeneity of national deprivation orders across the EU

In Table 21.6, there is a large degree of overlap between national hierarchies: going on holidays and the capacity to face unexpected expenses are generally the first items to be curtailed across all countries. As for the other items, most countries have an order similar to the EU one, but the variation is much more noticeable. Bulgaria and Portugal for example are the only countries where the lack of an adequately warm house is first and second respectively. Similarly, access to a car/van is the second (cross-sectional)/third (longitudinal) item in Romania.

Focusing on the differences between national best orders however hides the fact that the EU order fits most countries relatively well. A more sensible strategy is to store the aggregate errors for each of the 720 (6!) possible hierarchies and then rank them. As shown in Table 21.8, out of 720 possible longitudinal hierarchies the EU order has a rank of less than 55 in all countries apart from Denmark

and Finland. This means that the EU order may not be the best fitting one but it fits better than 92 % (i.e. (720-55)/720) of all the other possible orders in all but two countries. The orders that fit marginally better are very small variations of the EU order. For Denmark and Finland, the EU order is still better than the vast majority of orders but the rank is much lower (134th and 154th respectively). The third column of the table also shows that any order with holidays and unexpected expenses at end of the order fits all countries badly.

The key message from these results is that whereas the order of curtailment for holidays and unexpected expenses is very similar across all countries, the other four items (meat/chicken/fish/vegetarian equivalent, home warm, arrears and car/van) show more variability (both in cross-sectional and longitudinal analysis). Nevertheless, the EU order revealed by the cross-sectional and longitudinal deprivation sequence methods provides a good approximation of the order of curtailment of these four items.

**Table 21.7:** Best order of curtailment, cross-sectional data, by country, 2009

	EU	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Holidays	1	1	3	2	2	2	1	2	2	1	3	1	2	2	2	2	2	1	3	2	1	1	1	3	1	2	2	2
Unexpected expenses	2	2	4	3	1	1	3	1	3	3	2	2	3	1	1	1	3	1	1	1	2	8	7	1	3	1	1	1
Furniture	3	3	1	1	3	6	2	3	1	2	1	11	1	3	3	3	2	2	2	5	3	2	2	2	2	3	6	6
Pocket money	4	6	6	5	5	5	5	8	4	4	4	3	8	6	5	4	6	6	5	4	5	4	5	7	6	6	4	3
Leisure	5	4	8	6	6	4	7	7	6	5	5	4	6	5	4	5	5	5	4	3	4	5	4	5	4	7	5	4
Drink/meal out	6	5	7	10	7	3	8	6	9	6	8	5	9	7	6	6	4	4	6	6	6	6	6	9	9	8	8	5
Clothes	7	7	5	9	4	8	6	13	7	8	7	6	7	4	7	7	7	7	7	8	7	7	8	6	9	5	7	7
Meat/chicken/fish/vegetarian equiv.	8	10	9	4	10	7	9	11	10	13	9	8	10	8	8	10	8	8	12	7	8	12	9	8	4	9	11	9
Home warm	9	9	2	11	12	9	13	9	5	9	11	7	4	11	9	11	11	9	11	12	9	3	10	10	13	12	12	8
Arrears	10	8	10	12	8	10	10	4	4	7	6	9	5	10	11	9	9	10	8	9	10	13	11	4	11	4	3	11
Car/van	11	11	11	7	11	12	4	8	12	12	12	13	12	9	10	12	10	11	9	10	11	10	6	12	5	10	9	12
Computer/Internet	12	12	12	8	13	13	11	10	11	10	13	10	13	12	12	13	12	12	13	11	12	11	12	11	10	11	13	13
Shoes	13	13	13	13	9	11	12	12	13	11	10	12	11	13	13	8	13	13	10	13	13	9	13	13	12	13	10	10

Reading note: The first item curtailed in Austria is 'capacity to face unexpected expenses', and the last item is 'shoes'.

Source: The cross-sectional orders are based on the original results from Deutsch et al. (2015) calculated on the full 13-item list available in EU-SILC 2009 cross-sectional data, UDB-August 2011.

Aggregate longitudinal analysis also suggests a similar pattern of curtailment: a large proportion of those entering MD in a given year ( $N$ ) were already lacking holidays or could not face unexpected expenses the previous year ( $N-1$ ), but the majority of them did not experience the other four deprivations.

### 21.3.4 Item response theory

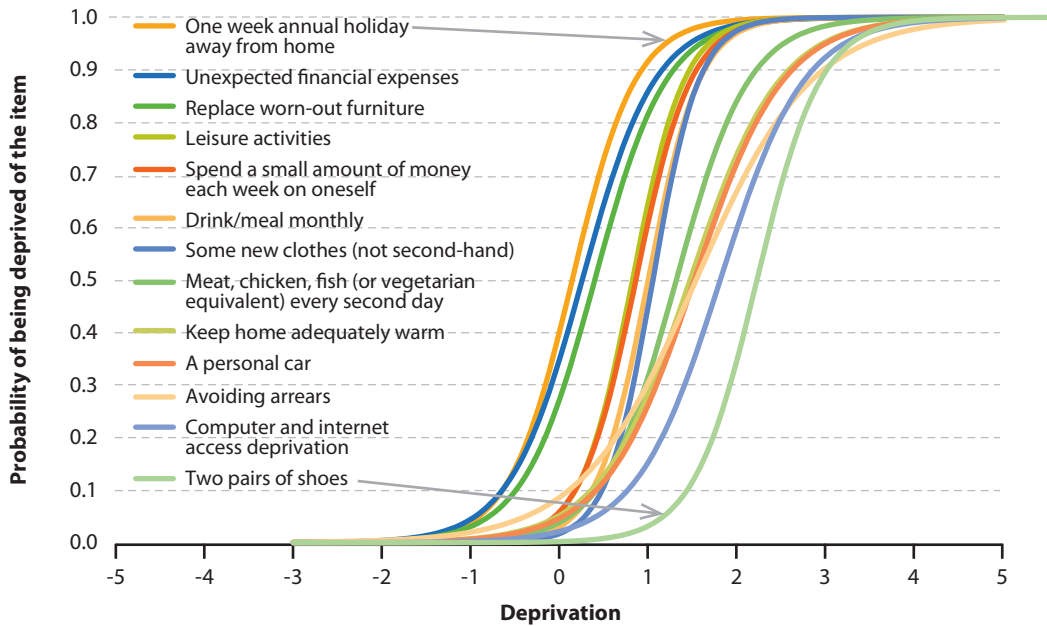
Item Response Theory (IRT) models have been used in the measurement of MD by, among others, Dickes (1983, 1989), Gailly and Hausman (1984), Pérez-Mayo (2004), Cappellari and Jenkins (2007), Ayala and Navarro (2007 and 2008), Fusco and Dickes (2008), Guio, Gordon and Marlier (2012) and Szeles and Fusco (2013). Also known as Latent Trait Analysis, IRT is a set of statistical models that describe the relationship between questionnaire item

**Table 21.8:** Rank of the EU order in each country, longitudinal data, 2011

Country	Rank of EU order	Highest rank of order with holidays and unexpected expenses as last (5th and 6th item respectively)
Poland	1	515
Czech Republic	3	435
Malta	4	517
Italy	6	478
Bulgaria	8	483
Romania	13	498
Estonia	15	520
Hungary	16	519
Belgium	17	478
Lithuania	17	429
Spain	19	431
Austria	20	478
Cyprus	30	425
Latvia	30	541
United Kingdom	33	466
Portugal	46	381
Luxembourg	53	343
Netherlands	54	415
Denmark	134	355
Finland	162	251

*Reading note:* Out of 720 possible longitudinal hierarchies, the best EU longitudinal order ((1) Holidays; 2) Unexpected expenses; 3) Meat/chicken/fish/vegetarian equivalent; 4) Home warm; 5) Arrears; 6) Car/van) is the best 20th rank in Austria. Any order with holidays and unexpected expenses at end of the order is the best 478th order.

*Source:* Authors' computation, UDB August 2013.

**Figure 21.3:** Item characteristic curves (ICCs), 13 items (cross-sectional data), EU level, 2009

*Reading note:* Each Item Characteristic Curve shows the probability of being deprived of an item (Y-axis) for a given level of MD (X-axis). For example, those enduring a level of MD which is one standard deviation greater than the mean EU level of MD will on average almost certainly be unable to pay unexpected financial expenses while they will have a 50 % probability of being unable to afford meat/chicken/fish/vegetarian equivalent every second day.

*Source:* Authors' computation, UDB August 2011.

responses and an unobserved latent trait, such as academic ability, level of happiness or MD. IRT postulates a relationship between each item and the underlying MD trait, and this is best represented using Item Characteristic Curves (ICCs).

Figure 21.3 shows 13 ICCs, which illustrate the relationship between the underlying MD trait (comparable to a standardised version of the MD score shown in Figure 21.1) and the probability of being deprived of each item: as MD (shown on the X-axis, expressed in standard deviations (s.d.) from the mean) increases, the probability of being deprived of an item (shown on the Y-axis) increases. The further to the right the ICC the more severe the MD. The curves are ordered according to the EU (cross-sectional) MD order (see Table 21.7, EU column). The ICCs for the first two items in the order (i.e. holidays and unexpected expenses) show variation between -1 and 1 s.d.: as shown above these items detect the first signs of MD, and the vast

majority of those who suffer from more extreme levels of MD (i.e. above 1 s.d.) cannot afford these. The horizontal distance between the curves (which reflects the range of MD severity and is shown by the dashed horizontal line) shows that the ICCs for these two items are close together but far apart from the other four items (meat/chicken/fish/vegetarian equivalent, home warm, car/van and arrears) which were included in our longitudinal MD order. This means that the severity of MD associated with these two deprivations is distinctively lower than that of the other four items. However, at higher levels of MD the probabilities of being deprived of the four items at the bottom of the order (meat/chicken/fish/vegetarian equivalent, home warm, car/van and arrears) are very similar; the curves are so close together that it is difficult to tell them apart, and it could be argued that the order of curtailment for these items is therefore much harder to establish. These results give a potential explanation of why there is greater variability in the order of

curtailment of these items at national level and yet the EU order shows on average a good fit across most countries. These four items indicate more severe levels of MD than holidays and unexpected expenses, but their respective ranks in the order seem interchangeable.

The ICCs also corroborate the results presented above: not being able to afford two pairs of properly fitting shoes is associated with extremely high level of MD (above 1 s.d.), and therefore this represents the very last item to be curtailed for most countries and population subgroups. The ICCs also reiterate the need to have a broad range of items that capture all levels of MD, in both the cross-sectional and longitudinal components of the survey. Among the 13 items proposed by Guio, Gordon and Marlier (2012), those which were not yet collected in the core EU-SILC are crucial to capture adequately the full range of MD severity.

## 21.4 Conclusions

The *Deprivation Sequence* methodology developed by Deutsch and Silber (2008) in the context of MD research proves to be an insightful methodology to detect orders of curtailment. As shown in this chapter, its simple and data-driven logic can easily accommodate longitudinal data. Item Response Theory can also be used to explore some of these findings further and to identify the overlap in national MD ranks across the EU.

The analysis presented in this chapter shows that MD data can be used to build an insightful narrative of the way people are gradually excluded from some of the key aspects of living conditions of each Member State. Cross-sectional analyses show that people generally first cut back on their annual holidays, then their savings to face unexpected expenses, new furniture, leisure and social activities. Those experiencing higher levels of MD tend to also be unable to afford a meal with proteins, a warm house and paying bills, and eventually even two pairs of properly fitting shoes. Although using a smaller set of items (because of data availability in the longitudinal dataset at the time of writing), the main contribution of this chapter is to extend the cross-sectional methodology developed by

Deutsch et al. (2015) using longitudinal data. The analysis confirms that the same MD pattern is also found when following the same people across time and that the cross-sectional order can be used as a reasonable proxy of the longitudinal order when data are not available. Across the EU, the bad fit of a MD order in which expenditure on holidays away from home is given priority over other goods and activities provides clear evidence against claims that poverty is the result of erratic spending or inefficient household budgeting: the vast majority of those who cannot afford basic items (e.g. meals every second day or two pairs of shoes) do not go on holiday nor have they enough money to face unexpected expenses. It also highlights the importance of social activities such as a monthly drink or meal with friends or family and reiterates the importance of seeing poverty as a form of exclusion from ordinary living patterns, customs and activities (Townsend, 1979).

This type of analysis is also extremely important to confirm the validity and reliability of the EU MD measures in general, and of the 13-item scale proposed by Guio, Gordon and Marlier (2012) in particular (see Chapter 10 of this book). The analysis shows that these 13 items can be used to capture a large range of MD severity, which is not perfectly well captured by the items currently collected in EU-SILC. It shows, for example, that questions on extreme MD such as two pairs of shoes are needed in the longitudinal element of EU-SILC to further corroborate the cross-sectional results and more generally for capturing extreme levels of MD.

Although theories of consumption behaviour and relative prices may be useful to analyse detailed expenditure studies which collect information on the cost and quality of household goods, we argue that MD items available in surveys such as EU-SILC are less suited to empirical exploration of such theories; detailed expenditure data for example may show how the purchase/quality of certain goods is cut down as resources decrease and how individuals are (un)able to find cheaper goods, while MD items simply signal the enforced lack of these. The strength of much of the available MD items lies in their ability to detect the exclusion from shared living patterns, customs and activities because of lack of resources. Nevertheless, future research

could use relative price theories to track changes in MD across several years when more data are available and could use MD data in conjunction with expenditure data to unify these two subject areas (see Chapter 13 of this book for an example of such an approach). Finally, we acknowledge that the issues we have raised deserve further exploration, particularly in understanding which formal and informal resources prevent people from experiencing extreme levels of MD.

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# 22

## How does attrition affect estimates of persistent poverty rates? The case of EU-SILC

Stephen P. Jenkins and Philippe Van Kerm <sup>(176)</sup>

### 22.1 Introduction

Over the last decade and through its Open Method of Coordination, the EU has agreed a set of common objectives for monitoring and measurement of social protection and social inclusion, together with a set of indicators to assess national and EU progress towards these goals. Among the primary indicators of social inclusion is the persistent at-risk-of-poverty rate, defined as the proportion of persons in a country who are at risk of income poverty in the current year and who were at risk of income poverty in at least 2 of the preceding 3 years. Evidence about poverty persistence is an important complement to information about poverty prevalence at a point in time: it is widely agreed that poverty is worse for an individual, the longer he or she experiences it. Eurostat derives estimates of persistent at-risk-of-poverty rates using samples from the longitudinal component of EU-SILC in which the fortunes of individuals are tracked over 4 consecutive years. Because not all of the individuals present in the first sample year provide 4 years of income data — there is attrition — estimates of

persistent at-risk-of-poverty measures may not be reliable. In this chapter, we analyse the extent to which this is the case, and how the potential problems vary across EU Member States.

Attrition is a potential problem for two reasons. First, it means that the sample size for the 4-year sample used to calculate a persistent at-risk-of-poverty rate is smaller than the size of the sample of respondents in the first year of the four (Wave 1), and a smaller sample size leads to *less precise inference* (larger standard errors and wider confidence intervals). Second, if the individuals who are lost to follow-up differ systematically from the initial respondent sample — the case of non-random or ‘differential’ attrition — the 4-year sample may not be representative of the underlying population, thereby leading to *biased estimates* of persistent at-risk-of-poverty rates.

The longitudinal weights supplied with EU-SILC longitudinal data are intended to address the second problem. The idea is that, if differences in the chances of sample dropout can be fully characterised in terms of differences in individuals’ observed characteristics, weighting will make the 4-year sample representative of the initial sample. Individuals with characteristics associated with large dropout probabilities receive relatively large weights to compensate for the large fraction of similar individuals that have been lost. Individuals less likely to dropout receive relatively small weights. The weighting strategy works as long as observable characteristics predict dropout probabilities well and those who remain in the sample are not systematically different from those who attrit. However, problems arise if the chances of attrition also depend on unobserved characteristics

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that are systematically correlated with the chances of being persistently at-risk-of-poverty. Because such characteristics are unobserved, their impact is difficult to assess.

Our research builds on analysis of attrition in EU-SILC's forerunner, the European Community Household Panel (ECHP), undertaken by Behr, Bellgardt and Rendtel (2005) and Watson (2003). EU-SILC differs substantially from the ECHP which ran between 1994 and 2001. Although both sources employ annual data collection, EU-SILC longitudinal data refer to information collected over a 4-year period, rather than up to 8 years. Instead of using a survey instrument with a cross-nationally input harmonised design and questionnaire (pure household panel surveys in ECHP), EU-SILC uses output harmonisation, rotating sample designs, and gives priority to timeliness and cross-sectional estimates. Countries are mandated to deliver a number of statistics conforming to particular specifications (and the data used to create them) but have some discretion about the ways in which the information is collected. Most notably, some countries use household panel surveys to collect the longitudinal data; others use linked administrative registers <sup>(177)</sup>. In addition, there are many more countries contributing EU-SILC data than were in the ECHP: we use 23 countries in our analysis; there were only 15 countries covered by the ECHP.

Behr, Bellgardt, and Rendtel (2005) and Watson (2003) both drew attention to a substantial diversity in response rates in ECHP and, moreover, their conclusions were that, although the amount of attrition was relatively large, its effects on estimates of poverty rates and quintile transition probabilities were relatively benign. Indeed, Watson went so far as to state that 'fears that attrition has undermined the representativeness of the ECHP samples in later waves of the survey are largely unfounded' (2003, p. 361). Her results about representativeness are similar to those reported by Fitzgerald, Gottschalk, and Moffitt (1998) for the US Panel Study of Income Dynamics.

Patterns of attrition and their consequences may have changed over the last decade. Also, with

<sup>(177)</sup> On this, see e.g. Lohmann (2011) or, for a thorough discussion, Jäntti, Törmälehto and Marlier (2013) and Chapter 28 of this volume.

many more countries with data, and output harmonisation rather than input harmonisation, there is much greater scope for differences across Member States. Our analysis of attrition and estimation of persistent at-risk-of-poverty rates in EU-SILC data is therefore not only timely but also important given the place of this indicator in the EU's portfolio of social inclusion indicators.

The remainder of the chapter is organised as follows. In Section 22.2, we explain the data that we use, drawn from the 2011 longitudinal EU-SILC UDB. This discussion covers the definition of the persistent at-risk-of-poverty rate, how attrition arises, the weights that are available, and the samples that we use in the analysis. The extent of attrition across Member States, and how it varies with personal characteristics, is described in Section 22.3. In Section 22.4, we analyse the implications of sample dropout, again contrasting the situation across countries. We assess effects on representativeness by comparing estimates of at-risk-of-poverty rates from the full initial sample with estimates derived from the smaller 4-wave sample. Section 22.5 contains a summary and conclusions.

For brevity, we report here only a subset of the analyses we have conducted. See Jenkins and Van Kerm (2017) for a complete set of results.

## 22.2 Data, definitions, sample selection, weighting

Our analysis is based on the 2011 EU-SILC longitudinal files. More specifically we use the scientific-use release of the longitudinal EU-SILC files made available to the Net-SILC-2 project, which are an update of UDB 2011-1, released in August 2013. These files refer to data covering the four survey years 2008-2011. Because the reference period for EU-SILC income data is the calendar year preceding the year of data collection, the income years covered are 2007-2010 <sup>(178)</sup>.

<sup>(178)</sup> There are two exceptions. For Ireland, the data refer to the 12 months prior to the interview, and for the United Kingdom, the income reference period is the period around the date of interview with income totals subsequently converted to annual equivalents pro rata.

## 22.2.1 At-risk-of-poverty rates and persistent at-risk-of-poverty rates

Following EU official definitions, an individual's 'at-risk-of-poverty' status in a given income year is determined by the equivalised household disposable income of the household to which he or she belongs. (For further details of the sources included in household income and the equivalence scale, see Eurostat (2010).) A person is counted as being at-risk-of-poverty (henceforth *poor*) in a given year if his or her equivalised household disposable income is less than 60 % of the national median equivalised household income for that year<sup>(179)</sup>. The current at-risk-of-poverty rate (henceforth *current poverty rate*) for a particular country or group within a country is the proportion of persons in that country or group who are poor in the current income year.

The persistent at-risk-of-poverty rate (henceforth *persistent poverty rate*) is the proportion of persons in the country or group who are currently poor and who were poor in at least two of the preceding 3 years. Thus in our longitudinal data, the persistent poverty rate refers to the proportion of individuals who were poor in 2010 as well as in at least 2 of the 3 previous years (2007-2009). This indicator is the principal official EU indicator on social inclusion for which estimation is based on the longitudinal component of EU-SILC, and hence the indicator that is most sensitive to attrition issues.

## 22.2.2 Samples

EU-SILC has a 4-year rotating panel design. A fresh sample of households is drawn every year in every country, and the respondents in this sample are eligible for an interview in each of the following 3 years, contributing a total of up to four interviews. In each particular calendar year, data are available from four cohorts of respondents and contribute to the EU-SILC cross-sectional data. The 2011 EU-SILC longitudinal data (and similarly in preceding releases) consist of the three subsamples that provide data in 2011 and in at least one earlier survey year

as well, i.e. the cohorts that entered the survey in 2008, 2009, or 2010.

To examine the magnitude and pattern of attrition, and to assess their implications for estimation of persistent poverty rates, we work with the 2008 rotation group sample which provides data over up to 4 years and is therefore the basis for calculation of the 2011 persistent at-risk-of-poverty indicator. We use the samples for 23 countries. We exclude the samples for Luxembourg (because no rotation group was started in 2008), Norway (because some of the relevant sample weights were not available — see below), Denmark (because the 2011 UDB appears to exclude households that attrited before the fourth interview), and Sweden (because of unexplained differences in sizes between the 2010 and 2011 versions of the 2008 rotation group samples).

Our examination of the magnitude and effect of attrition relies on two overlapping subsamples. The first sample is composed of all individuals from all households in the rotation groups for survey years 2008-2011 that responded at Wave 1 (Wave 1 is the year in which households entered the survey, i.e. 2008) irrespective of their subsequent participation. We refer to this full sample of the 2008 rotation group as the *full W1 Sample*. In principle, this sample should provide estimates close to those derived from the full 2008 cross-sectional sample. We return to this point later.

Our second subsample is composed of the subset of individuals from the W1 Sample that belong to a household successfully interviewed in each one of the 4 survey years 2008-2011. This is the *4-wave Balanced Sample*, from which persistent poverty rates can be calculated<sup>(180)</sup>. We consider only individuals who were living in a household that was interviewed at Wave 1: we discard children born after Wave 1 as well as co-residents that joined a sample household after Wave 1 since, by construction, these individuals do not have a full 4-year set of responses. An important distinction between 'register' and 'survey' countries then comes into play.

<sup>(179)</sup> Throughout our analysis, poverty risk lines for each country and year are taken from Eurostat (2014). These thresholds are derived from the cross-sectional EU-SILC datasets.

<sup>(180)</sup> More precisely, it is based on the subsample with valid (non-missing) data on household income in the EU-SILC data files in all years. However, because missing information on income is imputed (and we use the imputed values), all households contain non-missing data on income in the EU-SILC data files.

Two distinct models are used in EU-SILC in the follow-up of respondents (see Chapter 27 of this volume). Survey countries use a standard longitudinal survey design and aim to follow over time all household members initially interviewed; that is, if an original household splits, they attempt to follow all individuals in all the newly-formed households. By contrast, register countries use a 'selected respondent' design and only track *this* 'selected respondent' from each original household. Only co-residents who remain living in the same household as the selected respondent provide information on income over time. This following rule mechanically leads to higher attrition rates in register countries, as we show below, since not all the members of the households that split are tracked.

Variations in practice and in the success of tracking such individuals and interviewing 'split-off' households has been shown to vary widely across countries by Iacovou and Lynn (2013). (see also Chapter 27 of this volume.) These are likely sources of the cross-country differences in attrition rates documented below.

### 22.2.3 Attrition

The differences in size and composition between the W1 Sample and the 4-wave Balanced Sample reflect attrition. Not all individuals or households eligible for an interview after the first interview provide data in subsequent years. There are four reasons for this. First (this is related to the following rule used by these countries), co-residents of the main 'selected respondent' that leave a household are not followed in register countries, by design. Second, some individuals or households move out of scope after the first interview, for example because they die, or move abroad permanently, or move into an institution. Third, eligible individuals may not be followed by the data collection agency, or the agency may be unsuccessful in tracking them (with the chances greater for individuals that split off from a household, or where all members of a household move from the initially-sampled address). Fourth, individuals or households may

refuse to participate in the survey in the second interview or later<sup>(18)</sup>.

The first kind of attrition among register countries — attrition by design — is not necessarily a problem *per se*; the issue in the current context is that it leads to cross-national inconsistencies in EU-SILC. The second kind of sample dropout reflects the dynamics of a population and is a natural feature that is built into the data collection design (based on representation of the population of individuals in private households in a particular country). By contrast, the third and fourth types of attrition are undesirable and, other things being equal, data collection agencies should aim to minimise them. Country-specific factors may also play a role, for example, whether up-to-date address registers exist, the prevalence of geographical mobility by households, general attitudes towards surveys, etc.

### 22.2.4 Sampling weights

Sampling weights are designed to adjust for biases arising from cross-sectional non-response and subsequent longitudinal attrition. The EU-SILC longitudinal files include five types of sample weights (Museux, 2006), of which two are relevant to our analysis.

The first set of weights is the *individual-level base weights* (variable *rb060*). In Wave 1, this is the design weight adjusted for non-response and calibrated. In later waves, it is the base weight of previous year adjusted for non-response. When individuals leave the sample, they are attributed with a weight of zero for each wave thereafter. Our analysis of the W1 Sample uses *rb060* to ensure the sample accounts for non-proportional sampling design (and initial non-response), and for differential attrition, and is calibrated to population totals in 2008.

The second set of weights that we use, *rb064*, is the individual-level longitudinal weights created for analysis of data for the four survey years 2008-2011 and, of course, the weights are only relevant for the single rotation group that provides data for these 4 years. For analysis of the 4-wave Balanced Sample, we contrast results obtained with *rb064* (construct-

<sup>(18)</sup> Chapter 27 in this volume discusses the difficulty in consistently identifying the causes of attrition in EU-SILC across the different countries.

ed to ensure that the balanced sample remains representative of the original 2008 population), with *rb060* at their 2008 values (so they correct for initial non-response and sampling rates, but not for differential attrition), and with *rb060* at their 2011 values (in which case they are similar to *rb064*).

We also create our own bespoke set of longitudinal weights (discussed later). The advantage of these weights is that we can use them to engage in a number of counterfactual exercises that we cannot undertake with the weights that are supplied. We show below that these weights generally closely reproduce estimates derived using the official longitudinal weights although our bespoke weights are derived using variables available in the longitudinal data files, and we do not have access to all the factors employed by statistical offices when producing longitudinal weights (*rb064*), nor do we attempt to calibrate our weights to known population totals, for example, as derived from other data sources or from the full EU-SILC cross-sectional files.

## 22.3 How much attrition is there? Who drops out?

In this section, we document how much attrition there was in the 2008-2011 EU-SILC longitudinal data, and which types of individual were most likely to be lost to follow-up. We discuss attrition — or its complement, sample retention — in terms of differences between the full Wave 1 Sample and the smaller 4-wave Balanced Sample.

### 22.3.1 How much attrition is there overall?

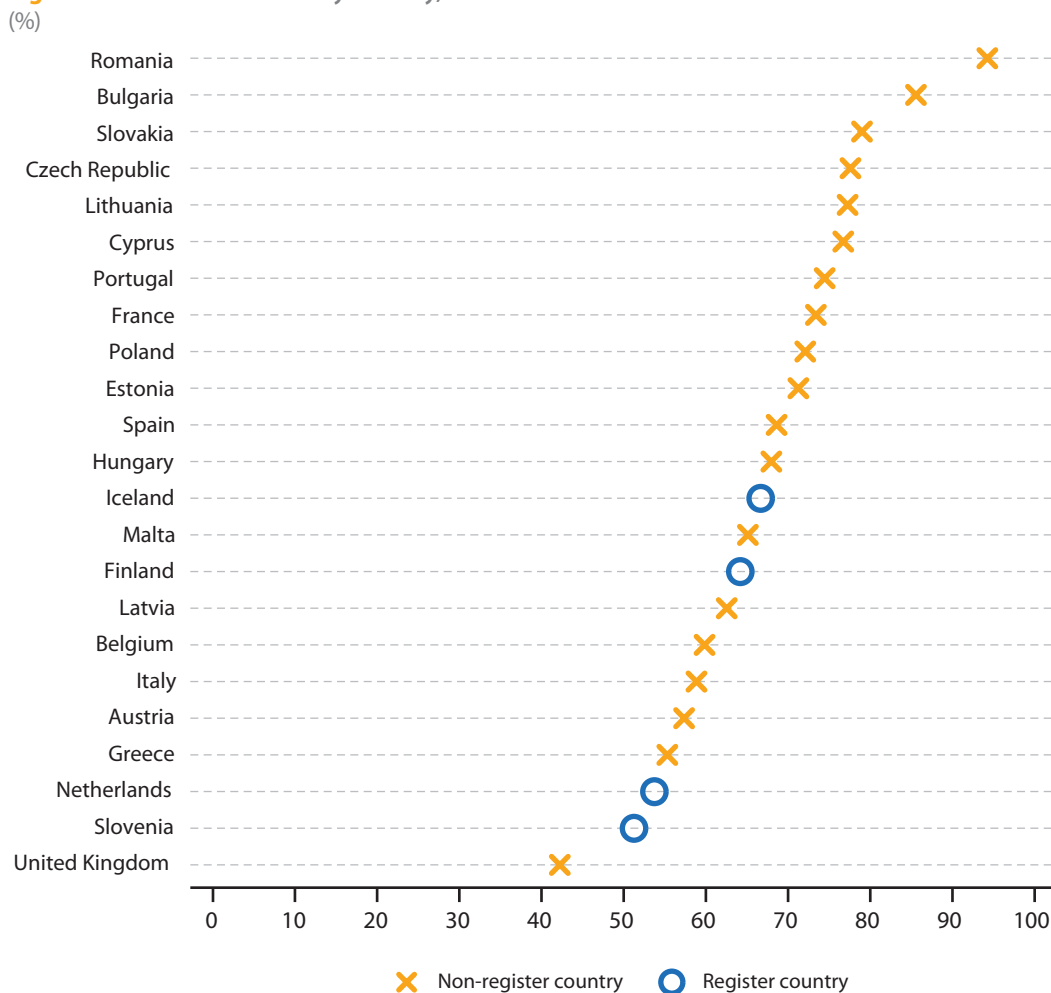
The overall retention rate for each country is the fraction of the country's full W1 sample that belongs to the Balanced Sample. More precisely we calculate the retention rate as the proportion of individuals belonging to a respondent household at Wave 1 which remains in a respondent household in each of the three subsequent waves. These rates are shown in Figure 22.1.

There are very large differences in retention rates across countries, ranging from greater than 90 % to nearer 40 %. The UK stands out as having a particularly low retention rate, nearly 10 percentage points smaller than the next smallest rate, 50 % for Slovenia. There is a cluster of two countries with remarkably large retention rates: those for Romania and Bulgaria are all near 90 %. Unsurprisingly, the method of data collection is related to the retention rate of original household members: 'register' countries (identified by the circles in Figure 22.1; Slovenia, Finland, Iceland and the Netherlands) tend to exhibit comparatively low retention rates for reasons outlined above.

### 22.3.2 Attrition's effect on the precision of estimates

The decrease in sample sizes associated with attrition means that, questions of representativeness and hence bias aside (on which see below), estimates of persistent poverty rates are estimated less precisely. Standard errors are larger, and confidence intervals are wider. The effects of differences in sample size on the sampling variability of estimates can be gauged by noting that the persistent poverty rate is a proportion ( $p$ ), and there is a standard formula for the standard error of a proportion. The standard error of  $p$  is given by,  $d\sqrt{p(1-p)/N}$  where  $N$  is the sample size and  $d$  is a design effect arising because of the complex survey design. We examined how standard errors vary with  $N$ , using values of  $N$  and  $p$  which cover the range of estimates observed in EU-SILC. Following Goedemé (2013), we set  $d$  equal to 1.8, i.e. survey design effects such as stratification and clustering (e.g. of individuals into households, and households into primary sampling units) increase the standard error by 80 % compared to the standard error for a simple random sample of the same size.

Our calculations may provide some cheering news for analysts. Even with substantial attrition and hence relatively small sample sizes, standard errors for persistent poverty rates at the national level may be sufficiently precise. For example, if the persistent poverty rate is around 20 % and the sample size is 2 500, the standard error for the rate is around 0.015, so the estimated rate is more than

**Figure 22.1: Retention rates by country, 2008-2011**

*Reading note:* The retention rate is the proportion of individuals belonging to a respondent household at Wave 1 (2008) which remains in a participating household in each of the three subsequent waves. Only these individuals are used for the calculation of the 2011 persistent poverty rates. Unweighted proportions of Wave 1 sample.

*Source:* Authors' computation, UDB August 2013. 2008 rotation group only.

ten times larger than its standard error, and the 95 % confidence interval is roughly [17 %, 23 %]. If the sample size were instead 1 000, then the standard error increases to around 0.025, so the ratio of estimate to standard error is around 8, and the confidence interval is approximately [15 %, 25 %]. If, instead, the persistent poverty rate is only 5 %, then a sample size of 1 000 implies a standard error of around 0.012, so the ratio of estimate to standard error falls to just over 4. Ratios of around 2 or more

are often interpreted as indicating statistical significance of sufficient degree.

Estimates of persistent poverty rates for subgroups within a country may not be precisely estimated, however. For subgroups of particular policy interest, for example individuals living in households headed by a lone parent, sample sizes are likely to number a few hundred at most. With a sample size of 100 and a persistent poverty rate of 20 %, the standard error is around 0.06, implying a ratio of estimate to standard



error of just over 3 and a 95 % confidence interval of approximately [8 %, 32 %] which is rather wide. In this case, it would be hard to detect statistically significant changes over time in the subgroup persistent poverty rate. The same problem would arise if the persistent poverty rate were smaller than 20 %. To add to this cautionary note, we should say that we suggest later that, even for large sample sizes (such as for countries as a whole), confidence intervals may be sufficiently wide to encompass differences between estimates that are unbiased and those that are biased because of differential attrition.

### 22.3.3 Who drops out?

We now consider which types of individuals are most likely to be included in the 4-wave Balanced Samples. We classify individuals according to their characteristics when measured in Wave 1, and calculate retention rates separately for subgroups defined by those characteristics. The individual characteristics we use are poverty status, quintile group of equivalised disposable household income, age and sex, household type, labour market activity status and education level of the household head, and whether the interview questionnaire was completed by a proxy respondent (another household member filling out the questionnaire on behalf of the target respondent). Differences in attrition (retention) rates associated with individual characteristics exemplify the process of *differential* attrition (retention).

Figure 22.2 shows the univariate breakdowns for each country. Each panel of the figure has a common format. Countries are ordered vertically in each chart by their overall retention rate as provided in Figure 22.1. Each subgroup retention rate is shown separately using a numerical code. If all subgroup rates for a country are very close to each other (and thus also close to the national rate), then attrition is not associated with subgroups membership.

For example, Figure 22.2 panel (a) shows that poor individuals are more likely to be lost to follow-up in around half the countries and, in a few countries (e.g. Belgium and Iceland), the differences are very large. Panel (b) tells a similar story. Retention rates do not vary greatly with income group, except that in a small number of countries, individuals in the poorest fifth are more likely to be lost. (The effects are

more muted than in panel (a), probably because the poorest fifth includes more people than only those counted as poor.)

Figure 22.2, panel (c), shows that, in the vast majority of countries, young men (aged between 18 and 40 years) as well as (to a lesser extent) young women are more likely to attrit than the other age-sex groups. The difference in retention rates across age-sex groups is particularly marked in some countries. For example, in Malta and the UK, the range is around 20 percentage points between the smallest and largest rates.

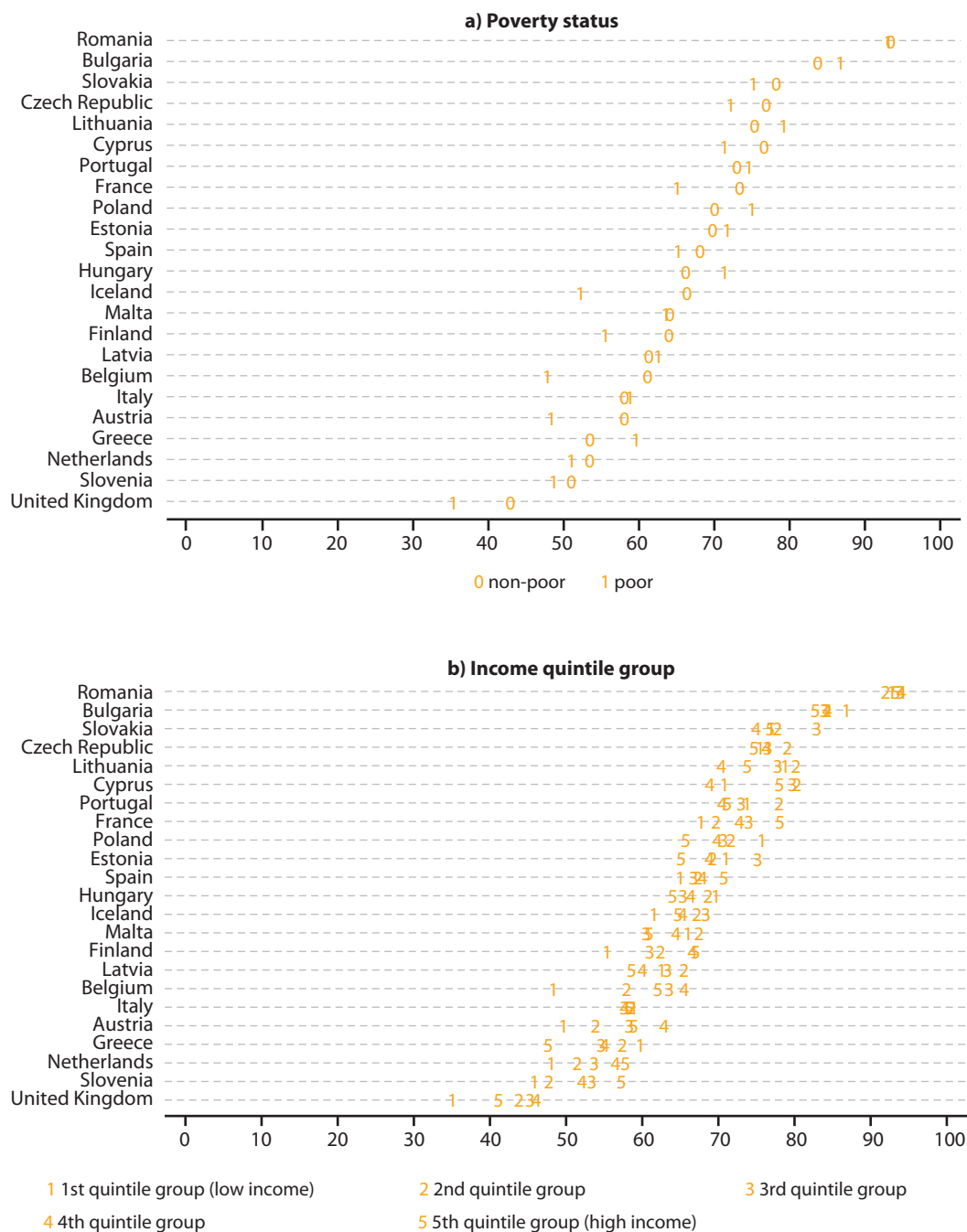
Figure 22.2, panel (d), shows that, for many but not all countries, there are large differences in retention rates between household types in some countries, some of which are larger than shown in panel (c). The general picture is that single adult households (with and without children) are most likely to be lost to follow-up, whereas single or couple households with the head aged 60+ have substantially higher retention rates. These differentials are what one would expect given the positive correlation between geographical mobility and age. But dispersion in retention rates by household type is not inevitable: observe the relatively small differentials for the countries with large overall retention rates (at the top of the figure).

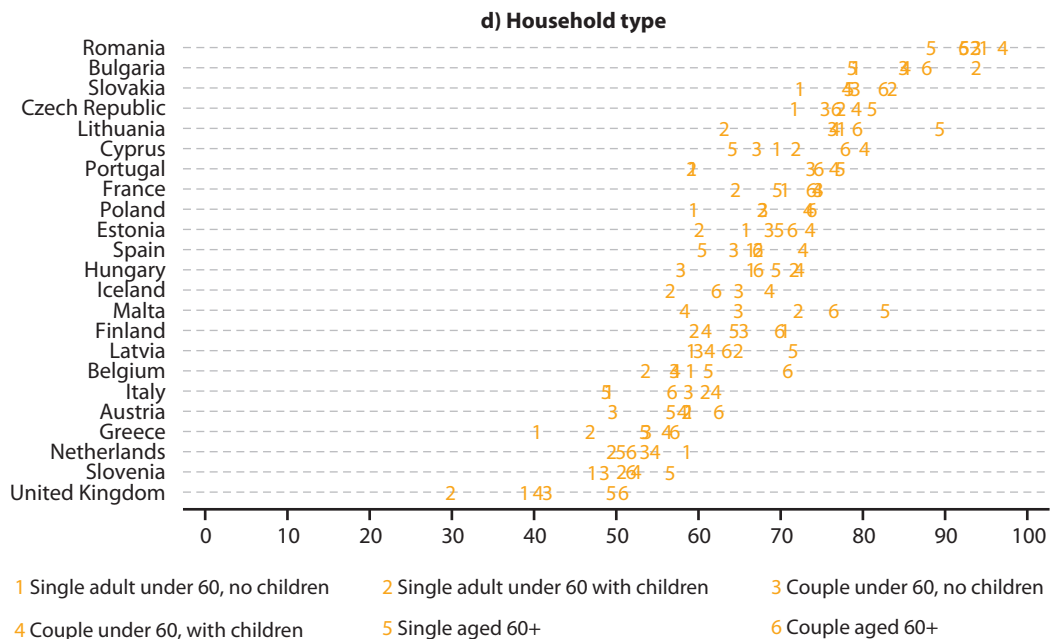
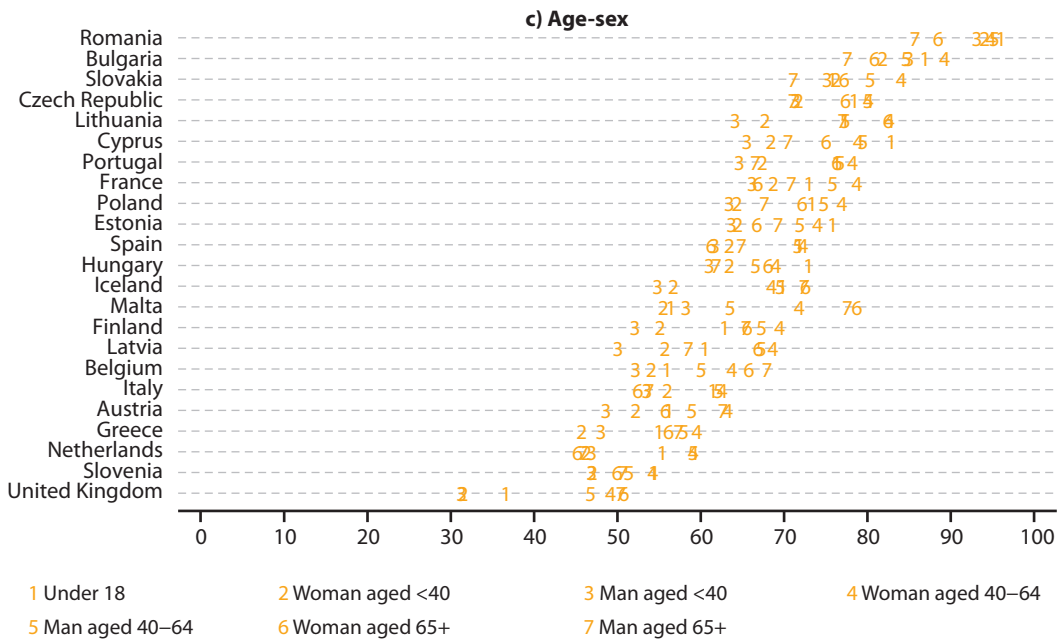
Figure 22.2, panel (e), shows that for most countries retention rates do not vary substantially with the labour market activity status of the household head, though there is a tendency for individuals with unemployed household heads to be more likely to be lost to follow-up and individuals with a retired household head to be less likely to be lost. (In both cases, the head may be the individual him- or herself.) This pattern is particularly marked in some countries. For example, in the UK, the retention rate is just below 20 % for individuals with an unemployed head but around 50 % for individuals with a retired head (a difference of some 30 percentage points). The corresponding differential is more than 20 percentage points in Malta.

There appears to be a more complex association between the education level of the household head and retention rates. For countries with relatively low overall retention rates, it is individuals whose household head has either of the two lowest education-

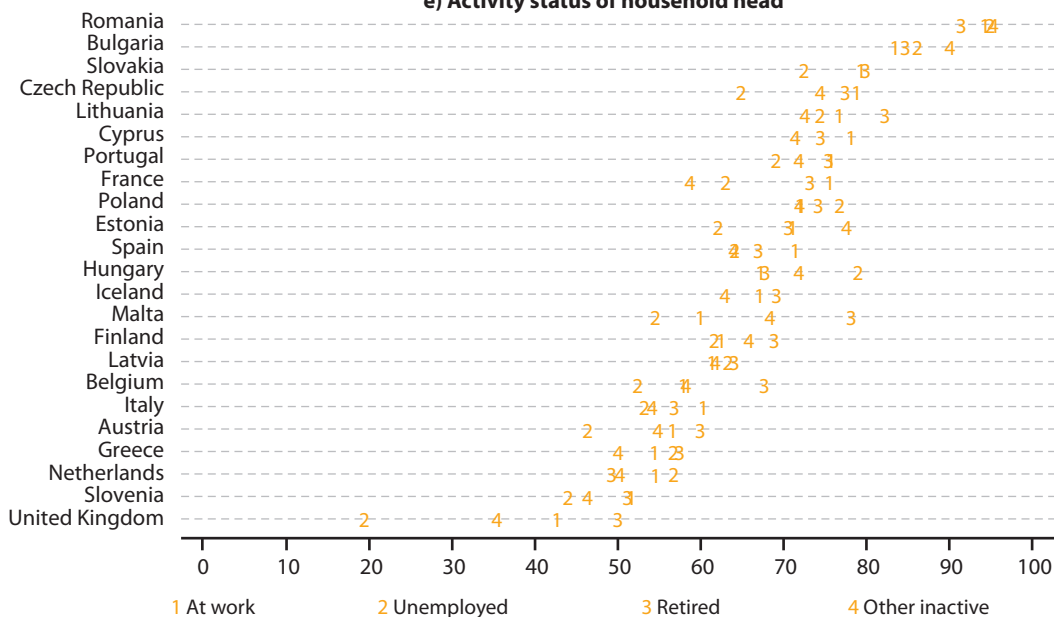
**Figure 22.2: Retention rates by characteristic by country, 2008-2011**

(%)

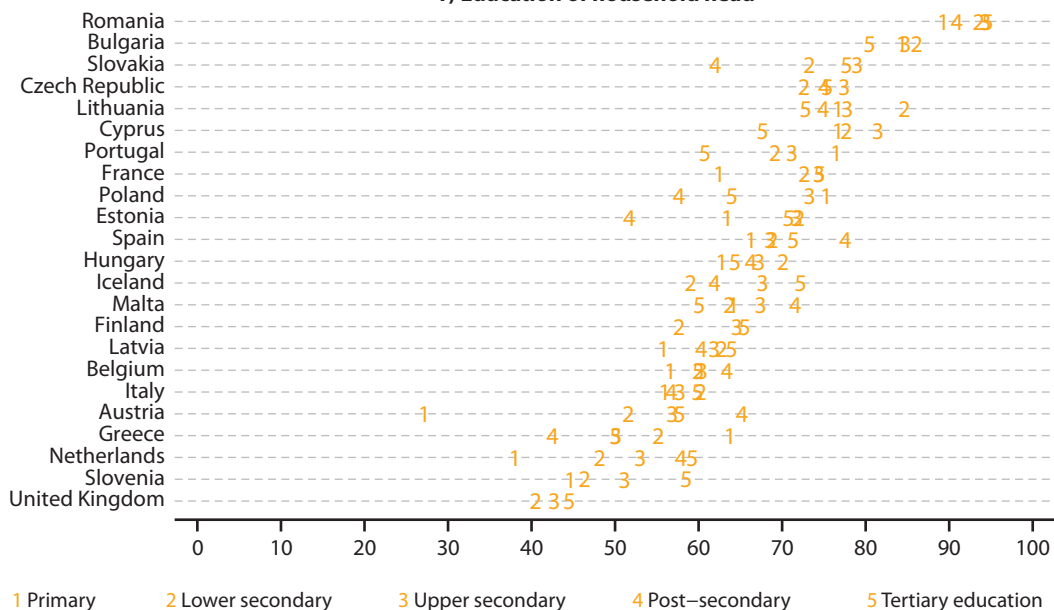


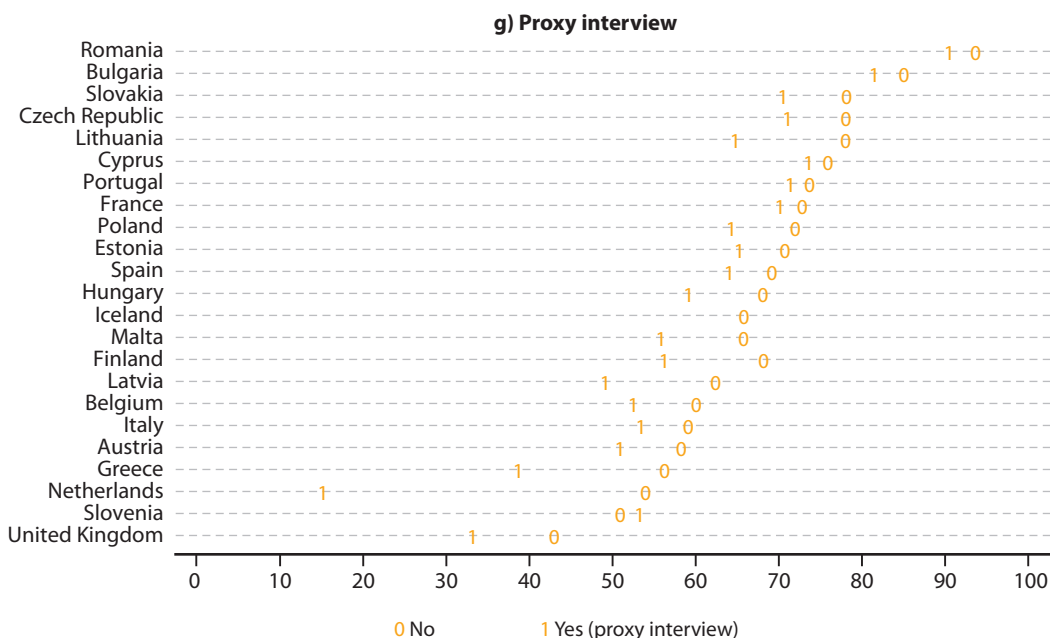


**e) Activity status of household head**



**f) Education of household head**





*Reading note:* The retention rate is the proportion of individuals belonging to a respondent household at Wave 1 (2008) which remains in a participating household in each of the three subsequent waves. Breakdowns are based on data observed in Wave 1. Unweighted proportions of Wave 1 sample. Numbers identify subgroup retention rates. For the overall retention rate, see Figure 22.1.

*Source:* Authors' computation, UDB August 2013. 2008 rotation group only.

al levels who have the largest attrition rate. (Austria stands out as an example of this.) And for countries with relatively high overall retention rates, it is individuals whose household head has either of the two highest educational qualifications who have the largest attrition rate. (Look at the cases of Estonia or Slovakia, for example.)

Besides individual or household characteristics, fieldwork-related features are correlated with attrition. Figure 22.2, panel (g), shows that the retention rate for individuals for whom data were collected from a proxy respondent in Wave 1 tend to have low retention rates. This is particularly strong in the Netherlands or Greece, for example. This is unsurprising because a proxy interview in the first wave is indicative of difficulties in securing a respondent's participation to start with. Under-representation of the 'proxy respondent' characteristic itself is unlikely to be a concern; rather, the concern is the extent to which being a 'proxy respondent' is associated with other relevant individual characteristics.

In sum, there is substantial diversity in the rates at which individuals from EU-SILC Wave 1 samples are also found in the 4-wave Balanced Samples from which persistent poverty rates can be calculated. There is differential attrition in terms of observable characteristics <sup>(182)</sup>. The finding of diversity in retention rates was also reported by Behr, Bellgardt, and Rendtel (2005) and Watson (2003) in the ECHP, though specific results are difficult to compare because findings are summarised in different ways in the different studies (and there is no good 'one number' summary of the *amount* of differential attrition).

<sup>(182)</sup> We have also undertaken probit regression analysis to examine the association between the probability of retention and each characteristic. Multivariate analysis helps tease out the associations between retention rates and a particular characteristic, holding other characteristics constant. Our multivariate analysis of the correlates of retention propensities is reported in Jenkins and Van Kerm (2017: Figure 4). It turns out that many of the associations uncovered by the univariate analysis are also found in the multivariate analysis, and so we do not discuss these results further here.

### 22.3.4 Generating bespoke sample weights from retention regressions

The purpose of longitudinal weights in general is to adjust the 4-wave Balanced Sample so that the reweighted Wave 1 covariate distributions of the sample is the same as the Wave 1 distribution of covariates in the full Wave 1 Sample. Using simple multivariate probit regressions, we construct bespoke weights by multiplying the Wave 1 base weights of each observation  $i$  provided in EU-SILC,  $\omega_i$ , by the inverse of the retention probability predicted by the combination of the fitted regression parameters and the values of the predictor variables. So, if  $r_i = \Phi(X_i b)$  is the predicted retention probability of observation  $i$  belonging to the 4-wave Balanced Sample for a given country given standard Normal distribution  $\Phi(\cdot)$ , vectors of characteristics  $X_i$  and fitted regression parameters  $b$ , individual  $i$ 's bespoke longitudinal weight is  $w_i = \omega_i \times (1/r_i)$ .

EU-SILC longitudinal weights are constructed by national statistical institutes in a similar though not identical fashion. They use cumulative year-on-year retention probabilities (rather than a 4-year probability we have). They may include Wave 1 characteristics or perhaps more detailed fieldwork information that is not available in the public release files; and more flexible specifications for the regression equations used to predict retention probabilities; and there may be adjustment and calibration to the marginal distributions observed in full cross-sectional samples. Our specification is basic, but it can be implemented straightforwardly using the data in the scientific-use EU-SILC files that are available to us.

The greater the dispersion of subgroup attrition rates around a national average, the greater the variance in a country's sample weights. This can also have an adverse impact on the precision of estimates of persistent poverty rates — a factor that we did not take into account earlier when showing the connection between standard errors and sample size. We assumed in our illustration that the design effect was constant across countries. However, the variance of the sample weights is one of the factors that influence the design effect, mediating

the relationship between sample size, standard errors and the poverty rate. So, although application of sample weights may adjust for bias associated with differential attrition, it may come at a cost in terms of sampling variability when attrition is heavily differential and therefore sample weights have substantial variability.

We use our bespoke weights for some counterfactual exercises that cannot be undertaken with the EU-SILC weights.

## 22.4 What effects does differential attrition have?

In this section, we provide indirect evidence about potential bias in estimates resulting from differential attrition. See Jenkins and Van Kerm (2017) for additional analysis using different approaches.

### 22.4.1 Indirect evidence of attrition bias: comparisons of estimates of Wave 1 poverty rates

We follow Behr, Bellgardt, and Rendtel (2005) and assess the magnitude and potential impact of attrition by comparing our original base sample with the sample that remains after attrition. In our application, this means comparisons of statistics derived from the W1 Samples with the same statistics derived from the 4-wave Balanced Samples. The benchmark statistic is the Wave 1 (2008) poverty rate. If there are differences in estimates, this suggests that the differences in the samples will also lead to bias in estimates of persistent poverty statistics (which cannot be calculated for both samples, of course) <sup>(183)</sup>. We refer to this as indirect evidence because it is not directly about the persistent poverty rate.

<sup>(183)</sup> The W1 Samples and the Balanced Samples are not representative of exactly the same target population. The latter excludes by definition people who leave the sample frame between Wave 1 and Wave 4 (through death, out-migration, or move into non-private households). So differences in Wave 1 estimates between the two samples can also reflect differences in target populations. However, over only 4 years, we expect this effect to be very small.

Figure 22.3, panel (a), contains four series of estimates of Wave 1 poverty rates for each country (countries are ranked as before). The 'All W1' sample consists of all individuals in the Wave 1 sample; there are two series calculated using our Balanced Samples but using different weights (the EU-SILC longitudinal weights and our bespoke ones). As an additional reference point, we show the estimates of the 2008 poverty calculated using the full cross-sectional sample (i.e. based on multiple cohorts rather than simply one) that are calculated and reported by Eurostat (2014).

In an ideal world, without random sampling variability, attrition or other data problems, all series would provide the same estimate for the poverty rate in 2008. Comparison of the Eurostat series (yellow filled circles) with the 'All W1' series (green diamonds) indicate that there are discrepancies associated with differences between full cross-sectional and longitudinal data files that we are unable to resolve using the data available to us. Although the differences in estimates are small for some countries (e.g. Bulgaria, Estonia, France, Italy, Hungary, Poland, Slovenia, Slovakia), there are differences that are relatively large for some other countries, nearly five percentage points in some cases (sometimes a negative difference, sometimes a positive one). See e.g. Greece, Iceland, the Netherlands, Romania and the UK. There appears to be no systematic relationship with type of data collection or persistent poverty rate. Because these differences relate to aspects that we cannot control, we note the inconsistencies and pass on to the other comparisons. (Differences between full cross-sectional and longitudinal files are primarily related to sampling variability since the former are composed of about four times as many observations, but note also that the longitudinal files potentially have more non-response bias and older frames than 'All W1' estimates.)

Specifically, we are interested in the extent to which the longitudinally-weighted estimates from the 4-wave Balanced Samples match the estimates from the 'All W1' samples (compare estimates denoted by a cross and by a green diamond, respectively), and then the extent to which estimates using our bespoke weights match the estimates based on the Eurostat weights (compare estimates

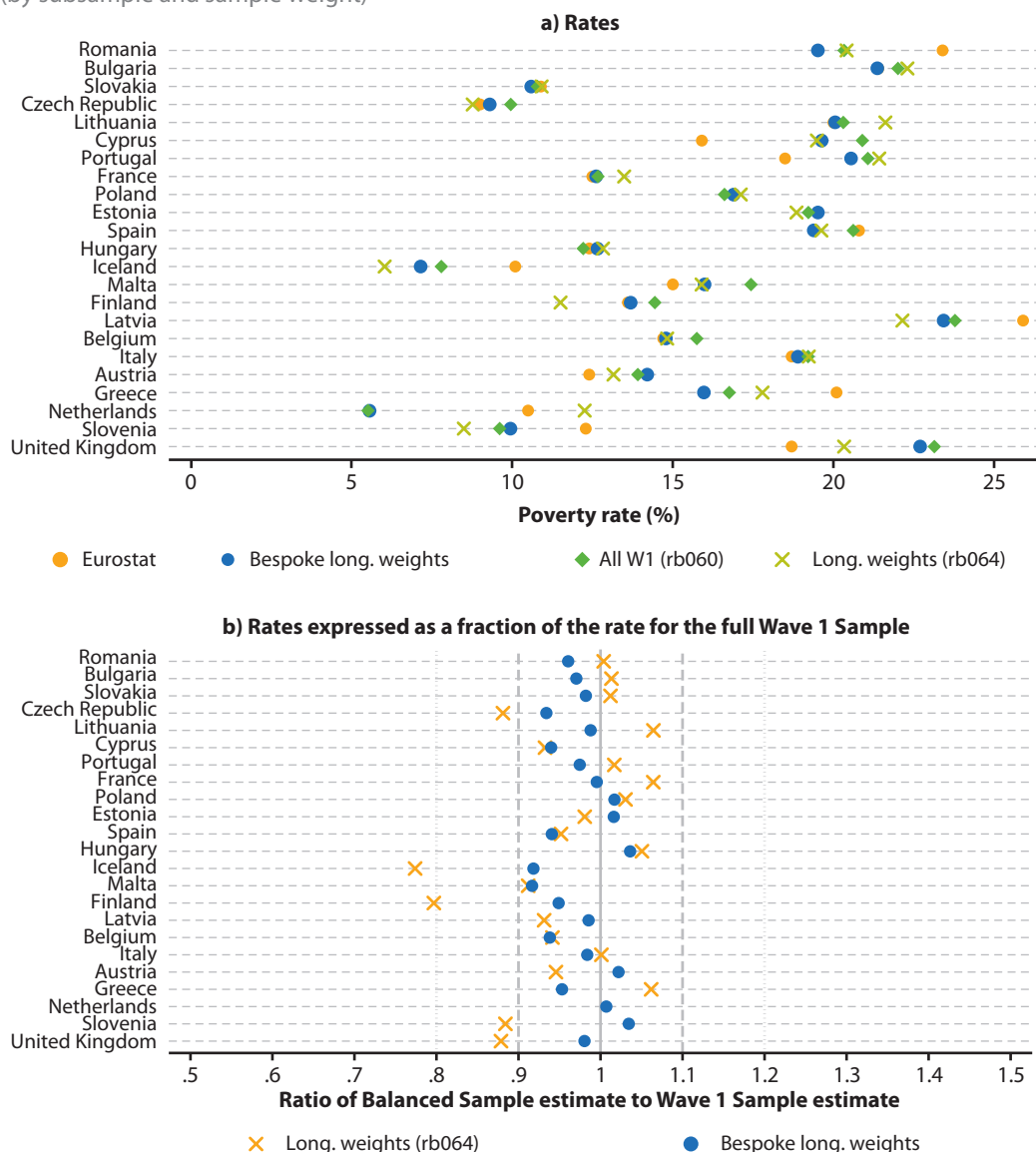
denoted by a green cross and by a blue dot). These comparisons are easiest to make if one looks at Figure 22.3, panel (b), in which each longitudinal sample estimate is expressed as a ratio of the corresponding 'All W1' sample estimate. Longitudinal estimates that lie outside the boundaries demarcated by the vertical dashed lines differ by more than 10 % from the 'All W1' sample estimates. These cases are a signal that differential attrition is likely to lead to bias that is not fully accounted for by weighting. (The boundaries are sufficiently wide to allow for differences arising from sampling variation or differences in the underlying sample frame.)

The figure shows that, for 17 of the 23 countries, the longitudinal estimates based on the Eurostat weights are within 10 % of their full Wave 1 Sample counterparts. However, for six countries, the estimates are outside the boundaries, and hence there is indirect evidence that unaccounted-for differential attrition is possibly leading to bias. For three countries (the Czech Republic, Slovenia and the UK), longitudinal sample estimates are between 80 % and 90 % of their corresponding Wave 1 sample estimate and, for two countries (Finland, Iceland), the longitudinal estimates are even smaller, less than 80 % of their corresponding Wave 1 sample estimate.

Differences turn out to be large for the four register countries (Finland, Iceland, the Netherlands and Slovenia). However, again, the evidence about potential bias from differential attrition is less strong for these countries if our bespoke longitudinal weights are used rather than the Eurostat ones. With the former, the longitudinal estimates for all countries are within 10 % of their Wave 1 Sample counterpart.

The Netherlands stands out in this exercise. Its poverty rate estimate based on the balanced sample with EU-SILC longitudinal weights is more than twice the estimate obtained on the All Wave 1 sample and the estimate obtained from the balanced sample with our bespoke weights. (The relative difference is so large that it does not fit the horizontal scale of Figure 22.3 (b).) Eurostat's estimate is in between the two estimates although it is almost twice as large as our calculations. This suggests, first, that the other three cohorts forming the full cross-sectional dataset differ widely from the

**Figure 22.3: Estimates of Wave 1 (2008) poverty rate**  
(by subsample and sample weight)



NB: Countries ordered as in Figure 22.1.

Reading note: Panel (a) shows Wave 1 (2008) poverty rates estimated on alternative subsamples and with alternative sample weights. All estimates are based on the balanced sample of full 4-year respondents, except 'All W1' which is based on all respondents at Wave 1 (including subsequent attriters) and Eurostat's estimates based on cross-sectional data for 2008. The weighting of the samples are: 2008 base weights (*rb060*) for 'All W1', 2011 EU-SILC longitudinal weights (*rb064*) and 2011 bespoke longitudinal weights for the Balanced Sample. Panel (b) shows estimates expressed as a fraction of the corresponding 'All W1' sample estimates. In the bottom panel, the estimate for NL is not shown as its estimate from the EU-SILC longitudinal sample is an outlier (see text).

Source: Authors' computation, UDB August 2013. 2008 rotation group only. Eurostat estimates are from Eurostat (2014) and are computed using 2008 cross-sectional EU-SILC data.



2008-2011 cohort we focus on. Second, the EU-SILC weights for the Netherlands appear to be calibrated to fit a rich set of external distribution characteristics, including income distribution information. This casts serious doubt about the representativeness of analysis based on the Dutch longitudinal data alone, since, as we shall illustrate, large adjustments to the longitudinal sample weights lead to wide sampling variability.

In sum, there is suggestive evidence of bias from differential attrition for a number of countries, but strong(er) conclusions are difficult to draw because of the inconsistencies across the different sets of estimates. We observe that our bespoke longitudinal weights generally do a good job of reproducing estimates derived using Eurostat longitudinal weights but, again, there are a few marked differences.

### 22.4.2 Is attrition bias within the range of sampling variability?

Our ability to draw strong conclusions is also complicated by the fact that all estimates are subject to sampling variation, and this may overwhelm any differences in bias due to differential attrition. We illustrate this point in Figure 22.4, which shows estimates of persistent poverty rates from the 4-wave Balanced Sample calculated using the Eurostat weights (crosses) and our bespoke weights (green diamonds), and their associated 95 % confidence intervals. For reference, also shown (using yellow circles) are the estimates published by Eurostat for the same period (Eurostat 2014) and estimates obtained without any weights (green squares) <sup>(184)</sup>.

The main messages of Figure 22.4 are, first, that confidence intervals for persistent poverty rates calculated using Eurostat and our bespoke longitu-

dinal weights overlap substantially in the vast majority of countries. There are some clear differences, to be sure, most notably for the Netherlands, but also for several other countries (such as Slovakia) — the countries for which we identified differences between the series earlier.

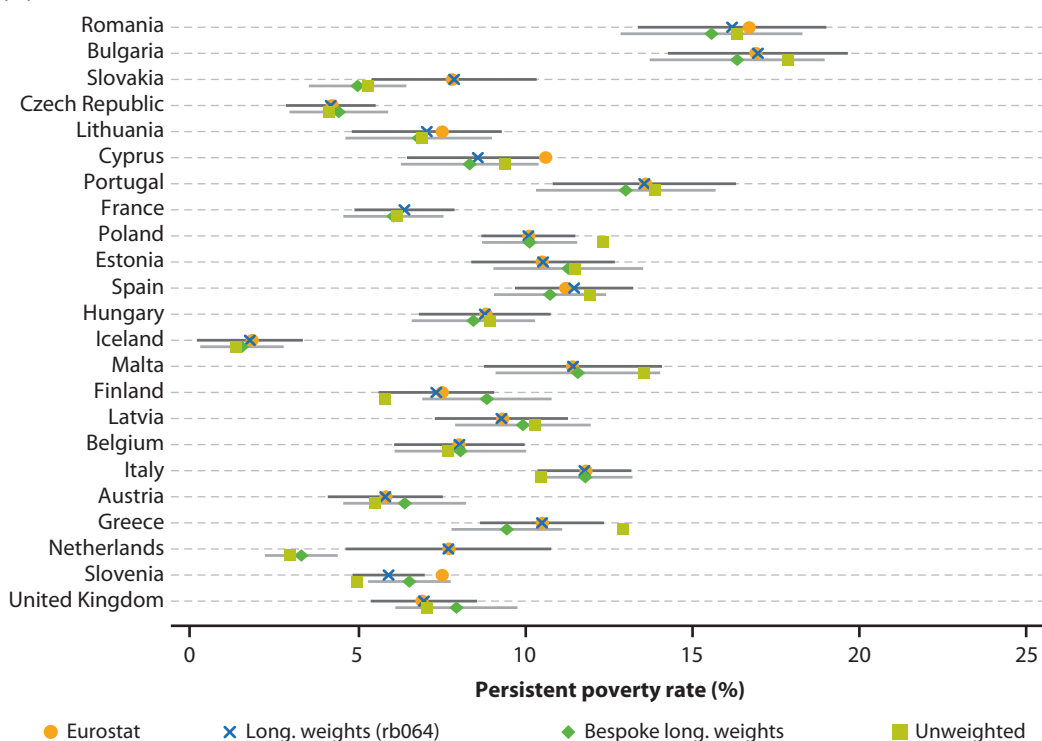
The second lesson is that confidence intervals for persistent poverty rates can be relatively wide. The ranges shown in the figure are of course similar to those suggested by our calculations earlier, but the lesson here is that the effects of differential attrition would have to be relatively large for differences to be significant in the statistical sense and, for example, to change the ranking of countries by persistent poverty rates.

The wide confidence interval for the Netherlands with the EU-SILC longitudinal weights connects to the discussion of Figure 22.3 and illustrates how large adjustments to sampling weights influence sampling variability. In light of these results, it is unclear whether the benefits in terms of bias reduction from calibrating sample weights to more reliable external information (here the cross-sectional data) are not offset by the increased sampling variability. A more detailed analysis in terms of mean squared error (which summarises both bias and variance in a single statistic) would be relevant here.

The cross-country ranking of persistent poverty rates shown in Figure 22.4 is broadly the same as the ranking that we reported in earlier work (Jenkins and Van Kerm, 2014), though we should point out that the estimates are not directly comparable because the sets of countries differ (the 21 used in the earlier paper are not a subset of the 23 used here), and the EU-SILC data have been revised since the earlier study.

<sup>(184)</sup> Puzzlingly, there are some distinct differences between the published estimates and estimates based on the Eurostat longitudinal weights. The former are larger than the latter for Spain and Cyprus (around three percentage points in the latter case).

**Figure 22.4: Estimates of 2008-2011 persistent poverty rates with different sampling weights**  
(%)



NB: Countries ordered as in Figure 22.1.

Reading note: Persistent poverty rates calculated by the authors use alternative sampling weights (defined in the text) and are surrounded by 95% confidence intervals. They are contrasted with rates published by Eurostat (circles) and plain unweighted estimates (squares).

Source: Authors' computation, UDB August 2013. Eurostat estimates are from Eurostat (2014).

## 22.5 Conclusions

Rates of attrition from the 4-year EU-SILC samples used to calculate persistent poverty rates vary substantially across Member States. The loss of sample size associated with attrition may lead to increases in standard errors for persistent poverty rates, and wider confidence intervals, that are sufficiently large — especially for population subgroups — that it is not possible to derive statistically robust conclusions about changes in persistent poverty rates over time or differences between subgroups.

There is substantial cross-national diversity in the characteristics of individuals lost to follow up. One key distinction stems from the different follow-

ing rules applied by register and survey countries when households split. Overall, differential attrition abounds in EU-SILC. Moreover, we provide indirect evidence that application of longitudinal weights is essential yet it may not fully account for the effects of attrition, and that different assumptions about the poverty status of attritors lead to wide bounds in estimates of persistent poverty rates for most Member States. Thus, overall, we are less sanguine about the impact of attrition of EU-SILC-based estimates of persistent poverty than Watson (2003) was about the estimation of cross-sectional statistics using the ECHP.

We have been unable to pin down with confidence the effects of sample attrition on bias and precision in estimates of persistent poverty rates, but we have produced sufficient evidence to support

a conclusion that researchers and data producers need to be mindful of these issues. Researchers analysing persistent poverty should at the least provide standard errors and confidence intervals for their estimates of rates, and their changes over time or differences between countries. (For EU-SILC applications, see e.g. Goedemé, 2013 and Chapter 26 of this volume.) Sampling variability is not identical to the uncertainty introduced by attrition, but accounting for the former should help remind readers of the effects of the latter.

National data collectors and Eurostat should continue their efforts to reduce loss to follow-up. This would be all the more important if a decision is made to extend the panel dimension of EU-SILC to more than 4 years. Extending the panel duration is attractive on substantive grounds, but minimising attrition and minimising cross-country differentials in its patterns is essential to reap the benefits of panel lengthening. Currently, the following rules are not implemented successfully in all the survey countries and, in the register countries, they are different by design. Our analysis has provided additional information about the groups at greatest risk of not providing income data for 4 years, and whom should therefore receive special attention. Reducing inconsistency across countries in the application of following rules would also have payoffs for sample retention overall and reduce differential attrition (see Chapter 27 of this volume). If more information about the details of the data collection process were available in the EU-SILC UDB, this might be used to derive better weights to account for attrition or to build more successful parametric models. We have also drawn attention to a number of apparent inconsistencies in estimates between cross-sectional and longitudinal components of EU-SILC, and it would be good to have these resolved.

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# 23

## Exits from poverty and labour market changes: taking up a job does not always help to get out of poverty

Céline Thévenot <sup>(185)</sup>

### 23.1 Introduction

The population facing poverty and social exclusion is made up of both a body of permanently poor people and a number of rotating individuals experiencing shorter spells of poverty. To tackle poverty durably, policy-makers need to understand the drivers of both permanent and transient poverty. They also need to address the question of how to help people exit income poverty during both employment and unemployment spells.

This chapter aims at understanding the dynamics of poverty through an analysis of year-on-year transitions. It highlights national differences in poverty turn-over across EU Member States. This chapter also aims to relate changes in labour market conditions, i.e., job take-ups and exits from poverty. It shows that, on average, taking up a job helps people to get out of poverty in half of the cases. Finally, the role of policy support in changing employment status is discussed through the example of unemployment benefit coverage.

This chapter is structured as follows: The first section focuses on the dynamics of poverty and highlights the added value of understanding poverty as a dynamic process. It focuses especially on the year-on-year transitions into and out of the 'at risk

of poverty' group. The second section focuses on labour market changes and associated exits from poverty, with a special focus on the transition from unemployment to employment. The third part discusses to what extent a broad and well-designed unemployment benefit coverage can support transitions to employment and contribute to preventing entries into poverty.

### 23.2 The dynamics of poverty

#### 23.2.1 The value added of multiannual poverty measurement

Analysing the risk of poverty over time enables one to better understand its drivers and the channels to mitigate it. The first approach to poverty analysis over time was the life-cycle perspective (Rowntree, 1901). Based on this approach, individuals are more prone to experiencing poverty during earlier and later stages of their lives, and to getting out of it during their working age. Later approaches introduced in the 1990s refer to the individualisation of social risks and life events, such as birth of a child, or a separation (Beck, 1992; Taylor-Gooby, 2006). Based on this perspective, individuals go through their lives with a certain degree of insecurity, and face the risk of experiencing events such as unemployment, health problems or household changes.

Several outcomes can occur between the two extreme states of never being at risk of poverty on the one side, and always being at risk on the other

<sup>(185)</sup> OECD (European Commission, DG EMPL at the time of writing). The author wishes to thank Anthony B. Atkinson, Carlos Farinha Rodrigues, Tim Goedemé, Anne-Catherine Guio, Richard Layte, Isabelle Maquet, Eric Marlier, Guillaume Osier and Leen Vandecasteele for their comments. All errors remain her own. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2). Neither the OECD nor the European Commission bear any responsibility for the analyses and conclusions, which are solely the author's. Email for correspondence: [Celine.thevenot@oecd.org](mailto:Celine.thevenot@oecd.org).

side. Poverty spells can last for a while in the form of persistent income poverty, or be extremely short in the form of transient income poverty. The position of income with regard to the poverty line can also be less clear-cut, with alternative movements above and below the poverty threshold (recurrent or occasional) or people entering income poverty and never getting out of it. As a result, Jenkins (2011) referred to income trajectories as a plateful of cooked spaghetti, with each strand corresponding to an individual's profile, which needs to be unravelled.

In this perspective, empirical research has defined types of income trajectories in order to measure their prevalence (see for example Gardiner and Hills, 1999). Muffels et al. (1999) defined the following four income trajectories with respect to the poverty line (see Figure 23.1):

- persistent risk of poverty: trajectories where the risk of poverty is experienced during the whole period or almost the whole period;
- recurrent risk of poverty: trajectories where several spells of income poverty occur during the period;
- transient risk of poverty: trajectories where the risk poverty is experienced only for a short spell;

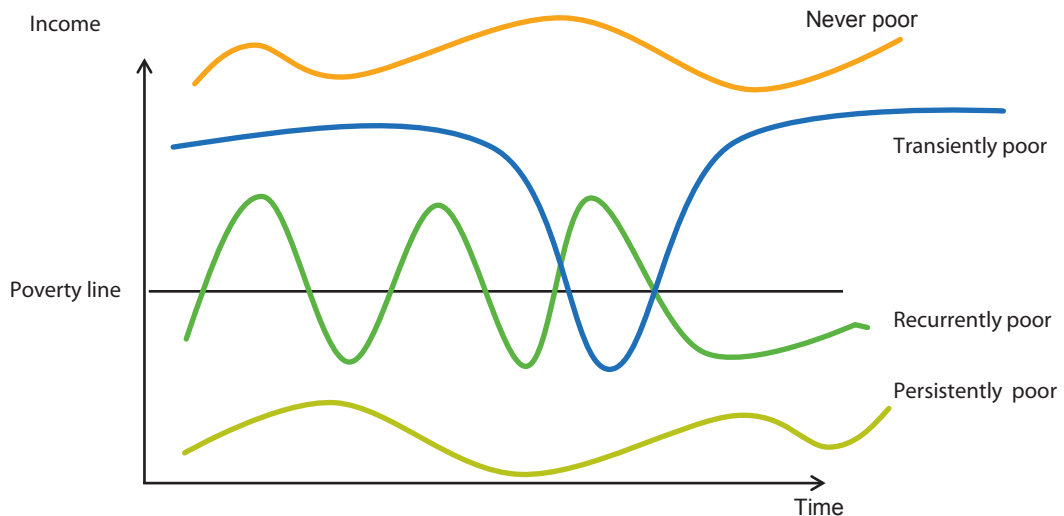
- never income-poor: trajectories where the risk of poverty is never experienced over the whole period.

Empirically, it is not possible to isolate each type of income trajectory with a 4-year panel such as EU-SILC. Recurrent risk of poverty can only be approximated with spells of poverty separated by at least 1 year out of the risk of poverty, and transient risk of poverty can be approximated with trajectories comprising only one spell of poverty.

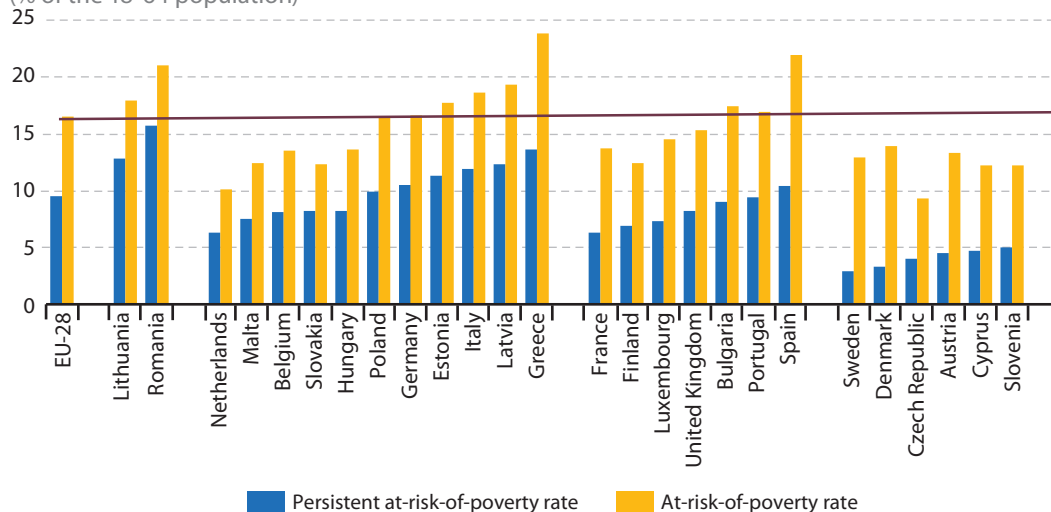
Longer spells of income poverty can be more easily identified. The risk of persistent poverty is defined consistently with the definition of the EU social indicator, namely the risk of poverty during the final year of the panel accompanied by at least 2 other years of poverty among the preceding 3 years.

In 2012, 16.5 % of the EU working age (18-64) population was at risk of poverty and 9 % was at persistent risk of poverty (see Figure 23.2). While a small part of the population at risk of poverty was persistently poor in some countries, much more significant parts were also persistently poor in others. Pairs of Member States with comparable cross-sectional risk of poverty rates, for example Romania and Spain, Slovakia and Austria, or France and Sweden, have quite different shares of their poor population suffering

**Figure 23.1: Types of poverty trajectories**



**Figure 23.2: Persistent at-risk-of-poverty rate and at-risk-of-poverty rate by Member State, 2012**  
(% of the 18-64 population)



NB: Member States are grouped by increasing size of the population at risk of persistent poverty within the population at risk of poverty and ranked within each block by increasing persistent-risk-of-poverty rates.

Reading note: In the EU-28, 16 % of the 18-64 population was at risk of poverty in 2012. 9.5 % of the 18-64 population was persistently poor.

Source: EU-SILC (Eurostat web-database).

from persistent poverty (and then suffering from less severe forms of exclusion).

Nevertheless, the measurement of persistent risk of poverty, which requires using the whole duration of the panel (4 years), might be subject to measurement problems such as attrition and treatment of new entrants in the rotation sample. As shown in detail in Chapter 22 in this book, which discusses these issues in-depth, there are large differences in attrition rates across countries, with larger attrition in the United Kingdom and in Slovenia and very limited attrition in Romania and Bulgaria.

uals not at risk of poverty among those who were at risk of poverty the year before. Between 2010 and 2011, some 7 % of the EU 18-64 population entered into income poverty, while 37 % of the population at risk of poverty in 2010 exited poverty in 2011. Both entry and exit poverty rates increased throughout the crisis <sup>(186)</sup>. The entry rate increased from 6.0 % between 2008 and 2009 (2010 EU-SILC data, see Box 23.1) to 7 % between 2010 and 2011 <sup>(187)</sup> (2012 EU-SILC data). Over the same period, exit rate increased from 35 % to 37 % <sup>(188)</sup>. See Chapter 20 in this book for further analysis of the changes in entries and exits from material deprivation during the crisis.

### 23.2.2 Entering into and getting out of poverty

A simple and complementary approach to examining the dynamics of the risk of poverty consists of analysing the year-to-year transitions into and out of risk of poverty, as does the rest of this chapter. The entry rate into poverty is measured as the share of those who were not at risk of poverty 1 year earlier but fell into risk of poverty. Symmetrically, the exit from poverty rate is defined as the share of individ-

<sup>(186)</sup> This can be explained by the severity of the crisis for entries into poverty, and by changes in at-risk-of-poverty thresholds due to a decrease of the median income and thereby the poverty threshold for exits out of poverty (see Vaalavuo, 2015 for a discussion on the impact of the changes in poverty threshold on poverty transitions).

<sup>(187)</sup> Over countries for which the 2012 data are available.

<sup>(188)</sup> During the same time, the poverty risk increased across these Member States. This is not incompatible with increases in both entry into and exits out of poverty, as the entry rate applies to a population four times bigger than that of the exit rate, i.e., the population not at risk of poverty.

The combination of entry and exit rates varies considerably across Member States (see Figure 23.3). Four main patterns emerge.

Spain, Austria and the United Kingdom are singled out in a first group. In these countries, both exit from poverty and entry-into-poverty rates are higher than the EU average. This outcome seems relatively positive, as those entering poverty can count on a high chance of exit in the near future. However, income poverty can also be recurrent. In such a framework, people might repeatedly go in and out of the risk of poverty with insecure prospects. In the United Kingdom and Spain, the share of means-tested benefits is far above the EU average, and might partly explain this pattern. This, however, is not the case in Austria.

The second group of countries, consisting of Estonia, Greece, Croatia, Italy, Latvia and Portugal, shows a high entry-into-poverty rate, and a moderate exit-from-poverty rate. This situation reflects a possible

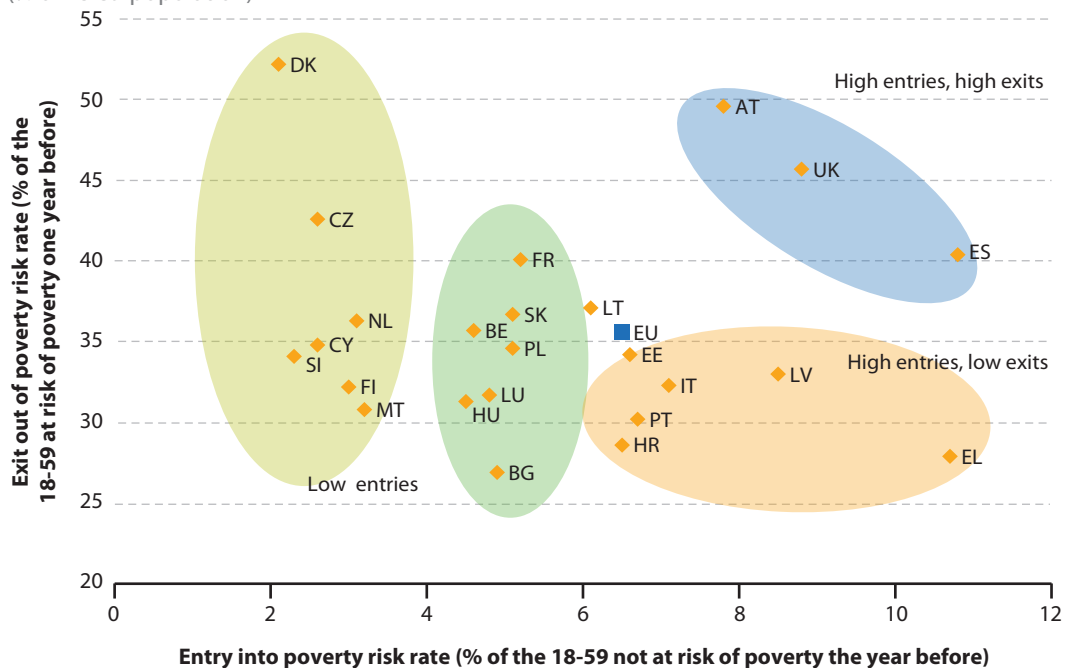
risk of being trapped in income poverty, with the individuals falling into the risk of poverty having limited chances to get out of it in the following years. These countries should both address better prevention of income poverty, and promote policies aiming at pulling individuals out of income poverty.

In the third group, entry-into-poverty rates are close to average, combined with low to moderate exit-from-poverty rates in Belgium, Bulgaria, France, Luxembourg, Hungary, Poland and Slovakia. In this group, there are some risks of being trapped in poverty, as chances to exit are low, especially in Bulgaria, where the exit-from-poverty rate is very low.

Finally, the Czech Republic, Denmark, Cyprus, Malta, the Netherlands, Slovenia and Finland show signs of very low entries into and low exits from risk of poverty. However, this does not prevent some parts of the population at risk of poverty to remain durably excluded. In Malta and the Netherlands for

**Figure 23.3: Entry into and exit out of poverty risk rates, 2010 and 2011**

(% of 18-59 population)



NB: The EU average is displayed for the 25 MS for which data are available.

Reading note: In the EU, 7 % of the 18-59 individuals not at risk of poverty in 2010 were poor in 2011 (entry poverty risk rate). Similarly, 36 % of those who were poor in 2010 were not poor in 2011 (exit poverty risk rate).

Source: Author's computation, UDB March 2015.



example, the share of the persistent income-poor is high within the population at risk of poverty.

As these figures result from survey data, some measurement errors can occur. Estimates of the 95 % confidence intervals around the entry and exit rates are detailed in Table 23.1.

## 23.3 The role of labour market transitions in exiting out of the risk of poverty

Changes in labour market conditions and risk-of-poverty transitions are linked, but to which extent? The European Commission (2009) highlighted that 'employment increases have not suf-

**Table 23.1: Entry-into- and exit-out-of poverty risk rates and 95 % confidence intervals, 2010 and 2011** (% of 18-59 population)

	Entry		Exit	
Denmark	2.1	[0.2;3.9]	52.2	[42.2;62.2]
Slovenia	2.3	[1.0;4.0]	34.1	[28.4;39.8]
Cyprus	2.6	[1.8;3.4]	34.8	[26.4;43.2]
Czech Republic	2.6	[2.0;3.2]	42.6	[36.2;49]
Finland	3.0	[2.2;3.8]	32.2	[26.6;37.8]
Netherlands	3.1	[2.3;3.9]	36.3	[28.9;43.7]
Malta	3.2	[0.1;6.3]	30.8	[23.3;38.3]
Hungary	4.5	[3.8;5.2]	31.3	[27.2;35.4]
Belgium	4.6	[3.6;5.6]	35.7	[29.2;42.2]
Luxembourg	4.8	[3.2;6.4]	31.7	[24.3;39.1]
Romania	4.8	[3.8;5.8]	16.9	[13.2;20.6]
Bulgaria	4.9	[3.8;6.1]	26.9	[21.7;32.1]
Poland	5.1	[4.3;5.9]	34.6	[30.7;38.5]
Slovakia	5.1	[4.0;6.2]	36.7	[30.6;42.8]
France	5.2	[4.5;5.9]	40.1	[35.8;44.4]
Lithuania	6.1	[4.7;7.5]	37.1	[31.3;42.9]
Croatia	6.5	[5.1;7.9]	28.6	[23.4;33.8]
Estonia	6.6	[5.4;7.8]	34.2	[28.7;39.7]
Portugal	6.7	[5.4;8.0]	30.2	[25;35.4]
Italy	7.1	[6.3;7.9]	32.3	[29;35.6]
Austria	7.8	[6.5;9.1]	49.6	[42.9;56.3]
Latvia	8.5	[7.0;10.0]	33.0	[28.3;37.7]
United Kingdom	8.8	[7.3;10.3]	45.7	[40;51.4]
Greece	10.7	[8.8;12.6]	27.9	[22.5;33.3]
Spain	10.8	[9.6;12.0]	40.4	[36.6;44.2]

NB: The 95 % confidence intervals have been computed with the statistical guidance of G. Osier using the Ultimate Cluster approach (see Chapter 26 in this book). Countries ranked according to national entry poverty risk rates.

Reading note: In Denmark, 2.1 % of individuals not at risk of poverty in 2010 were poor in 2011. The 95 % confidence interval of this figure ranges between 0.2 % and 3.9 %.

Source: Author's computation, UDB March 2015.

ficiently reached those furthest away from the labour market, and jobs have not always succeeded in lifting people out of poverty’.

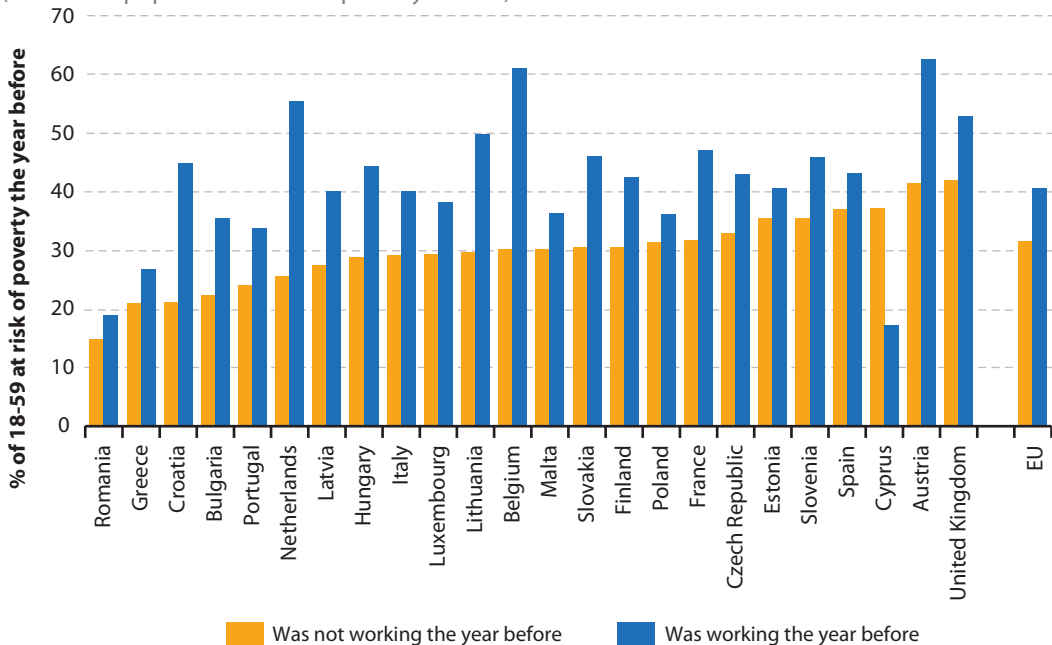
Exits from the risk of poverty are always lower for those who are out of work at the beginning of the reference period than for those who are already in-work. 40 % of in-work poor individuals get out of poverty from one year to the next, against 32 % of non-working poor individuals. Differences in exits from poverty associated with work vary across Member States, with large differences in exit-from-poverty between the working poor and the non-working poor in the Belgium, Croatia, the Netherlands or Austria (see Figure 23.4). At the opposite end of the spectrum, exit-from-poverty rates among non-working individuals are close to those of the working poor, due to household composition effects (non-working person living with

a partner at work for example) in Spain, Poland and Romania.

The gap — or absence of a gap — between the exits from poverty of the in-work poor and the non-working poor can be a function of the differences in household compositions. While the employment status refers to individuals, poverty is measured at household level. For this reason, changes in the employment status of one adult impacts the situation of other adults in the household. In such a framework, the variety in household composition across Europe can explain away these differences. As detailed in Corluy and Vandenbroecke (2012), household types do not have a uniform distribution across Member States. While Northern Member States account for large shares of single adult household, multigenerational households

**Figure 23.4: Exit out of poverty risk rates by initial labour market attachment, 2010 and 2011**

(% of 18-59 population at risk of poverty in 2010)



NB: EU average computed on the basis of the 25 Member States for which data are available. Data are treated so that labour market attachment and income reference period refer to the same year (see Box 23.1). Countries ranked according to exit rates for people who were not working the year before.

Reading note: In the EU, 31 % of individuals who were not working and at risk of poverty in 2010 exited poverty in 2011, and 41 % of those who were working exited poverty.

Source: Author's computation, UDB March 2015.

are much more numerous in Southern or Eastern European Member States.

### 23.3.1 Transitions to employment might refer to various cases

The following analysis investigates the question of the exits from poverty among poor out of work individuals who started a job the year after. The working age population out of work comprises both those who are (1) unemployed or (2) at risk of poverty and inactive. The rationale for such a reference population is to focus on those individuals who need to take up a job in order to avoid or escape the risk of poverty. Those who might be out of work for personal or household reasons are therefore excluded from this analysis, the rationale being to narrow the analysis to a population who needs to be activated.

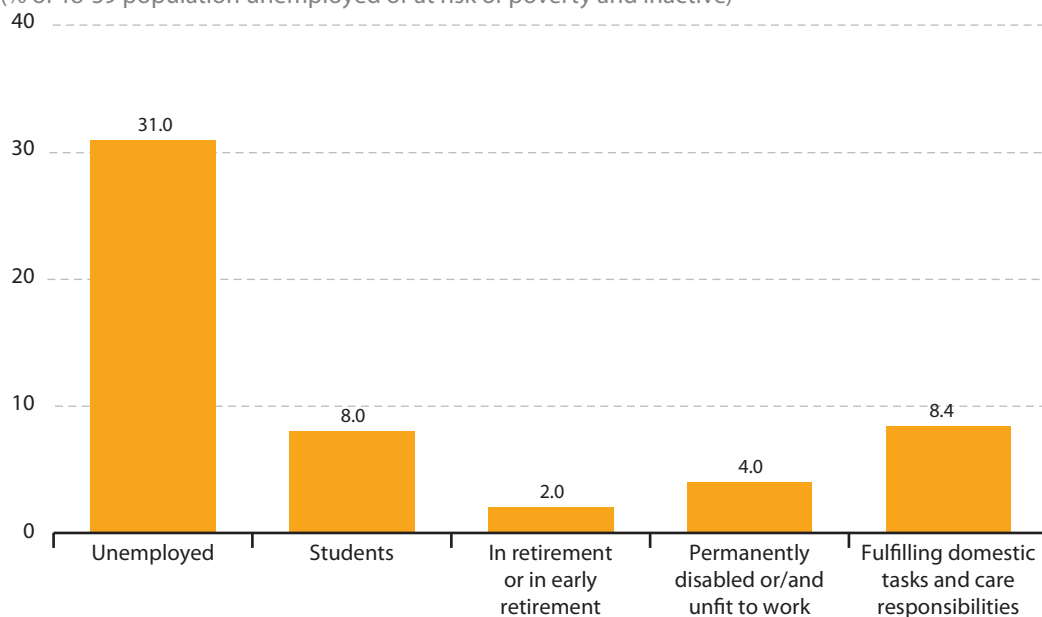
Several types of transitions from non-employment to employment are reviewed in the following analysis,

depending on the activity status before and after transition. Their respective exit-from-poverty rate is then estimated.

Evidence suggests that the chance of getting a job depends on the initial activity status. While the short-term unemployed are more likely to go back to work, the long-term unemployed, those who are disabled or adults fulfilling domestic tasks, might experience greater barriers to entering or re-entering the labour market. The rate of those who are short-term unemployed but are back in work the following year (30 %) is far larger than it is for the one of the long-term unemployed (9 %). Those who are unemployed and at risk of poverty have greater chances of being at work the year after compared to those who are inactive at risk of poverty (see Figure 23.5).

Second, the quality of the return to work is a key factor in making it possible to exit the risk of poverty. Low paid jobs, involuntary part-time work, or temporary jobs might be insufficient to lift job seekers out of poverty. For that reason, transitions are also

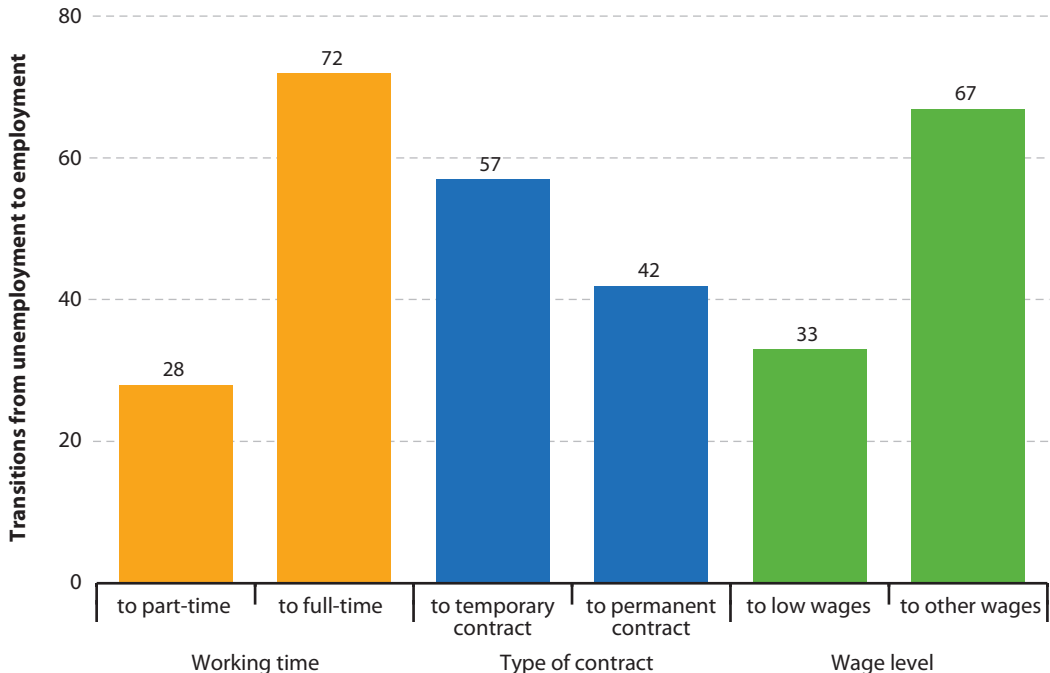
**Figure 23.5: Transitions from non-employment to employment among adults out of work (unemployed or at risk of poverty and inactive) by initial status, 2010 and 2011**  
(% of 18-59 population unemployed or at risk of poverty and inactive)



Reading note: 31 % of those who were unemployed in 2010 were employed in 2011.

Source: Author's computation, UDB March 2015..

**Figure 23.6: Transitions from non-employment to employment among adults out of work (unemployed or at risk of poverty and inactive) by type of job found, 2010 and 2011**  
(% of 18-59 population unemployed or at risk of poverty and inactive)



*NB:* The measure of low-wage earners in this chapter is defined above. This definition is restricted to the group of employees who worked more than 9 months over the income reference period; this is why the average of 'low-wage' and 'non-low-wage' workers is different from the value for (all) full-time workers.

*Reading note:* Among those who were out of work in 2010 and were working in 2011, 28 % were working part time, 57 % were employed as temporary workers, and 33 % were low wage earners.

*Source:* Author's computation, UDB March 2015.

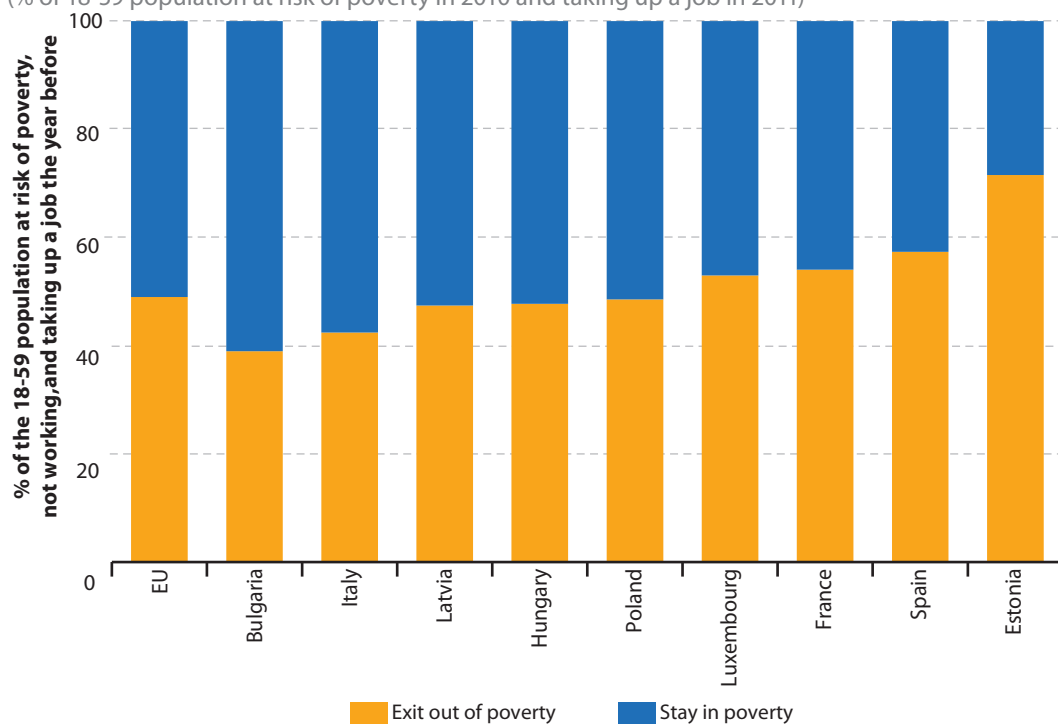
broken down by work characteristics (temporary or permanent contract, part-time or full-time position, low or high pay).

Taking up a job can have different implications and lead to different outcomes in terms of exits from the risk of poverty, depending on the characteristics of the job found. EU-SILC provides partial indicators in terms of the nature of the contract, time

worked over a week, and wage level. Figure 23.6 shows the likelihood of returning to permanent or fixed-term work, part-time or full-time jobs, and low-paid <sup>(189)</sup> and better-paid jobs for those who are out of work (both the unemployed and the inactive poor). It illustrates that most transitions to employment pertain to full-time, non-low paid jobs. Temporary contracts are also more represented than permanent contracts.

<sup>(189)</sup> Hourly wages have been computed from the EU-SILC following a methodology close to Engel and Schaffner (2012). A proxy of the hourly wage has been estimated among the population of those who worked full time over more than 9 months during the previous year by applying the number of hours worked a week declared at the time of the interview. Low-wage earners are identified as those who earn less than two thirds of the national median gross hourly earnings as in usual definition.

**Figure 23.7: Is taking up a job enough to leave income poverty? Share of adults out of work (non-working, at-risk-of-poverty) in 2010 and taking up a job who exited out of poverty in 2011**  
(% of 18-59 population at risk of poverty in 2010 and taking up a job in 2011)



NB: The confidence intervals have been computed with the statistical guidance of G. Osier using the Ultimate Cluster approach (see Chapter 26 in this book). Countries ranked according to exit rates.

Reading note: 50 % of those who were out of work and at risk of poverty in 2010 and who were working in 2011 exited poverty during the same time.

Source: Author's computation, UDB March 2015.

### 23.3.2 Getting a job helps to get people out of the risk of poverty in half of the cases

To what extent does getting a job help a person escape from income poverty? Between 2010 and 2011, 50 % of those who were out of work, lived in

a poor household and took up a job, exited from poverty. The chance of getting out of the at risk of poverty group while taking up a job varied from 40 % in Bulgaria to 70 % in Estonia (see Figure 23.7). As these figures rely on limited samples size, one must nevertheless bear in mind that they are associated with relatively broad confidence intervals.

### Box 23.1: Measuring year to year transitions: treatment of reference periods

Two main types of year-on-year transitions are considered in this chapter: labour market changes and at-risk-of-poverty transitions. The two variables do not refer to similar measurement periods in the EU-SILC data. Their analysis, therefore, requires a careful treatment (see Debels and Vandecasteele 2008 for a similar discussion).

The main variables in labour market participation, such as activity status, type of contract and number of hours worked over a week, refer to the *year of the interview* (2012 being the latest in the EU-SILC longitudinal UDB available at the time of writing). Some complementary information on activity during the previous year (reference year) is also available through the so-called calendar of activity, i.e. the number of months i) at work, ii) unemployed or iii) inactive over the whole reference year. In the EU-SILC longitudinal UDB 2012, these data refer to the year 2011.

Income data (including wages and poverty status) refer to the *income reference period*, i.e. the previous year. In the EU-SILC longitudinal UDB 2012, these data refer therefore to the year 2011. The UK and Ireland have however different rules. Data from the United Kingdom refer to the current income. Irish data refer to the last 12 months.

To properly compare the transitions into the labour market and the risk of poverty transitions between 2 years, the variables need to refer to the same time period. For example, observing the link between labour market and risk of poverty transitions for an individual in 2010 and 2011 requires referring both to the EU-SILC data collected in 2010 and 2011 for the labour market (current status), and to the data collected in 2011 and 2012 for income composition (which is to refer to reference years 2010 and 2011).

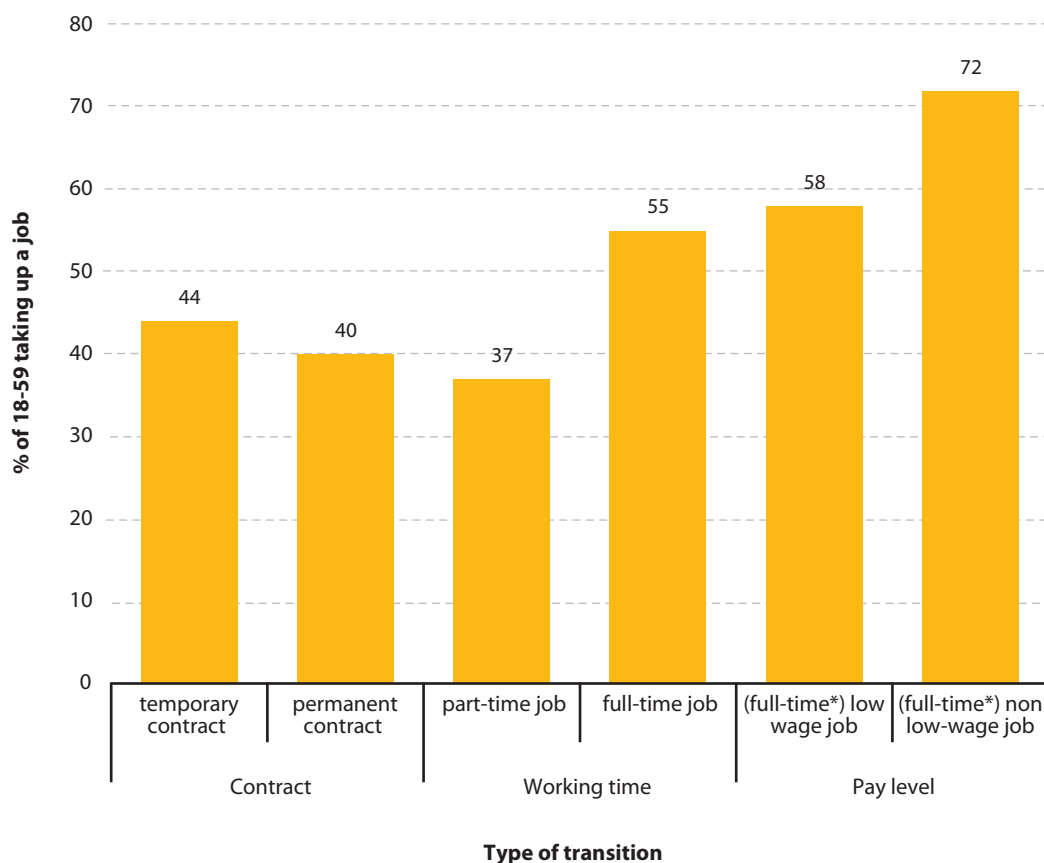
In this chapter, data are treated so that labour market attachment and income reference period refer to the same year as initial income (2010). Unless otherwise specified, transitions refer to the 2010-2011 reference years.

Various reasons explain why taking up a job does not guarantee exit from risk of poverty, notably the quality of the job found (as indicated by the type of contract, working hours and wages) and the household composition. At EU level, exit rates from the risk of poverty are similar if the job happens to be with a permanent or temporary contract (see Figure 23.8). Taking up a full-time job is associated with better chances of getting out of poverty. Among full-time jobs, those that are better paid, i.e., above the low-wage threshold, also led to better chances of exiting poverty. However, this overall picture needs to be nuanced as patterns of work-

ing arrangements differ a great deal across Member States in terms, for example, of whether temporary contracts or part-time jobs serve as stepping stones, or imply entry into the wrong part of a highly segmented labour market.

Whether getting a job is enough to get out of poverty may also depend on household composition. As Figure 23.9 shows, adults without children are more likely to get out of the risk of poverty when they take up a job than adults living with children, and especially single parents.

**Figure 23.8: Exit-out-of-poverty risk rate by type of labour market transition, 2010-2011**  
(% of 18-59 population at risk of poverty and taking up a job)

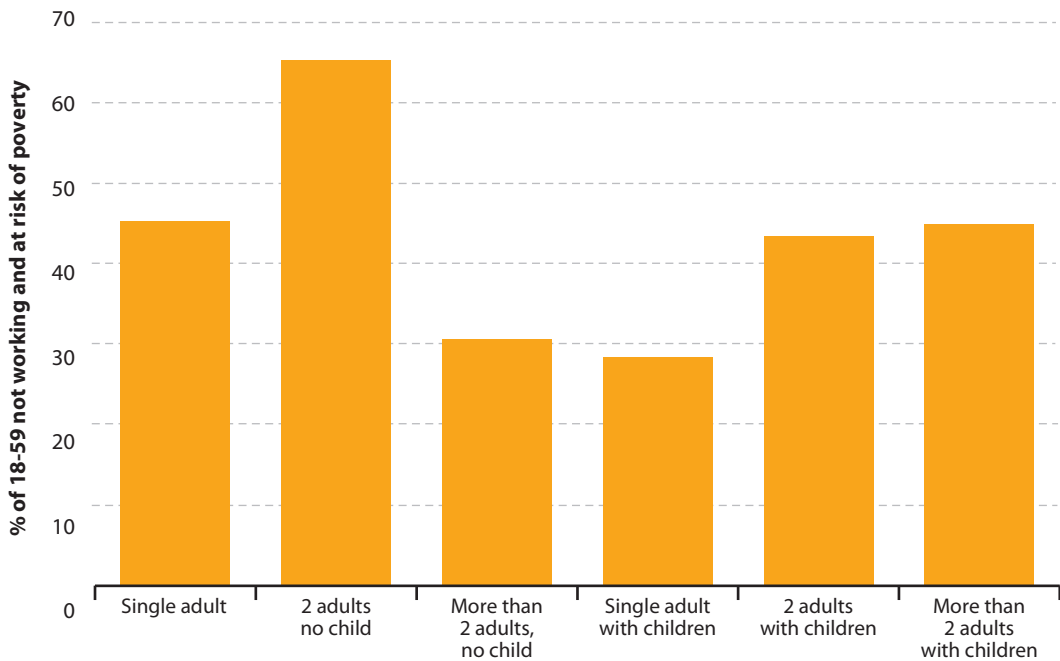


*NB:* The measure of low-wage earners in this chapter is defined above. This definition is restricted to the group of employees who worked more than 9 months over the income reference period; this is why the average of 'low-wage' and 'non-low-wage' workers is different from the value for (all) full-time workers.

*Reading note:* Among those who were out of work and at risk of poverty in 2010 and who were working full-time in 2011, 55 % exited poverty in 2011.

*Source:* Author's computation, UDB March 2015.

**Figure 23.9: Exit-out-of-poverty risk rate while getting a job, 2010-2011**  
(% of 18-59 population at risk of poverty in 2010 and taking up a job)



*Reading note:* Among adults living in a single adult household at risk of poverty and not at work in 2010 and at work in 2011, 45 % exited poverty by 2011.

*Source:* Author's computation, UDB March 2015.

## 23.4 The role of policies in labour market transitions and exits from poverty

Smoothing transitions to employment and ensuring that their success in exits from poverty can be achieved through combined efforts in providing adequate income support, promoting inclusive labour markets and ensuring wide access to enabling services, such as training or childcare services (see European Commission, 2014).

There is however little information at an individual level enabling an assessment that encompasses the effect of all these policy tools on transitions. The following analysis investigates the examples of the coverage of unemployment benefits, by taking advantage of the income composition information available at individual level on a yearly basis.

The characteristics of an unemployment benefit system can be described in terms of coverage, adequacy, duration, eligibility rules and associated tax-benefit treatments. Here we refer to one of these dimensions, namely the coverage of unemployment benefits. In practice, information on benefit coverage is difficult to measure, especially in the context of cross-country comparisons (see Maquet et al., 2016). Coverage of unemployment benefits is therefore estimated by the share of the population unemployed and actually receiving some unemployment benefits. This share is varying greatly over Member States, with broad coverage in some countries, such as Germany, and much weaker coverage of the unemployed in other countries, e.g. Greece or Italy.

The fact that, in a given country, some unemployed are covered by unemployment benefits and others not can be explained by several fac-



**Table 23.2:** Individuals characteristics of unemployed within groups considered as being of ‘similar profile’ in the propensity score matching analysis, 2010-2011-2012 (pooled)

Group	Propensity to be covered	Number of cases		Age (average, years)		Months worked over last 3 years (average)		Share of low educated (%)		Share of women (%)	
		Non-recipients	Recipients	Non-recipients	Recipients	Non-recipients	Recipients	Non-recipients	Recipients	Non-recipients	Recipients
1	[0.11;0.2]	940	171	26	28	0.44	0.98	0.31	0.40	0.28	0.17
2	[0.2;0.25]	559	163	35	39	1.09	2.24	0.46	0.28	0.57	0.41
3	[0.25;0.3]	429	159	41	42	3.05	3.81	0.39	0.49	0.59	0.59
4	[0.3;0.4]	486	278	40	39	7.58	8.36	0.56	0.46	0.49	0.57
5	[0.4;0.5]	347	276	38	39	15.06	15.11	0.35	0.40	0.40	0.48
6	[0.5;0.55]	169	157	38	39	20.39	19.80	0.32	0.44	0.39	0.36
7	[0.55;0.6]	139	201	40	39	21.91	23.25	0.38	0.31	0.39	0.35
8	[0.6;0.8]	421	936	43	42	27.60	27.93	0.42	0.41	0.36	0.44
9	[0.8;0.9]	25	149	53	50	34.84	34.65	0.66	0.58	0.57	0.61

*Reading note:* This table illustrates the profiles of individuals covered or not covered by unemployment benefits (recipients and non-recipients). It illustrates that within each group, the profiles of individuals are comparable in terms of age, gender, education and time spent in employment. For example, in group 1, individuals are on average aged 26 among non-recipients of unemployment benefit recipients and 28 among recipients, which is quite similar.

*Source:* Author's computation, UDB March 2015.

tors, such as the share of long term unemployed, who might have exhausted their rights. It can also depend on entitlement rules, such as the number of months of work required to claim benefits. The following analysis investigates the link at individual level between the coverage of unemployment benefits and transition to employment 1 year after. It tends to conclude that, at individual level, the unemployed receiving unemployment benefits have better transitions to work compared to those who do not receive any.

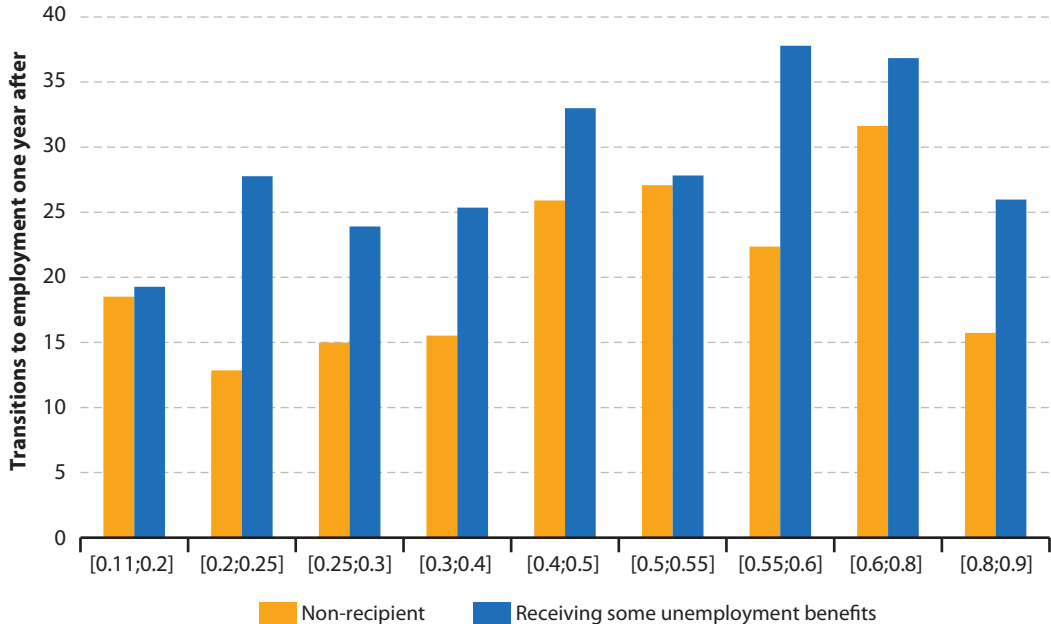
Nevertheless, it should be underlined that this result does not prove any causality between unemployment benefit reciprocity and returns to employment or poverty; nor does it mean that benefit reciprocity *per se* favours transitions to employment. Indeed, unobserved — but related — variables, such as training, conditionality of benefits or activation measures cannot be included in the

model. Therefore, the result tends to only suggest that well-designed income support does not prevent returns to employment. Further information about activation measures, training or counselling at individual level and their link to unemployment benefits reciprocity could help to better identify the drivers of successful returns to employment.

This result could, nevertheless, be disputed by the claim that those who are not covered by unemployment benefits might also have some specific characteristics in common, making them more likely to be unemployed in the long term, or to be in precarious labour market situations not covered by unemployment protection schemes. Those not covered by unemployment benefits might for example be less educated, unemployed for a longer period, or with lower employment spells over the past years, and have, therefore, lower chances to be employed. However, this result still holds

**Figure 23.10: Transitions to employment the year after for unemployed receiving or not unemployment benefits, by group of profiles based on propensity score matching, 2010-2011-2012 (pooled)**

(% of 18-59 unemployed population)



*Reading note:* Individuals are ranked against their propensity to be covered by unemployment benefits given some of their characteristics and grouped by blocks of similar propensity. Within each group, the bars represent the transition rate to employment for unemployment benefit recipients and non-recipients. For example, in the first block of individuals with low likelihood to be covered by unemployment benefits (young people, little work experience), 19 % were employed 1 year later.

*Source:* Author's computation, UDB March 2015.

when individuals with similar backgrounds with respect to the above-mentioned characteristics are compared.

Comparing individuals with similar backgrounds with respect to unemployment benefit coverage can be achieved through a propensity score matching <sup>(190)</sup>. This method aims at grouping individuals with similar characteristics (in terms of age, gender, education and time spent in employment) and then comparing across groups the share of those employed 1 year later. As Table 23.2 illustrates, within each group, unemployment benefit recipients and non-recipients within each group have similar characteristics.

Figure 23.10 shows that, within groups of individuals with similar characteristics, the transitions to employment are higher among individuals receiving unemployment benefits in most cases. To measure more precisely the difference in transition to employment between recipients and non-recipients, average treatment effects are estimated. Pairs of recipients and non-recipients with similar profiles are identified through different methods (see Table 23.3). The average treatment effect is then estimated as the difference of transitions to employment within pairs. Overall, the estimated impact of unemployment benefit coverage on the job take-up is significantly positive in the statistical sense.

<sup>(190)</sup> See Chapter 25 in this book for another use of this technique.

**Table 23.3: Average difference estimated through different matching methods in transitions to employment within 1 year between unemployment benefit recipients and non-recipients, 2010-2011-2012 (pooled)**

Technical estimation	Average treatment effect (%)*	Standard error (%)	Estimated confidence interval (%) (bootstrap)
<b>Stratification matching:</b> based on blocks of individuals with similar propensity to be covered. It matches each non-recipient with all recipients in the block.	6.6	1.5	[4.6;8.4]
<b>Nearest neighbour matching:</b> identifies for each non-recipient the benefit recipient with the closest propensity to be covered.	5.6	1.6	[1.7;9.3]
<b>Radius matching:</b> considers all benefit recipients with a likelihood to be covered differing no more than x % from the likelihood of the selected non-recipient (x being the so-called radius, here 0.05)	9.5	0.9	[7.0;12.0]
<b>Kernel method:</b> considers a wide range of recipients around the non-recipient, and weights them decreasingly as the distance to the selected non-recipient increases.	6.2	1.2	[3.5;8.8]

*Reading note:* The average treatment effect compares the transition to employment of identified pairs of unemployment benefits recipients and non-recipients among 2 490 unemployed receiving unemployment benefits and 2 275 unemployed not receiving any unemployment benefits. Propensity score matching estimates are based on number of months spent in employment during the 3 years before the income reference year, age and education level (low educated or not). Regional dummies are included (but not country dummies). This helps to identify wider groups of individuals with similar characteristics regardless of whether or not they are covered (as an individual with a given profile might be covered in a Member State and not covered in another one based on eligibility rules). However, this also has disadvantages, as variables such as national economic situation of the time cannot be captured. The average treatment effect is estimated by taking into account the following factors: number of consecutive months in employment during the income reference period, number of months spent in work during the past 3 years before the reference period, education level (being low educated or not), age, gender and number of children.

*Source:* Author's computation, UDB March 2015.

## 23.5 Conclusions

Through an approach based on examining the dynamics of entering and exiting poverty, this chapter has aimed at showing how addressing and preventing income poverty needs to take into account its dynamic nature. It has also explored to what extent labour market changes can contribute to explaining exits from income poverty.

The results show that entering and exiting poverty can vary greatly across Member States. Some main patterns can be distinguished: First, there are countries where rates of entry and exit poverty are high, sometimes with a significant share of those at risk of poverty forming the 'core group' of the permanently poor. Second, there are countries with a high risk of entering poverty, and low or moderate exit from it. This is related to the risk of an income poverty trap, as those entering the risk of poverty will have difficulties getting out of it. Third, there are countries with both low entry into and exit from risk of poverty. In some of these

countries, the share of people at risk of persistent income poverty is high, which highlights signs of social polarisation, with a group of people at risk of poverty; for these people there are few chances of getting out of it.

The chapter also explores to what extent taking up a job is associated with exits from risk of poverty. It has shown that transitions to employment do not necessarily result in exits from risk of poverty. Only half of individuals switching from non-employment to employment also get out of risk of poverty at the same time. This can be attributed to various factors that remain difficult to explore with existing data. These factors include household composition and its changes, work characteristics that are not observed in the current data and interactions with income-support schemes. There might also be some chronological effects, with exits from poverty occurring later.

Finally, the chapter investigates how unemployment benefit coverage is associated with job take-up. It shows that widely available systems

of income support do not prevent or discourage returns to employment if they are well-designed and accompanied with appropriate conditions (job search requirements). The analysis shows that, all other things being equal, people receiving unemployment benefits have greater chances to take up a job than non-recipients. Further analyses investigating the adequacy of the benefits, their design (such as reducing overtime) or their overlaps with other types of income support or services (such as training or counselling) are, nevertheless, required to draw proper lessons for policy-makers.

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# 24

## The evolution of inequality of opportunity across Europe: EU-SILC evidence

Francesco Andreoli and Alessio Fusco <sup>(191)</sup>

### 24.1 Introduction

The definition of the appropriate equalitarian objective for the (re)distribution of many social and economic outcomes has been a long debated topic among scholars, which is also of central interest for policy-makers. The notion of equality of opportunity has gained popularity over the last decades as one of the relevant distributional criteria for achieving a fair allocation of resources (see Lefranc et al., 2009 or Roemer and Trannoy, 2014) <sup>(192)</sup>. Opportunities are equally distributed when individuals of the same 'type' (i.e., sharing similar circumstances of origin for which they cannot be held responsible), who make similar 'effort' choices (for example in terms of hours worked, educational choices, etc.), also face identical opportunity profiles. This does not imply that opportunities should coincide for everybody, but rather that factors such as the background of origin should have no direct impact on determining individual life chances.

This is, indeed, the ideal distribution of opportunities that the policymaker should target to reach an 'endowment insensitive', 'responsibility-sensitive' allocation of resources (see Fleurbaey, 2008). When, instead, individual circumstances play a role in determining opportunities, a form of *inequality of opportunity* prevails, meaning that some types enjoy/suffer an unfair advantage/disadvantage compared to others.

By seeking to promote social inclusion across the EU, one of the objectives of the Europe 2020 policy agenda (see Chapters 1 and 3 in this book) is to enhance equality of opportunity among its citizens. Indeed, as argued by Atkinson and Marlier (2010, p. 3), 'an inclusive society is one that rises above differences of race, gender, class, generation and geography to ensure equality of opportunity regardless of origin'. Yet, the extent to which this objective has been attained across the EU is disputable, and different chapters in this book are offering various perspectives on social inclusion issues in the EU.

This chapter proposes a coherent evaluation framework for assessing the inequality of opportunity dimension of social exclusion in Europe. The contribution is twofold. First, it suggests a novel way of quantifying the degree of inequality of opportunity through simple indicators, that are consistent with the normative perspectives on equality of opportunity (see Andreoli et al., 2014) and that have an appealing interpretation for the policymaker. Secondly, it illustrates the proposed measurement framework by investigating the evolution of inequality of opportunity across selected European countries between 2005 and 2011.

<sup>(191)</sup> Both authors are with LISER (Luxembourg). Comments by Anthony B. Atkinson, Luna Bellani, Tim Goedemé, Sigita Grundiza, Anne-Catherine Guio, Eric Marlier, Marco Pomati, Philippe Van Kerm and participants to the 2014 International Conference on Comparative EU Statistics on Income and Living Conditions on a previous version are gratefully acknowledged. All remaining errors are ours. This work has been supported by the second Network for the analysis of EU-SILC (Net-SILC2), funded by Eurostat. The European Commission bears no responsibility for the analyses and conclusions, which are solely those of the authors. In addition, both authors acknowledge the financial support of the Luxembourg Ministry of Higher education and Andreoli acknowledges financial support from the Luxembourg Fonds National de la Recherche through AFR postdoctoral grant No 5932132. Email addresses: [francesco.andreoli@liser.lu](mailto:francesco.andreoli@liser.lu) and [alessio.fusco@liser.lu](mailto:alessio.fusco@liser.lu).

<sup>(192)</sup> This setting follows the work of political philosophers such as Dworkin (1981), Arneson (1989) or Cohen (1989) and comprises traditional models of equality of opportunity such as Roemer (1998) and Fleurbaey (2008).

Many factors may have affected the evolution of opportunity profiles in the period we consider. The recent economic crisis, the so-called ‘Great Recession’, may have considerably reshaped individuals’ labour market opportunities, as a consequence of the interaction between the dynamics of the EU labour market and the public intervention schemes promoted by each single government. While disentangling the various mechanisms that affected the evolution of inequality of opportunity may be a difficult exercise involving a counterfactual analysis of opportunities distributions, understanding how the opportunities of different types evolved over the last decade is relevant to understand new forms of unfair disadvantage, and to provide a new perspective on the recent crisis effects. The empirical goal of this chapter is to illustrate how the measures of inequality in access to opportunities discussed hereafter can usefully complement the current set of official statistics available to the policymaker. In particular, the chapter contrasts such measures with indicators of social inequalities, such as the EU ‘at-risk-of-poverty-or-social-exclusion’ indicator (AROPE; see Chapters 1 and 3 in this book). Furthermore, it allows for an assessment of the extent of convergence of opportunity inequalities across EU countries.

One of the major empirical obstacles to the assessment of inequality of opportunity is the lack of any large scale dataset of individual outcomes and circumstances, from where opportunity profiles can be estimated, which would allow for comparisons between countries and over time. In this chapter, we make use of the 2005 and 2011 EU-SILC ad hoc modules on intergenerational transmission of disadvantage where measures of parental background for a sufficiently large number of respondents are available. We use annual labour earnings before state intervention as a measure of opportunity faced by working individuals. Indeed, gross earnings define living standards opportunities and consumption possibilities. We use paternal education (a characteristic beyond one’s control) to capture the quality of the circumstances individuals are exposed to in young age<sup>(193)</sup>. Our model focus-

<sup>(193)</sup> It is well known from father-son education and income intergeneration mobility studies that more educated parents transmit significant wealth and social advantages to their children (see Jäntti and Jenkins, 2014).

es on distributional assessments, meaning that the analysis is carried out by looking at the *distribution* of opportunities for people sharing the same family background but making different effort choices.

The availability of the 2005 EU-SILC module led to several academic contributions analysing the question of inequality of opportunity across Europe, such as Checchi et al. (2010), Dunnzlaff et al. (2010) or Marrero and Rodriguez (2012). These studies have in common the use of the same underlying data but differ in their implementation of the concept of inequality of opportunity<sup>(194)</sup>. To our knowledge, this chapter is the first attempt to analyse the evolution of inequality of opportunity over time by making use of the 2011 EU-SILC module<sup>(195)</sup> as well.

The chapter is organised as follows. Section 24.2 presents in more details the indices of inequality of opportunity that we propose. Section 24.3 contains the description of our empirical analysis based on EU-SILC data and Section 24.4, the results. Finally, Section 24.5 concludes.

## 24.2 Indices of inequality of opportunity

We assume that individual opportunities can be measured by virtue of an outcome of interest, denoted  $y$ , which is determined by three components:

- Circumstances (denoted  $c$ ) capture illegitimate determinants of  $y$  that fall beyond individuals’ responsibility, such as parental background

<sup>(194)</sup> Various synthetic indicators of the extent of inequality in opportunities distribution have been used/proposed in these papers. Dunnzlaff et al. (2010) apply Gini opportunity index to the outcome variable à la Lefranc et al. (2008) to measure the average degree of advantage across pairs of opportunity profiles, evaluated according to a specific evaluation function. Marrero and Rodriguez (2012) or Checchi et al. (2010) decompose overall income inequality using regression methods à la Ferreira and Gignoux (2011) and separate the part of income that is mostly associated with circumstances from the residual component.

<sup>(195)</sup> Other papers have used the 2011 module in the context of intergenerational transmission of disadvantage analysis — a concept which bears similarity with that of EOp — e.g. Grundiza and Lopez Vilaplana (2013), Serafino and Tonkin (2014) as well as Chapter 25 in this book. The methodology in this last chapter, in particular, is based on matching methods to assess, in a form of counterfactual analysis setting, the inheritance of financial poverty. This differs substantially from the normative evaluations expressed by the EOp framework presented here.

or social origin. Individuals sharing the same circumstances belong to the same *type*.

- Effort (denoted  $e$ ) captures legitimate determinants of  $y$ , that pertain to the sphere of individual responsibility.
- Attainable outcomes are contingent on a state variable (denoted  $s$ ). All individuals in a society, which might represent a given country in a given period, share the same institutional background. The analysis of inequality of opportunity across states involves comparisons across countries and time.

Let  $y_s(c,e)$  denote the outcome of an individual in state  $s$  with circumstances  $c$  and exerting effort  $e$ . Given effort, Equality of Opportunity (EOp) holds whenever circumstances do not contribute to explain the distribution of the outcome across the population. If individuals cannot be made accountable for their circumstances, they should not be made accountable for the correlation between circumstances and effort, either. As a consequence, the notion of responsibility that is relevant in this setting should define effort as orthogonal to the circumstances. Assuming (as in Roemer, 1998) that there is a monotonic relation between effort and outcomes for any given circumstance, and that effort has only a relativistic meaning (i.e. more effort never yields lower outcomes), then individual effort can be identified by the position  $p$  with  $0 \leq p \leq 1$ , that this individual occupies in the outcome's distribution made conditional on his type. We define a *quantile*  $y_s(c,p)$  as the outcome level associated with position or effort  $p$  in the outcome's *Pen's Parade*, obtained by arranging outcomes by increasing magnitude <sup>(196)</sup>.

We define therefore EOp in state  $s$  as a situation where  $y_s(c,p) = y_s(c',p)$  for any pair  $c \neq c'$  and for any level of effort identified by the position  $p$ . When EOp holds, the opportunity profiles offered to different types exerting the same effort coincide. Al-

though opportunity profiles conditional on effort and circumstances are singletons (i.e. outcome levels), the hypothesis above makes the EOp criterion distributional in nature. Figure 24.1 illustrates this point. The Pen's Parades of outcomes distributions for types  $c$  and  $c'$  are reported in this figure. For each type, the curve's height in a given point (measured on the vertical axis) corresponds to the income associated with that level of effort (measured on the horizontal axis). Only the first panel displays a case where EOp is satisfied. In fact, the two types' outcome Pen's Parades coincide at every effort level. In the remaining cases, a form of *inequality of opportunity* prevails.

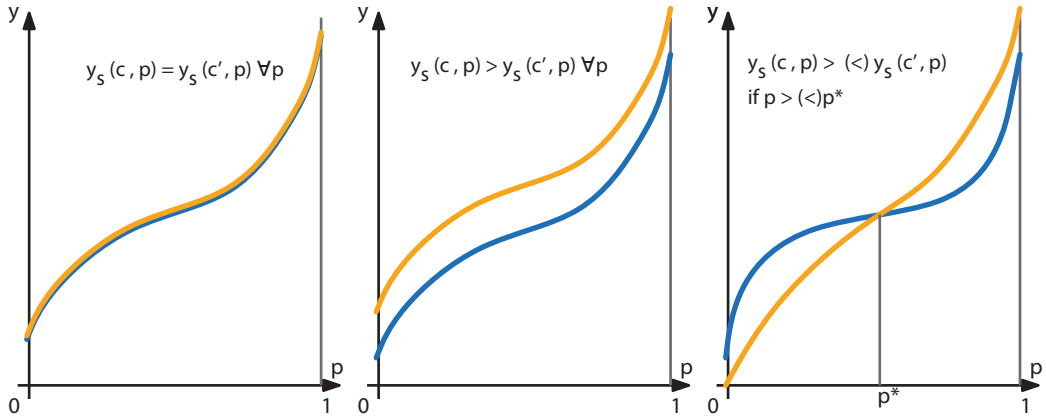
In the central panel of the figure, type  $c$  enjoys an *advantage* compared to type  $c'$  that holds irrespective of the effort chosen. In the right hand-side panel, type  $c'$  advantage is confined to comparisons involving low effort, while it reverses to a disadvantage at high effort. One intuitive, distributional measure of advantage is the *gap* between the opportunity profiles offered to each type at any given effort level. This is easily identifiable by the gap between outcomes Pen's Parades associated with two types  $c$  and  $c'$ , denoted:  $y_s(c,p) - y_s(c',p)$ ,  $0 \leq p \leq 1$ .

The distribution of this gap is informative on the distribution and sign of advantage across pairs of types (for alternative models based on the same principle, see Lefranc et al. 2008 and Andreoli et al. 2014). We provide integrated assessments of the extent of inequality of opportunity using *inequality of opportunity indicators*, denoted *IOp*, that are obtained as averages of these gaps. An *IOp(s)* indicator is a mathematical function that transforms the extent of advantage and disadvantage across types and effort levels into a number, which corresponds to the level of inequality of opportunity in state  $s$ . When,  $IOp(s') \geq IOp(s)$  state  $s$  is closer to an ideal situation where EOp is satisfied compared to state  $s'$ . If EOp holds in state  $s$ , then  $IOp(s) = 0$ .

There are many, equally valuable, alternative formulations of the *IOp* indicator. Here, we focus on *IOp* indicators that can be expressed as the average degree of advantage in a given society. Their representation, involving pairwise comparisons of opportunity profiles, is inspired by the well-known Gini index formulation of income inequality. The

<sup>(196)</sup> To identify the outcome quantile  $y_s(c,p)$ , it is sufficient to represent the cumulative distribution (cdf) of outcome  $y$ , conditional on circumstances  $c$  (denoted  $F_s(y|c)$ , which indicates the share of population whose outcome is smaller than  $y$ ) and then to measure the level of income corresponding to the poorest  $p$ -percent of the population. This quantile satisfies:  $p = F_s(y_s(c,p)|c)$ . The Pen's Parade is a graphical representation of the distribution of  $y_s(c,p)$  at various levels of  $p$ . It is often denoted by the inverse cdf:  $y_s(c,p) = F_s^{-1}(p|c)$  (see Maccheroni et al. 2005 for notation).

**Figure 24.1: Equality and inequality of opportunity**



*Reading note:* Effort ( $p$ ) is measured on the horizontal axis, quantiles of outcomes ( $y$ ) on the vertical axis. The yellow (blue) line refers to the distribution of outcomes of type  $c$  ( $c'$ ).

Gini index  $GI(\cdot)$  is, in fact, a weighted average of the gap between any pair of incomes  $y_i$  and  $y_j$  observed in a distribution:

$$GI(y_1, \dots, y_n) = \frac{1}{2\mu_y} \sum_i \sum_j w_i \cdot w_j \cdot |y_i - y_j|$$

where  $w_i$  is unit  $i$ 's weight and  $\mu_y$  denotes the average income. There are two ways of aggregating evaluations across the effort dimension: the *ex post* and the *ex ante* perspectives.

### 24.2.1 Ex post perspective

In the *ex post* setting, we assume that the observation of effort bears relevant information for evaluating inequality of opportunity. Given two circumstances  $c_i$  and  $c_j$ , the absolute gap between opportunity profiles is a natural metric for assessing the advantage of one type over the other. The Gini-type *ex post* inequality of opportunity index  $IOP_p$  is an average, taken across the continuous effort measure considered, of the average degree of unfair advantage across types at each effort level (as measured by a Gini inequality index):

$$IOP_p(s) = \int_0^1 GI(y_s(c_i, p), \dots, y_s(c_N, p)) dp$$

$$= \int_0^1 \frac{1}{2\mu_s} \sum_i \sum_j w_{c_i} \cdot w_{c_j} \cdot |y_s(c_i, p) - y_s(c_j, p)| dp$$

where  $w_{c_i}$  denotes the demographic size of the type  $c_i$  and  $\mu_s$  the average outcome in state  $s$ . In the *ex post* setting, evaluations of unfair advantage should be neutral with respect to inequalities related to effort. This explains why the overall absolute advantage measured by  $IOP_p(s)$  is then averaged across the effort distribution (as indicated by the integral operator in the formulas).

The value of the index, scaled up by 100, can be interpreted as the average percentage change in the average outcome level in state  $s$  (i.e.  $\mu_s$ ) that can be associated with a change in the circumstances of origin from  $c_j$  to  $c_i$ .

### 24.2.2 Ex ante perspective

In the *ex ante* setting, evaluations are made as if effort has not been yet exerted. This is a normative standpoint rather than an empirical necessity. This means that the inequality of opportunity assessment should be based on overall evaluations of the opportunities distributions of each type at any effort levels, denoted  $F_s(y|c)$ . Each distribution represents the complete mapping between outcomes and responsibility. Evaluations are carried over through evaluation functions, denoted  $E$ , of the conditional distributions  $F_s(y|c)$ . Evaluations might incorporate efficiency (i.e. only the average size of the advantage experienced by the type should matter) and even equity (i.e. also the uncer-



tainty in the effort distribution should be taken into account) concerns about the effort distribution, which is *ex ante* unknown. The overall disadvantage in a society is captured by the *ex ante* index  $IOp_A$ . It consists in an assessment of the dispersion in evaluations across types. If the dispersion is measured by the Gini index, we obtain:

$$IOp_A(s) = GI(E(F_s(y|c_1)), \dots, E(F_s(y|c_N)))$$

We consider two specifications of this index. In the first case, evaluation is exclusively based on an efficiency argument, implying that the focus should be on the average realisations of individuals with circumstance  $c$ , denoted  $\mu_c$ , so that  $E(F_s(y|c)) = \mu_c$ . The corresponding *ex ante* inequality of opportunity index is denoted:

$$IOp_{A1}(s) = GI(\mu_{c_1}, \dots, \mu_{c_N}) \\ = \frac{1}{2\mu_s} \sum_i \sum_j w_{c_i} \cdot w_{c_j} \cdot \left| \int_0^1 y_s(c_i, p) - y_s(c_j, p) dp \right|.$$

By definition, the integral in the second row is equivalent to  $\mu_{c_i} - \mu_{c_j}$ , since the area below a Pen's Parades (i.e., its integral) is an alternative way of computing the average of the outcomes generating that Parade. In this type of evaluation, positive and negative gaps in opportunities along the effort domain can exactly compensate each other.

In the second case, we consider evaluations incorporating efficiency *and* equity concerns, incorporating not only the expected realisations of a type's opportunities distribution, but also the intrinsic uncertainty about the distribution of effort. To do so, we express the evaluation as the expected value of an opportunity profile corrected by an inequality measure, which captures distributional concerns. Assuming that the inequality in each type's opportunities distribution is measured by the Gini coefficient  $Gl_c$ , the new *ex ante* inequality of opportunity indicator writes:

$$IOp_{A2}(s) = GI(\mu_{c_1} \cdot (1 - Gl_{c_1}), \dots, \mu_{c_N} \cdot (1 - Gl_{c_N})) \\ = \frac{1}{2\mu_s} \sum_i \sum_j w_{c_i} \cdot w_{c_j} \cdot \left| \int_0^1 2 \cdot (1 - p) \cdot (y_s(c_i, p) - y_s(c_j, p)) dp \right|.$$

The Gini index  $Gl_c$  can be reformulated as the integral of a Pen's Parade, distorted by a weighting function,  $2 \cdot (1 - p)$ , that depends on the position along the parade (for references see Zoli, 1999). In this type of evaluations, positive gaps in opportunities associated with low effort levels overweight negative gaps of equal intensity, but associated with high effort level. This is the perspective behind the *Gini Opportunity index* by Lefranc et al. (2009).

### 24.2.3 Comparing the two approaches

The indicators provide different perspectives about the distribution of advantage that are interesting in their own right. The comparison of these indicators is, indeed, useful to assess which dimension of advantage is driving countries' performance. The indicators have a common interpretation: they measure the expected percentage change in opportunities (income) associated with a change in the circumstances. Since circumstances are not a-priori ordered, assessments of this differential effect require a comparison of gaps across all possible pairs involved in the analysis. These gaps are estimated in a regression framework<sup>(197)</sup>. Finally, note that the well-known clash between the *ex ante* and *ex post* perspectives (Fleurbaey, 2008) emerges clearly from the formulation of the indicators  $IOp_P$  and  $IOp_A$ . They essentially differ from where the absolute value, defining the extent of advantage, is placed. Unless the types can be clearly ordered by the advantage they confer, thereby giving  $IOp_P = IOp_{A1}$ , the indicators  $IOp_P$  and  $IOp_{A1}$  give different perspectives on the extent of inequality of opportunity. The  $IOp_{A2}$  index, instead, conveys additional information on the distributional features of the *ex ante* distributions of opportunities.

<sup>(197)</sup> To estimate the  $IO_c(s)$  indices we use quantile regression within a RIF design to estimate gaps at selected deciles of the conditional distributions, and then we average these gaps according to the relative size of the type in the sample. Standard errors of our estimates are bootstrapped (see Goedemé, 2013 for bootstrap analysis on EU-SILC data).

## 24.3 Using EU-SILC intergenerational modules to study inequality of opportunity

We use our measurement framework to investigate the evolution of inequality of opportunity across selected EU countries. In addition to the core information collected in EU-SILC (see Chapter 2 in this book), every year ad hoc modules on specific topics are added to the cross-sectional dataset. We use the 2005 module on 'Intergenerational transmission of poverty' and the 2011 module on 'Intergenerational transmission of disadvantage' to construct between-states, cross periods, comparisons of the recent evolution of inequality of opportunity in the EU. These modules provide repeated cross-sectional information on the socioeconomic background of origin of the individuals interviewed in EU-SILC, along with standard relevant measures of labour market outcomes. In particular, they contain retrospective information about the parental background experienced by the respondents when aged between 12 and 16 (see Atkinson et al., 1983 for pros and cons of retrospective data). This unique base provides (to a large extent) comparable data allowing similar definitions for variables measuring outcome and circumstances across countries and time<sup>(198)</sup>.

Our estimation sample covers 19 countries where data of interest are available both in 2005 and 2011<sup>(199)</sup>. Our objective is to estimate opportunity profiles in each country from labour market outcomes. As a consequence, the focus is shifted on individuals, rather than households. To estimate opportunity profiles, we restrict attention to males aged between 30 and 50 who worked full time as an employee for at least 7 months in the

income reference period. In addition, individuals who declared that they were living in another private household, foster home, collective household or institution were excluded. All tables are based on this estimation sample. Following Raitano and Vona (2014), we use the intergenerational module weight included in both modules. In 2011, these weights are available for 16 countries. For Denmark, France and Cyprus, we substitute the missing intergenerational module weights in 2011 with the personal non-module specific weights.

### 24.3.1 Circumstances

The modules contain retrospective information about parents' educational attainment, occupational status, labour market activity status, family composition as well as presence of financial difficulties during respondents' teenage years. In this chapter, we focus on the educational attainment of the father as the relevant circumstance. This choice, which is in line with previous literature (e.g. Roemer, 1998 or Lefranc et al., 2008), is driven by comparability motives and by sample size requirements at the moment of estimating the unfair disadvantage distribution. As a consequence, we disregard interesting circumstances that were not present in both waves (e.g. the migration status of the parents) or whose comparability over time is not guaranteed (e.g. financial difficulties). By using paternal education we aim, nonetheless, at drawing out the effect of a circumstance which escapes individual responsibility but might explain unfair inequalities in the labour market.

To construct circumstances, individuals are first divided in three types (or groups) according to their father's education. The *high education* type consists of individuals who lived in a household where the father attained the first (e.g. bachelor, master or equivalent) or second (e.g. PhD or equivalent) stage of tertiary education; the *medium education* type consists of individuals who lived in a household where the father attained upper secondary education and post-secondary, non-tertiary education. Finally, the *low education* type consists of individuals who lived in a household where the father at most completed lower secondary education.

<sup>(198)</sup> The assessment of the implementation of each module can be found here: <http://ec.europa.eu/eurostat/web/income-and-living-conditions/data/ad-hoc-modules>; see Whelan et al., 2013 for possible limitations of the 2005 module.

<sup>(199)</sup> These countries are: Austria (AT), Belgium (BE), Cyprus (CY), Denmark, (DK), France (FR), Germany (DE), Estonia (EE), Finland (FI), Hungary (HU), Ireland (IE), Iceland (IS), Lithuania (LT), Luxembourg (LU), the Netherlands (NL), Norway (NO), Poland (PL), Sweden (SE), Slovakia (SK) and the United Kingdom (UK). The other countries were left out because they were not present in both years, did not report gross earnings in 2005 or because of other data issues.

**Table 24.1: Average gross earnings by type and country, 2005 and 2011**  
(Purchasing Power Standard (PPS))

Country	2005				2011			
	All	High	Medium	Low	All	High	Medium	Low
Belgium	38 363	66 493	35 496	32 305	38 693	45 270	38 943	35 600
Denmark	33 253	37 810	33 851	31 065	41 770	48 700	40 558	37 749
Germany	39 142	42 081	38 409	35 727	40 160	43 920	39 571	34 104
Estonia	11 268	14 356	11 882	9 153	17 672	22 060	17 390	13 935
Ireland	36 824	41 470	68 336	31 446	44 464	54 726	46 432	38 981
France	27 205	35 618	28 954	25 592	30 807	40 700	35 729	28 636
Cyprus	26 459	32 351	31 562	24 744	32 014	34 834	35 207	30 629
Lithuania	8 813	13 268	9 100	7 746	10 630	12 844	12 185	9 077
Luxembourg	51 020	70 120	59 723	43 286	47 993	67 426	56 391	37 817
Hungary	9 945	22 108	10 427	6 922	12 715	18 918	13 918	10 857
Netherlands	40 361	48 555	44 080	37 092	47 214	51 018	49 156	43 257
Austria	32 394	39 010	35 534	29 768	39 727	48 731	40 634	34 993
Poland	11 735	16 894	12 491	10 185	16 975	24 766	17 291	14 558
Slovakia	7 371	11 391	7 277	6 408	14 374	18 364	14 042	13 512
Finland	26 592	35 366	25 168	24 385	36 364	41 078	34 242	35 158
Sweden	27 415	36 523	28 252	25 554	34 342	42 470	33 386	31 255
United Kingdom	44 324	58 673	50 498	37 726	41 626	55 472	39 974	37 751
Iceland	36 024	42 207	37 558	31 706	36 011	39 874	37 146	32 290
Norway	34 155	39 756	33 207	31 290	46 681	52 887	45 093	42 374

*Reading note:* In Austria in 2005, the average gross earnings of our estimation sample was 32 394 Purchasing Power Standard (PPS; see Chapters 1 and 3 in this book). For individuals who lived in a household whose father was highly (low) educated when he was between 12 and 16 it was 39 010 (29 768) PPS.

*Source:* Authors' computation, UDBs of August 2009 and August 2014.

### 24.3.2 Outcome

Our outcome variable of interest is the annual gross employee cash or near cash income. It is defined as the monetary component of the compensation in cash payable by an employer to an employee, and it includes the value of any social contributions and income taxes payable by an employee or by the employer on behalf of the employee to social insurance schemes or tax authorities. This variable reflects the relation between the labour income and individual circumstances before state intervention. Differences in earnings originating from this variable are likely to reflect the effect that paternal education has on the individual skill accumulation process, on the individual costs in exerting effort, and on equal access to all positions offered in the job market.

Two caveats apply to this particular metric of opportunities. First, this variable is defined at the level

of the individual, implying that labour supply decisions are assumed to be made at individual level, thus neglecting household bargaining issues. Second, earnings represent yearly evaluations of performances, since we focus on individuals who spent more than 6 months in the income reference period as full-time workers. The observed earnings were converted in purchasing power standard (PPS) using the conversion rates provided on the CIRCABC user group <sup>(200)</sup>. Table 24.1 contains the average gross earnings by type and country. As expected, individuals with a more highly-educated father have the highest gross earnings.

<sup>(200)</sup> See: <https://circabc.europa.eu/w/browse/3c60eeec-aca4-4db7-a035-0a6d892e6069>. It is also worth mentioning that the method is scale invariant, which means that we obtain the same results when analysing gross earnings in national currency or after conversion in PPS. On PPS, see also Chapters 1 and 3 in this book.

## 24.4 Results

In this section, we first study the patterns of the indicators discussed in Section 24.2 and applied to the EU-SILC data presented in Section 24.3. Then, we explain how these indices relate to known measures of intergenerational income elasticity. This perspective makes clear that the inequality of opportunity indicators capture components related to structural inequalities and disadvantage. Finally, we discuss how the structural component of disadvantage is related to the 'at-risk-of-poverty-or-social-exclusion' (AROPE) EU indicator.

### 24.4.1 Inequality of opportunity indices

As the data show, the social prestige stemming from the paternal educational status also reflects the unfair advantage or disadvantage that these circumstances are likely to generate in terms of opportunity profiles for the younger generations. This holds across all years and countries. The magnitude of these gaps, along with their variation across time, are reported in Figure 24.2. The figure also reports, for each estimate, the 95 % confidence interval based on bootstrapped resampling procedures on baseline data, where stratification by country, year and region of residence is accounted for (see Goedemé, 2013).

The top-left panel of the figure shows that there is a strong heterogeneity in inequality of opportunity (measured in the *ex post* perspective) across the 19 EU countries considered in this chapter. In 2005, we can distinguish two well-defined groups of countries. The first group, comprising the Nordic countries, as well as Germany, Austria, Belgium, France, Cyprus and the Netherlands, displays low levels of inequality of opportunity, ranging from 0.023 to 0.04. The remaining countries display higher heterogeneity in inequality of opportunity, ranging from 0.043 for Slovakia to 0.098 for Hungary. This group includes lower income EU countries, with some notable exceptions such as Finland, Luxembourg and the United Kingdom. For the last two countries, it is likely that part of the measured inequality of opportunity is driven by the high-skill premium specific to their labour market conditions,

which has probably benefitted more those coming from relatively advantaged backgrounds. In general, we conclude that these indicators are all significantly positive in the statistical sense.

We can give an easy interpretation to the extent of inequality of opportunity measured by the indicators: in Germany (the least 'opportunity unequal' country in 2005), one expects that a shift in the background circumstances generates a 2.3 % change in earnings, while the same shift would induce a 9.8 % change in earnings in Hungary (the most opportunity unequal country in 2005).

Some patterns of changes in *ex post* inequality of opportunity across the 2005-2011 period are worth mentioning. Among the least opportunity unequal countries in 2005 we generally observe an increase in inequality of opportunity, with the largest change in absolute terms being registered in Austria. Countries placed at the centre of the inequality of opportunity spectrum in 2005 generally experienced a drop in  $IOp_p$  index. These reductions have been particularly high for the Netherlands and Cyprus, becoming the least opportunity unequal countries in 2011. For the most opportunity unequal countries in 2005, the change is more heterogeneously distributed. Finland, for instance, has seen a major drop while Luxembourg has jumped to the top of the ranking in 2011, with a measured inequality of opportunity of around 0.11, which can be interpreted as 11 % of the average income. How many of these changes are statistically significant? An answer comes from the analysis of the patterns of  $IOp_p$  differences and their standard errors across the countries, reported in the bottom-right panel of Figure 24.2. As the graph shows, the 95 % confidence interval around the absolute change in inequality of opportunity contains the zero for most of the countries, detecting cases where the changes between the 2 years are not statistically significant. Relevant exceptions to the general trend are Austria, where inequality of opportunity has increased by 0.018, and Finland, where inequality of opportunity has dropped by 0.024 in 2011. Overall, we conclude that the level of *ex post* inequality of opportunity has not dramatically changed during the period considered, underlying the relevance of long term trends in this phenomenon.

Moving onto the analysis of the *ex ante* inequality of opportunity perspective embodied by the  $IOp_{AI}$

indicator, we obtain patterns that are very closely related to what has been discussed above. The results reported in the top-right panel of the figure reflect the patterns described above, indicating that the opportunities prospects associated with the groups we are looking at can be ordered consistently at any effort level. These results confirm that the extent of inequality of opportunity we are measuring is characterised by a strong component of advantage across types, with children of more educated parents expecting more favourable opportunities, which is unchanged across the effort spectrum.

Also the bottom-left panel of the figure, reporting the distribution of  $IOP_{A2}$  indicators across countries, displays a pattern in line with the evolution of inequality of opportunity in the *ex post* setting. However, the size of inequality of opportunity is somehow lower. This finding reflects the fact that the  $IOP_{A2}$  indicator gives larger weight to the advantage/disadvantage concentrated at the bottom of the distribution of effort. Hence, the overall advantage/disadvantage between the different types must be concentrated at high levels of effort, indicating that children from families with more educated fathers receive an economic advantage in the labour market compared to children from low educated fathers, and this advantage increases along the 'comparable' effort dimension. Comparing the patterns in 2005 and 2011, we find that changes in the  $IOP_{A2}$  index reflect changes observed for the other indicators. The relevant exception is Luxembourg, where we cannot reject that *ex ante* inequality of opportunity has augmented in the period considered.

What are the drivers of these results? The answer lies on the cross-country heterogeneity in the pattern of the gaps between opportunity profiles associated with different types. These gaps are conveniently rearranged and reported with their 95 % confidence intervals in Figure 24.3. In the figure, the height of the bars represents the weighted average gap in PPS between pairs of types, where the opportunity profile of children with more educated parents is always compared with the opportunity profile of children with less educated parents. These gaps are mostly positive, aside from some cases where they are not statistically distinguishable from zero. In general, the gaps between the children from more educated parents and those

from less educated parents drive the inequality of opportunity indices, despite the relatively small size of the most advantaged type across the sample of countries considered here.

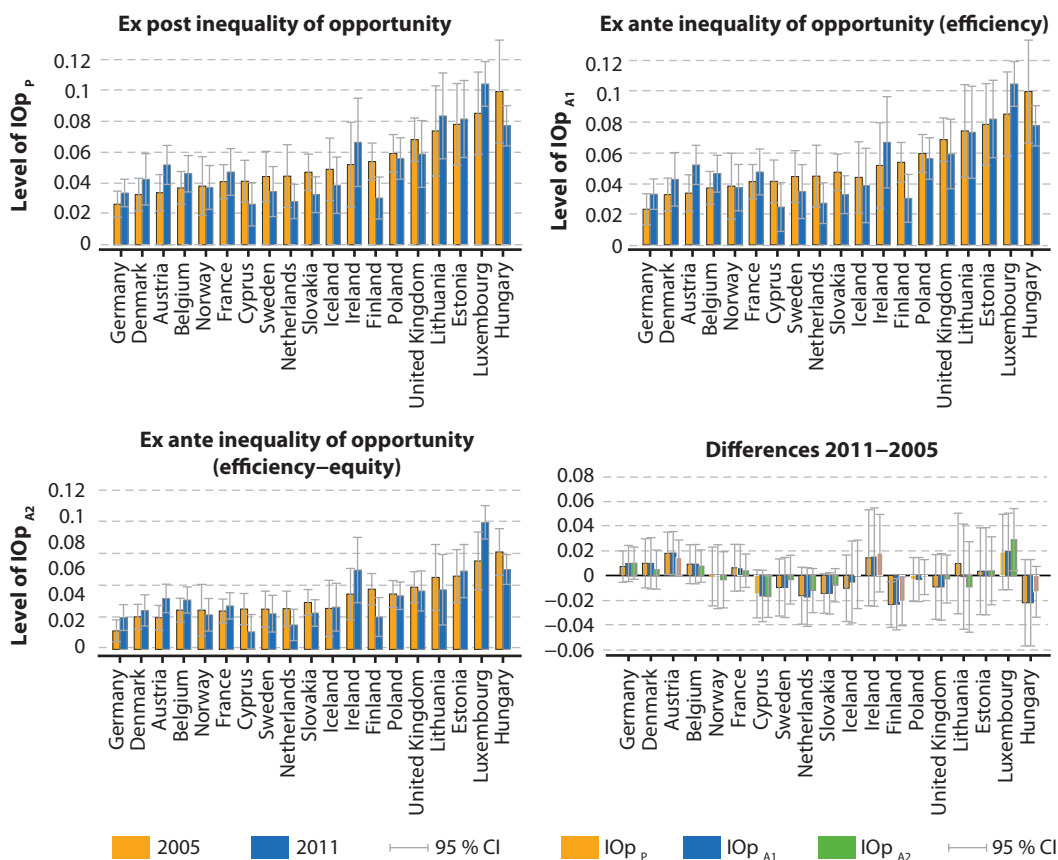
Notable cases where the gap is particularly high are Luxembourg, registering the largest gap across types, and Ireland <sup>(201)</sup>.

## 24.4.2 Inequality of opportunity and risk of poverty or social exclusion

The inequality of opportunity indicators are related to structural components of inequality that have to do with the pattern of transmission of advantage and disadvantage across generations. We support this conjecture by drawing from the literature on intergenerational father-son earnings elasticity. Reliable estimates for these elasticities, depicting the percentage change in the earnings of the son as a response to a 1 % change in paternal earnings, are practically hard to identify and measure on available data. The most reliable estimates are available for Nordic countries (see Jäntti and Jenkins, 2014).

For illustrational purposes, we focus on the case of Sweden in 2005. In the data, we find that  $IOP_p = 0.038$ , indicating that over the effort distribution, an increase by a category of the paternal educational standards when the child was still living with the parents is associated with a 3.8 % increase in the expected advantage this child will experience. Here, the 'change' in circumstances has a vague interpretation, since circumstances are not ordered on a-priori ground (they represent categories of parental education). However, with the appropriate metric the indicator can be associated with a measure of intergenerational elasticity. Let us approximate the expected shift of an educational circumstance by the income returns to education that fathers would have experienced over the life cycle. For Sweden, it can be safely argued that returns from education for the father's

<sup>(201)</sup> It is worth recalling that the indicators are standardised by the mean income of the country. Hence, despite the fact that Luxembourg displays larger advantage gaps in 2005 compared to Hungary, it also has a comparatively larger average expected earnings levels which finally smooths the evaluation of these gaps.

**Figure 24.2:** Inequality of opportunity indicators and their changes, 2005 and 2011

NB: The two panels at the top and the bottom-left panel report the patterns of the *ex post* and *ex ante* indicators in 2005 and 2011 for all selected countries. In these three panels, the vertical columns indicate the level of inequality of opportunity in a given country-year as measured by one of the indicators. The bottom-right panel reports, for each country, the actual changes in the indicators from 2005 to 2011. In all four panels, the grey bars indicate the 95 % confidence bands for these estimates (based on 250 bootstraps replications for stratified data). Countries are ordered by  $IOp_p$  values in 2005.

Reading note (top-left panel): In Germany (least 'opportunity unequal' country in 2005), the 0.023 figure means that a shift in the background circumstances is expected to generate a 2.3 % change in wages.

Source: Authors' computation, UDBs of August 2009 and August 2014.

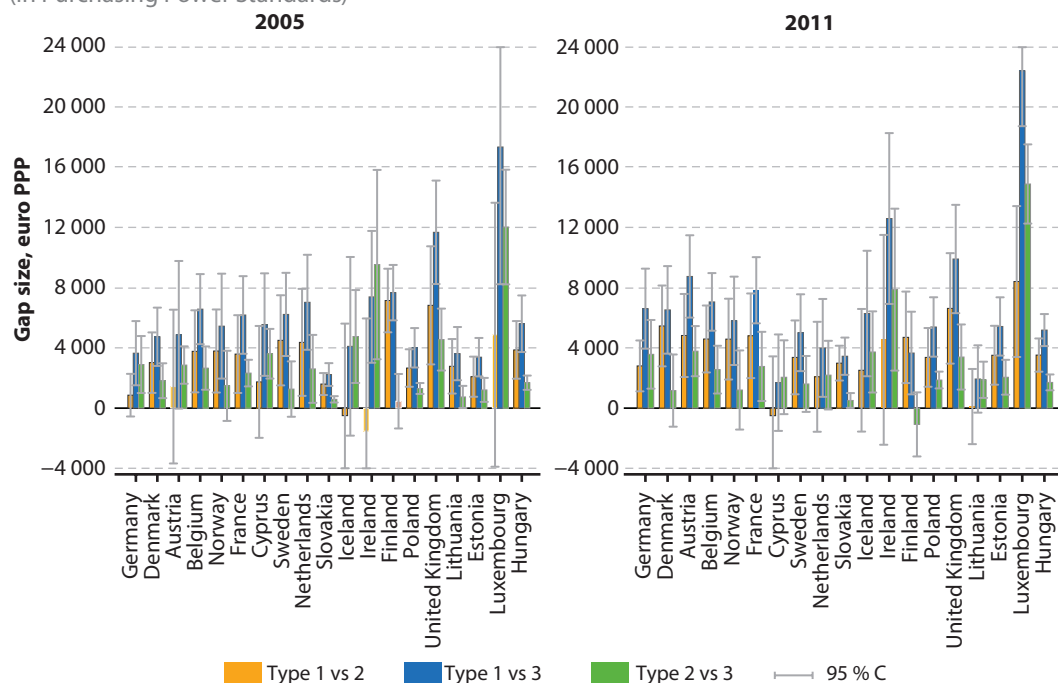
generation considered here are generally larger than 9.95 %<sup>(202)</sup>. Using these data, we can infer an

<sup>(202)</sup> Björklund (1986) has documented a fall in the returns to schooling in Sweden from 7.8 % in 1968 to nearly 4 % in 1984. This result is confirmed by Björklund and Kjellström (2002) who show that for male worker, the returns from education estimated by the Mincer equation have shifted in the same time span from 8.7 % to 4.6 %, or from 11.2 % to 5.4 % according to the reference scenario. It is therefore reasonable to assume a 9.95 % return to education for the cohort of the parents considered in this study. Given the trend identified by the two authors, and the possibly large shift in human capital associated with a change in the circumstances we consider, this figure is likely to be a lower bound of the earning variation we are interested in.

upper bound for the earning elasticity between fathers and children earnings of nearly 0.382 (equal to 3.8 %/9.95 %), which is close to the 0.3 intergenerational elasticity estimate found by Björklund and Jäntti (1997) on 1990 earnings of Swedish male workers aged 29-38.

This simple example shows the relevance of the inequality of opportunity analysis in capturing intergenerational patterns of advantage and disadvantage, and allows approximate mobility coefficients for countries where reliable estimates of intergen-

**Figure 24.3: Average weighted gaps in opportunity profiles across types, 2005 and 2011**  
(in Purchasing Power Standards)

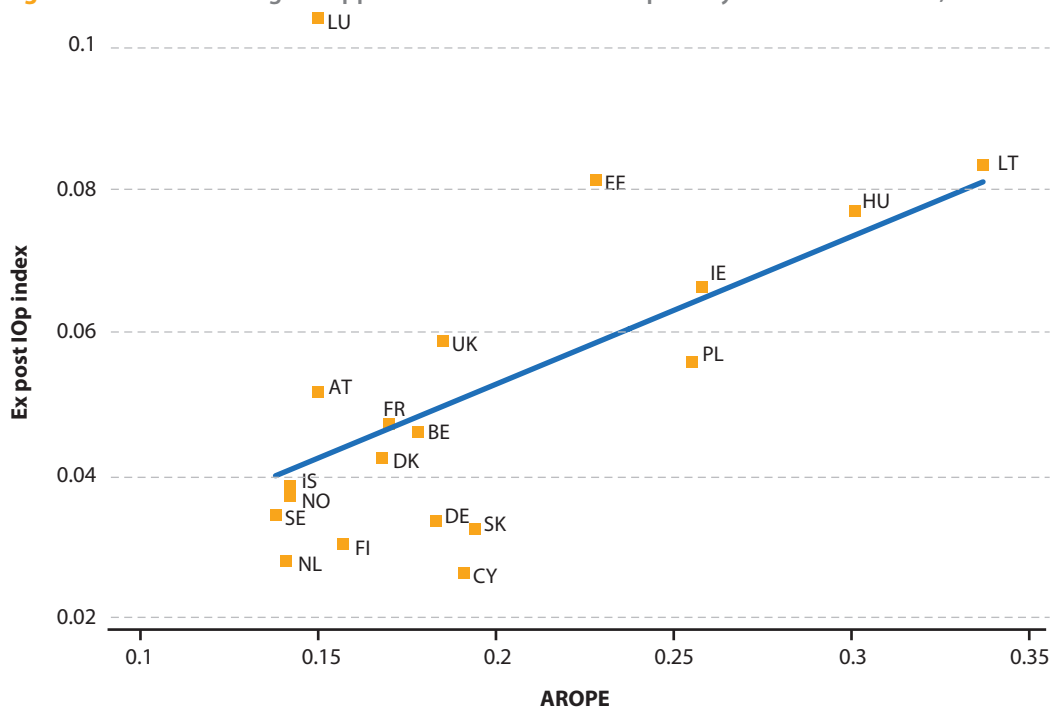


*Reading note:* Each panel reports, for each country in a given year, the weighted average gap between the opportunity profiles of pairs of types (high, low and medium educated fathers), or a total of three comparisons per country. The grey bars indicate the 95% confidence bands for these estimates (based on 250 bootstraps replications for stratified data). Values trimmed at 24 000 and -4 000 PPS. Countries ranked as in Figure 24.2.

*Source:* Authors' computation, UDBs of August 2009 and August 2014.

erational elasticities are not available. Within this perspective, it is interesting to understand how the intergenerational dimension of disadvantage is related to the actual extent of disadvantage. Figure 24.4 provides some hints on this. The figure scatters the 19 countries considered in this study, where the level of *ex post* inequality of opportunity measured in 2011 is confronted with the realisations of the EU indicator of 'at-risk-of-poverty-or-social-exclusion (ARPE) for the male population aged 25-49. The figure provides evidence on two stylised facts. First, that there is a positive association between short-term disadvantage, as captured by the ARPE index, and long-term disadvantage, as captured by  $IOp_p$ . Hence, countries promoting labour market policies targeting the ARPE indicator have good chances of reducing the process of intergenerational persistence of disadvantage. The second fact is that, even among countries with very low levels and

stable patterns of actual disadvantage, there is high heterogeneity in intergenerational disadvantage. This indicates that despite similar level of poverty or social exclusion, the policies targeting intergenerational disadvantage may affect the channels through which disadvantage passes across generations. This can be done, for instance by fostering participation in the educational system or, as suggested by recent evidence in Andreoli et al. (2014), by shaping universal pre-schooling programmes to provide uniform high quality pre-primary education to all children, while targeting with additional support those children with the most disadvantaged background who are most unlikely to thrive in the labour market. This form of *predistribution* taking place early in life would contribute to promoting a fair distribution of resources later on, alongside yielding efficiency gains if the disadvantaged children are those with

**Figure 24.4: Disadvantage in opportunities and the risk of poverty or social exclusion, 2011**

*Reading note:* The AROPE index is based on male population aged 25-49 in 2011. The OLS estimates of the fitted regression line coefficients (SE) are 0.011 (0.015) for the intercept and 0.207 (0.078) for the slope.

*Source:* Authors' computation, UDBs of August 2009 and August 2014. The AROPE indicator for selected countries is available from the Eurostat web-database (code *ilc\_peps01*). Data extracted on 24.9.2014.

larger potential to develop additional skills that are valuable in the labour market <sup>(203)</sup>.

## 24.5 Conclusions

The purpose of this chapter was twofold. First, to propose a novel way of quantifying the degree of inequality of opportunity through simple indicators, which are consistent with the normative perspectives on EOp. Secondly, to illustrate this measurement framework by investigating the evolution of inequality of opportunity across a selection of European

countries between 2005 and 2011. Our analysis suggests that there have been no statistically significant changes in inequality of opportunity across the 19 EU countries considered in the study. There are exceptions, and the change seems to be driven from variations in the gap between opportunity profiles of the more and the least advantage 'types' (a type gathers all individuals who share similar characteristics for which they cannot be held responsible for, such as paternal education). While these results probably reflect the differentiated effect of the recent crisis on each country's labour market (our analysis focuses on gross earnings, i.e. before taxes and transfers) and the measures that have been proposed to mitigate its effects though incentives to the labour market, explaining the causes of this evolution will require further research and analysis (e.g. focusing on household net income).

<sup>(203)</sup> A synthetic overview of mechanism transforming predistribution of skills into redistribution of wealth can be found in J.J. Heckman's post on the Boston Review: <http://www.bostonreview.net/forum/promoting-social-mobility-james-heckman> (Accessed: 10 March 2016).



While the EU-SILC 2005 and 2011 modules constitute the best available data to answer our research question, some comparability issues across countries and time constrained us to reduce the scope of our analysis to countries which collected both waves and with similar income and circumstances (father's education) data. Indeed, the 2011 module is an improved version of the 2005 module taking into account pitfalls of the initial module highlighted by the assessment of the 2005 module (see also Whelan et al., 2013 for issues related to the 2005 module). These improvements increase the quality of the 2011 data but affect the comparisons of the results drawn from both modules. For example, the possibility for respondents to answer 'don't know' to a wide range of questions in 2011 (an option that was not given to the respondent in the 2005 questionnaire) may affect the comparisons of the results drawn from the two modules in ways that are difficult to assess.

In addition, as already mentioned, the two EU-SILC modules are examples of retrospective questions that ask 'present-day respondents about past history' (Atkinson et al., 1983, p. 17). Respondents are asked about their parents' past characteristics. This type of survey is appealing as it allows the study of intergenerational issues without actually having to wait for two generations. The validity of the data is, however, crucial and rests on the ability of each respondent to provide accurate answers about their parents' characteristics. To our knowledge, no external validity test of the retrospective modules present in EU-SILC has been undertaken. In order to do so, confronting EU-SILC module data with official records in register countries, or encouraging the researchers community to engage in meta-analysis, such as the one we performed by comparing inequality of opportunity indicators with results from the literature on intergenerational earnings elasticity, may be a strategy worth exploring further.

Finally, while our results depend on elements such as the choice of the outcome variable and the circumstances or, as already mentioned, the validity of the retrospective modules, they provide a new perspective on the distribution of well-being which can usefully complement the Europe 2020 social inclusion target. Indeed, the inequality of opportunity indicators are positively associated with actual measures of disadvantage and social exclusion, such as the AROPE

indicator. However, this correlation is not perfect and the inequality of opportunity indicators seem to capture some underlying heterogeneity among countries with very low and similar levels of social exclusion. This perspective highlights that the inequality of opportunity analysis is relevant in its own right, and that introducing inequality of opportunity indicators in the toolkit of the European social policymaker will foster the knowledge of the patterns of intergenerational persistence of inequality across the EU.

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# 25

## The impact of growing up poor in Europe

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### 25.1 Introduction

The impact of poverty during childhood on individuals' economic outcomes later in life is a topic of active research and a major policy concern in many developed as well as developing countries. Existing literature has focused typically on the estimates of the intergenerational elasticity in income or earnings of parents and their offspring. (See among others, Altonji and Dunn (2000), Chadwick and Solon (2002), for the United States; and Björklund et al. (2001) for Scandinavian Countries; Blanden et al. (2007), Ermisch and Nicoletti (2007) for Britain; Mocetti (2007) for Italy; and Lefranc et al. (2010) for France and Japan.) Together, these contributions provide evidence from several countries, mainly suggesting that the United States and the United Kingdom tend to have higher rates of intergenerational persistence, and, hence, less socioeconomic mobility than other countries, while the Scandinavian countries experience the higher intergenerational mobility in earnings.

Focusing on poverty (rather than earnings or income) persistence across generations, research has

highlighted that growing up in a poor family raises the probability of falling below the poverty threshold in adulthood (see Jenkins and Siedler (2007) for a comprehensive survey on industrialised countries).

Many of the findings reported in the literature are based on an estimation of the effect of experiencing poverty during childhood on the average of children's attainments. They rely on the assumption that the observed and unobserved components effects on attainments are uncorrelated with each other. If this is not the case, then these estimates are likely to be biased. One way to address this problem is the estimation of siblings' difference models. However, the use of these models does not guarantee that estimates are unbiased, since there may remain some child-specific factors contributing to potential bias that are also relevant to the estimation of the levels model. Moreover, these estimates are based on a selected sample of households with siblings, making the generalisation of the results to one-child families difficult. This type of family can in fact be different with respect to other factors affecting the outcome of the child, as well as their poverty status. Alternative methods to the levels models are based on instrumental variables <sup>(205)</sup>. In practice, it is difficult to find an additional variable which determines childhood poverty status and which at the same time has no direct influence on the outcome variable; moreover, instrumental variables estimates tend to lead to less efficient coefficient estimates.

Standard parametric models rely on strong assumptions about parents' and individuals' behaviour as well as about the mechanisms of poverty trans-

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<sup>(205)</sup> In attempting to estimate the causal effect of some variable  $x$  on another  $y$ , an instrumental variable is a third variable  $z$  which affects  $y$  only through its effect on  $x$ .

mission. In order to overcome the limitations of the previous studies, we contribute to the poverty transmission literature by using the potential outcome approach to causal inference (Rubin, 1974, 1978). Following the Rubin Causal Model, our estimation strategy consists in matching individuals that experienced poverty when children with individuals that did not experience poverty in their childhood, conditional on a large pool of observable characteristics (see Section 25.2 for further details).

Analysing data from a wide range of European countries, we find that experiencing financial problems in childhood significantly (in the statistical sense) decreases the level of income in adulthood, by an average of 2 %, increasing thereby the probability of being at risk of poverty by 4 percentage points. The remainder of the chapter is organised as follows. Section 25.2 introduces the estimation strategy and Section 25.3 describes the samples used through the whole chapter. Section 25.4 analyses both the average and distributional impact of growing up poor. Section 25.5 concludes.

## 25.2 Estimation strategy

The intergenerational transmission of poverty is a complex process. Both the economic outcomes of a person and the income of his/her family of origin may be partly determined by various unobserved individual or household characteristics, such as the parents' or the child's ability or any 'neighbourhood' effect. Therefore, estimating causal effects in this context is a notoriously difficult task. Experience of low income during childhood is not the only determinant of outcomes later in life; in order to assess the true causal effect of growing up in (financial) poverty, we need to control for these other potential influences.

In this chapter, we use the *Potential Outcomes* approach for causal inference (Rubin, 1974, 1978). The basic idea of *causal inference* and the statistical framework based on potential outcomes, is that of a 'treatment' (in our study, 'growing up in a financially poor household') applied to a unit (in our study, a child), at a specific point in time. As a result, for

each unit and each treatment, there are two potentially observable results: one referring to the value of the outcome variable in the event of treatment (growing up in a poor household), and the other in the event of non-treatment (not growing up in a poor household). The causal effect is the result of a comparison between the two potential results, that is the difference between the probability for an individual to be poor if he grew up in a poor household and the probability for the same individual (i.e. an individual with the same characteristics) of being poor if he did not grow up in a poor household.

This statistical framework, based on potential outcomes, is referred to as the 'Rubin's Causal Model' (RCM) by Holland (1986). It views causal inference as a missing data problem and explicitly formulates the *assignment mechanism* as a process for revealing the observed data.

Formally, if we consider the case of a binary policy treatment  $T = 0$  or  $1$ , let  $Y(0)$  be the value of the outcome variable  $Y$  if the unit is not treated ( $T = 0$ ) and  $Y(1)$  the value if the unit is treated ( $T = 1$ ). Causal effects are defined as comparisons of  $Y(1)$  and  $Y(0)$ , i.e.  $Y(1) - Y(0)$ . Inference on such effects is characterised by missing data, since only one of the two potential outcomes can be observed for each unit. This creates uncertainty on the causal effects even if all units of a given population of interest are available. In order to infer the causal effects, it is therefore crucial to specify the *assignment mechanism*, i.e. the process that determines which unit receives which treatment, and so which potential outcomes are realised and can be observed, and which are missing.

In experimental studies, this stochastic rule is the known probability that subjects will be assigned to treatment; it usually does not depend on individual characteristics nor on the potential outcomes. In observational studies, the assignment mechanism is usually unknown and may depend on the potential outcomes (either directly or indirectly). Formally, the assignment mechanism, or 'propensity score', is the probability of growing up in a poor household conditional on a set of observable characteristics ( $X$ ), such as parental characteristics, family composition, and other features fixed in childhood, like the number of siblings or the birth order:

$p(X) = Pr(T = 1 | X = x) = E[T | X = x]$  <sup>(206)</sup>. It is ignorable if it depends only on observed values, as is the case in randomised experiments or in observational studies where the treatment is supposed to be ‘unconfounded’. The ‘unconfoundedness’ assumption, often referred to as ‘ignorability, or selection on observables’ (see Imbens, 2004 for an extensive review), assumes that, among units with the same value of the pre-treatment variables, the treatment was assigned at random. Under this key assumption, all biases between treated and control groups can be removed by conditioning on observed covariates; this assumption underlies the propensity score (PS) matching methods for treatment effects estimation (Rosenbaum and Rubin, 1983).

As already explained above, in our analysis  $T_i$  indicates whether an individual (when he/she was a child) was growing up in a household experiencing financial problems,  $T_i = 1$  (treated), or not,  $T_i = 0$  (control). For each individual, we observe a vector of pre-treatment variables,  $X_i$  and the value of the outcome variable (here the household equivalised disposable income) associated with the treatment,  $Y_i(1)$  for being a poor child,  $Y_i(0)$  for not being a poor child. The central assumption of our approach is that the ‘assignment to treatment’ is unconfounded given the set of observable variables:  $Y_i(0), Y_i(1) \perp T_i | X_i$ .

In our study, we assume that unconfoundedness holds conditional on all the pre-treatment variables, arguing that these characteristics are also good proxies of unobserved factors that might have an effect on the likelihood of being poor as a child (Rubin, 2008). More specifically, in order to measure the causal impact of experiencing financial problems in childhood, we implement the propensity score procedure applying a single *nearest-neighbour matching*, taking each treated unit and selecting the control unit with the smallest propensity-score distance (see also Becker and Ichino (2002) and Dehejia and Wabba (2002) for an extensive review on alternative propensity score methodologies). We apply this method with replacement, that is, we allow a comparison unit to be the best match for more than one treatment

unit. Rosenbaum and Rubin (1983) show that if the potential outcome  $Y_i(0)$  is independent of the treatment assignment conditional on  $X_i$ , it is also independent conditional on PS (that is, within strata with the same value of a given propensity score, exposure to treatment can be considered as random and thus poor and non-poor children should be on average observationally identical). After matching each treated unit with a control unit, we compute the difference between the outcomes of the treated and control units.

In our study, we use the matched samples of poor and non-poor children to estimate the average effect of experiencing financial problems during childhood on adulthood outcomes, primarily equivalent disposable income and probability of being poor, on the whole population (Average Treatment Effect [ATE]:  $\tau = E[Y_{1i} - Y_{0i}]$  given  $p(X_i)$ ), and the average effect of being poor on those exposed to poverty (Average Treatment on the Treated [ATT]:  $\tau_t = E[Y_{1i} - Y_{0i} | T_i = 1]$  given  $p(X_i)$ ), respectively.

Moreover, regarding income in adulthood, we focus not only on the mean impact, but also on the distributional effects of growing up poor. A way to explore differences across the distribution of outcomes is the quantile regression, which allows quantifying the effect of being born in a poor family on an arbitrary point along the conditional distribution of the relevant outcomes of children when adult. This flexibility to look across the distribution allows for an examination of differences between children at the top of the income distribution versus children at the bottom of the income distribution. It is referred to as *Quantile Treatment Effects (QTE)* <sup>(207)</sup>.

More formally, we can define the QTE for a given quantile  $q$  in a similar manner as the ATT introduced above. Let  $F_{Y_1}$  be the distribution function of potential outcomes  $Y_1$ , while we note with  $Q_{Y_1}(q)$  the quantile  $q$  of this distribution. The QTE,  $\tau(q)$ , coincides with the expected gains/loss from treatment associated to quantile  $q$  of outcomes distributions:  $\tau(q) = Q_{Y_1}(q) - Q_{Y_0}(q)$ . QTE is thus defined as the horizontal difference between the distribution function

<sup>(206)</sup> So, an individual's propensity score is the probability for him/her to be poor in childhood given a number of observed characteristics.

<sup>(207)</sup> We thus apply Quantile Treatment Effects (QTE), identified through semi-parametric and non-parametric estimators (Firpo, 2007, Firpo et al., 2009, Frölich and Melly, 2010, 2013), in order to identify the potentially heterogeneous impacts of growing up poor at different points of the income distribution (see Section 25.4.2 for further details).

in the presence and in the absence of the treatment, in our case the distribution function of incomes of individuals who experienced financial problems in their childhood and the ones who did not.

## 25.3 Data

For the specific purpose of our analysis, we use the modules on intergenerational transmission included in the 2005 and 2011 EU-SILC Waves <sup>(208)</sup>. We restrict our sample to individuals aged between 35 and 55 years, in order to maintain a higher degree of homogeneity in the stage of the life cycle in which the outcomes of interests are measured <sup>(209)</sup>. More precisely, for the 2005 sample, our treatment variable is an indicator of having experienced poverty in childhood. It is based on the presence of financial problems in the household (often or most of the time), while the variables we use as pre-treatment are: for the child, country of residence and of birth, gender, year and quarter of birth, family composition and number of siblings and for both parents, year of birth, highest level of education <sup>(210)</sup>, main activity and main occupation <sup>(211)</sup>. For the 2011 sample, our treatment variable is constructed either on the basis of the financial situation of the household (very bad or bad) or from the 'ability to make ends meet' question (the household manages to make ends meet with great difficulty or with difficulty), and as pre-treatment variables (i.e. already determined at the birth of the child) we are able to add also the number of adults in the household, the number of persons in the household at work, the country of birth, the citizenship, the managerial position of the father and of the mother and the tenancy status. We focus on three outcomes of the children as adults: the log of the equivalised disposable income <sup>(212)</sup>, the probability of being at

risk of poverty (as defined at EU level, i.e. a household is at risk of poverty if its equivalised disposable income is lower than 60 % of the national household median equivalised disposable income) and the difficulty of making ends meet (only for the analysis of the 2011 module) <sup>(213)</sup>. In both samples we treat missing data as an additional category, keeping cases that would otherwise be dropped. As mentioned in Allison (2001), 'this is particularly appropriate when the unobserved value simply does not exist. For instance, individual may have questions on mother's and father's education, but the father or mother was unknown or never part of the family'.

Finally, as we are dealing with retrospective questions, we are aware that individuals may suffer from recall bias, as respondents may not remember correctly when an event actually happened, or how an event exactly took place. Mathiowetz and Duncan (1988), looking at the accuracy of retrospectively collected unemployment information, find that 89 % of respondents indeed had an unemployment period if they reported it in the survey. Moreover, Akerlof and Yellen (1985) and Jürges (2007) checking the correct report of unemployment spells by means of retrospective questions, find that the more important the event was at the time, the more accurately it is remembered. In studies of intergenerational occupational mobility the retrospective technique has been extensively applied, as a conventional longitudinal survey would have to cover more than a generation's time to link the present to those events in the past.

In our specific context, we believe that the type of question asked is less affected by this problem given its saliency and the lower level of information required compared, for example, with a direct question on the level of income in the household. Moreover, it is plausible that this problem would affect our estimates by introducing a downward bias as parents tend to shield their children from the financial problems they may experience, resulting in more cases of individuals reporting no financial problem in childhood, while there were in fact problems, than the other way round.

<sup>(208)</sup> See Chapter 24 in this book for a description of these modules.

<sup>(209)</sup> Our main results hold also on the unrestricted sample, the relative Tables are not presented here but are available from the authors upon request.

<sup>(210)</sup> See Chapter 24 in this book for a description of the various educational levels.

<sup>(211)</sup> See <http://www.ilo.org/public/english/bureau/stat/isco/isco88/>

<sup>(212)</sup> For the definition of equivalised disposable income, see Chapter 3 in this volume. The log transformation allows interpreting average differences in earnings across treated and non-treated units in terms of percentage changes.

<sup>(213)</sup> The descriptive statistics of the sample used are available from the authors upon request.

**Table 25.1: Test of the difference in the averages of the outcomes by treatment status, pooled data, 2005 and 2011**

	2005	2011(a)	2011(b)
Equivalised disposable income, log	0.131*** (39.64)	0.0967*** (29.94)	0.0990*** (31.21)
At risk of poverty as adult	-0.0655*** (-25.75)	-0.0952*** (-34.65)	-0.0936*** (-34.68)
Ability to make ends meet as adult		-0.217*** (-61.67)	-0.220*** (-63.73)

NB: t statistics in parentheses, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. The treatment variable is based on the question about childhood financial problems for 2005, financial situation for 2011(a) and ability to make ends meet for 2011(b).

Reading note: Individuals who experienced financial problems during their childhood have on average almost 7 % (almost 10 %) more probability of being at risk of poverty in adulthood than those who did not experience financial problems in our 2005 (2011) pooled sample.

Source: Authors' computation, UDBs of August 2009 and August 2014.

## 25.4 Results

### 25.4.1 Propensity score-based methods

A simple test of the differences by treatment status in the averages of the outcomes of interest gives us a first insight on our data (see Table 25.1). On average, poor and non-poor children significantly (in the statistical sense) differ in their level of income and in their probability of being income-poor or not being able to make ends meet in adulthood in both samples, with all the different definitions of poverty in childhood that we consider: experiencing financial problems (with the different wording in the 2005 and 2011 surveys) or not being able to make ends meet (only available in 2011). These differences go from 10-13 % for the level of disposable income to 7-10 % for the probability of being income-poor up to 22 % for the probability of not being able to make ends meet.

As we can notice from the results presented in Table 25.2, these differences, although varying considerably in the levels, show a consistent statistically significant difference in the outcomes in adulthood between poor and non-poor children in all countries, with the exception of Denmark, Finland, Iceland, Malta, Sweden and Switzerland for at least one outcome in one of the samples.

As explained briefly in the introduction, these simple differences do not take into account that there

are factors jointly affecting both the probability of experiencing financial difficulties in the family of origin when being a child and the financial situation in adulthood. In order to measure the impact of experiencing financial problems during childhood, abstracting from other factors that correlate with both childhood and adulthood financial situation, as a first step in our empirical strategy, we estimate each individual's propensity score, i.e. his/her probability to be poor in childhood given the observed characteristics introduced in the previous section. We do so by means of probit models<sup>(214)</sup>.

A first interesting result is that almost all our pre-treatment variables result in statistically significant prediction of the probability of experiencing financial problems in both samples. The only characteristics of the child which seem to play no significant role are his/her gender and the quarter of birth.

Younger children seem to be less likely to experience poverty, while immigrants are more likely to face financial problems in the 2005 sample, and the country of birth has no real impact in the 2011 sample. Living arrangements different from the standard reference (i.e. not living with both parents) and also living in larger households (i.e. having more siblings or more generation under the same roof) are correlated with a higher probability of experiencing poverty in childhood.

<sup>(214)</sup> The results are available from the authors upon request.

**Table 25.2:** Test of the difference in the averages of the outcomes by treatment status, country data, 2005 and 2011

	Equivalised disposable income, log			At risk of poverty as adult			Ability to make ends meet as adult	
	2005	2011(a)	2011(b)	2005	2011(a)	2011(b)	2011(a)	2011(b)
Belgium	0.0796***	0.110***	0.110***	-0.0882***	-0.156***	-0.151***	-0.225***	-0.212***
Bulgaria		0.234***	0.227***		-0.285***	-0.279***	-0.265***	-0.246***
Czech Republic	0.0405***	0.0603***	0.0560***	-0.0253*	-0.0704***	-0.0738***	-0.177***	-0.184***
Denmark	0.0598***	0.0465**	0.0490**	-0.0547***	-0.0318	-0.0371	-0.0651**	-0.0747***
Germany		0.0520***	0.0530***		-0.0484***	-0.0494***	-0.119***	-0.117***
Estonia	0.0637***	0.0496*	0.0376*	-0.0589***	-0.0804**	-0.0757**	-0.174***	-0.186***
Ireland	0.111***	0.0576***	0.0617***	-0.136***	-0.0779***	-0.0710**	-0.191***	-0.209***
Greece		0.0787***	0.0786***		-0.0801***	-0.0710***	-0.111***	-0.115***
Spain	0.0545***	0.118***	0.115***	-0.0344***	-0.121***	-0.121***	-0.279***	-0.276***
France		0.0419***	0.0469***		-0.0409***	-0.0484***	-0.0640***	-0.0829***
Croatia		0.0781***	0.0738***		-0.0875***	-0.0814***	-0.189***	-0.182***
Italy	0.0790***	0.0961***	0.0868***	-0.0800***	-0.121***	-0.108***	-0.287***	-0.291***
Cyprus	0.0840***	0.0795***	0.0786***	-0.0600***	-0.0705***	-0.0675***	-0.185***	-0.181***
Latvia	0.0722***	0.115***	0.113***	-0.0753***	-0.166***	-0.164***	-0.191***	-0.192***
Lithuania	0.0655***	0.0943***	0.0872***	-0.0623***	-0.0907***	-0.0960***	-0.239***	-0.239***
Luxembourg	0.135***	0.115***	0.121***	-0.209***	-0.152***	-0.157***	-0.125***	-0.129***
Hungary	0.0472***	0.104***	0.101***	-0.0538***	-0.163***	-0.159***	-0.221***	-0.219***
Malta		0.0387**	0.0375**		-0.0280	-0.0306	-0.246***	-0.250***
Netherlands	0.0352***	0.0580***	0.0582***	-0.0176	-0.0532**	-0.0564***	-0.102***	-0.100***
Austria		0.0478***	0.0449***		-0.0442***	-0.0402***	-0.112***	-0.121***
Poland	0.0750***	0.0874***	0.0754***	-0.0802***	-0.0963***	-0.0824***	-0.220***	-0.197***
Portugal		0.131***	0.130***		-0.105***	-0.109***	-0.289***	-0.293***
Romania		0.0989***	0.0973***		-0.116***	-0.119***	-0.262***	-0.258***
Slovenia	0.0450***	0.0422***	0.0400***	-0.0272*	-0.0557***	-0.0525***	-0.131***	-0.129***
Slovakia	-0.0161**	0.0576***	0.0572***	0.0231*	-0.0548**	-0.0647***	-0.239***	-0.237***
Finland	0.0121	0.0370*	0.0366*	-0.0132	-0.0447*	-0.0457*	-0.0477**	-0.0567**
Sweden	0.0203	0.0354**	0.0263*	-0.00499	-0.0251	-0.0130	-0.0859***	-0.109***
United Kingdom	0.0384***	0.0489***	0.0466***	-0.0272**	-0.0668***	-0.0652***	-0.111***	-0.124***
Iceland	0.0329	0.0292	0.0184	-0.0271	-0.0232	-0.0193	-0.106*	-0.0954*
Switzerland		0.0385***	0.0442***		-0.00924	-0.00280	-0.123***	-0.112***

NB: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. The treatment variable is based on the question about childhood financial problems for 2005, financial situation for 2011(a) and ability to make ends meet for 2011(b).

Reading note: In Finland, Iceland and Sweden there is no statistically significant difference in the probability of being at risk of poverty in adulthood between children who experienced financial problems and children who did not in our 2005 sample.

Source: Authors' computation, UDBs of August 2009 and August 2014.



Focusing on parental characteristics, as expected, the higher the educational level, the lower the probability of falling into poverty, whereas being unemployed, retired or full time house worker increases this probability; this is true for both mothers and fathers. Interestingly, while having a father who is self-employed decreases the probability of experiencing financial problems, if it is the mother who is self-employed this probability increases. Analysing the impact of the variables available only in the 2011 sample, we see that the country of birth and citizenship of the parents do not seem to have a significant role, while growing up in a family that owns its dwelling and having a father with a managerial position significantly decrease the probability of experiencing financial difficulties.

Finally, looking at country dummies, although we cannot directly say something about the link between each dummy and the probability of being poor, given that this impact is somehow mediated by potential migration between those countries (e.g. one individual may have experienced poverty in his/her childhood in Poland and then moved to Italy at the time of the survey, so he/she will now be included in the Italian sample) <sup>(215)</sup>. Yet, we can infer from the country dummies the general trend at country level on the probability of experiencing poverty during childhood, suggesting that in general there are significant differences in these probabilities between countries in both samples. Countries which do not differ from the United Kingdom (country of reference in our regressions) are: Belgium, Czech Republic, and Italy with no substantial differences in 2011; Cyprus in 2005; Luxembourg in both cases.

As mentioned in Section 25.2 ('Estimation Strategy'), after matching each treated unit with a control unit conditional on a given PS, the difference between the outcomes of the two groups (treated and controls) is computed. The *ignorable* assignment mechanism (unconfoundedness) underlies PS matching techniques for (causal) treatment effects estimation of interest (Rosenbaum and Rubin, 1983).

<sup>(215)</sup> 'Mediated' because migration exhibits an indirect causation. It should be noted that we have information regarding immigration that we use as the country of birth, but we do not know where the individual was living during his/her childhood when he/she was experiencing financial problems.

Results of this procedure are presented in Table 25.3 (part A for 2005, part B and C for 2011).

In our analysis, results show a significant decrease in the equivalised income in adulthood due to exposure to poverty in childhood. This decrease is on average around 2 % (only 1 % when we focus on the average effect on those exposed to poverty in childhood in 2005). It is also worth noticing that, although the difference in income by treatment status in the 2005 sample is slightly higher than in the 2011 one, the causal impact of experiencing financial difficulties as a child accounts for 20 % and 30 % (in 2005 and 2011 respectively) of the difference between income levels (in adulthood) presented in Table 25.1.

The impact of the treatment on the risk of poverty in adulthood is also significant in both samples. It is 2.3 percentage points in 2005 and almost doubles in 2011. Here again, recalling the simple difference in means between poor and non-poor in childhood, this effect accounts for 40 % and 50 % of the difference, respectively.

Important differences in the magnitude of the results can be found once we use a different definition of poverty in both childhood and adulthood. The results regarding the respondent's feeling about the level of difficulty experienced by the household in making ends meet show in fact an increase of around 14 percentage points in the probability of not making ends meet as adult, if growing up in a household where it was difficult to make ends meet.

To conclude the discussion of these results, it is important to remind that the estimates between the two samples cannot be directly compared given the different wording used in the 2005 and 2011 surveys in the question at the basis of the definition of our treatment, and given the inclusion of additional pre-treatment variables in 2011, which provides a more informative and complete estimate of the probability of experiencing poverty.

As we can see from Figure 25.1 (part (a) and (b)), average effects at EU level mask statistically significant country differences both in the magnitude and the importance of experiencing financial problems. Scandinavian countries show no significant impact in both samples. In particular, in the 2005 sample,

**Table 25.3:** Average treatment effect estimation, pooled data, 2005 and 2011

	(1) Equivalised disposable income, log	(2) At risk of poverty
<b>Part A: 2005 sample</b>		
ATE	-0.020*** (0.005)	0.022*** (0.004)
ATT	-0.010*** (0.005)	0.024*** (0.004)
N.	98 318	98 483
<b>Part B: 2011 sample</b>		
ATE	-0.015*** (0.007)	0.037*** (0.005)
ATT	-0.032*** (0.005)	0.037*** (0.006)
N.	146 504	146 731
<b>Part C: 2011 sample</b>		
ATE	-0.024*** (0.005)	0.144*** (0.006)
ATT	-0.033*** (0.005)	0.139*** (0.007)
N.	146 390	146 498

NB: Bootstrapped standard errors in parentheses, \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The treatment variable is based on the question about financial problems for 2005 (part A), financial situation for 2011 (part B) and ability to make ends meet for 2011 (part C). The outcome at risk of poverty in C is based on the ability to make ends meet as adult in 2011. ATE is the 'Average Treatment Effect' and ATT the 'Average Treatment on the Treated'.

Reading note: The average treatment effect of experiencing poverty in childhood has a statistically significant decreasing impact of 2 % on the equivalised disposable income in adulthood in our 2005 sample.

Source: Authors' computation, UDBs of August 2009 and August 2014.

it is worth noticing that the most significant effect can be found in Ireland (around 8 %); among the other countries for which data are available only Italy, Cyprus and Poland show a significant impact of experiencing poverty during childhood (2-3 %).

When looking at the most recent sample, Ireland and Italy no longer show a significant effect, while now growing up in poverty in Spain significantly decreases the income later in life (by around 5 %). More significant effects can be in general found in the Eastern European countries — almost all of them (exceptions are Estonia, Croatia, Latvia, Slovenia and Slovakia) show a significant reduction of adult income if growing up poor, with a maximum of 10 % for Bulgaria. While the magnitude of these results should be considered in the light of the different levels of average incomes these countries have, the impact on the probability of being poor,

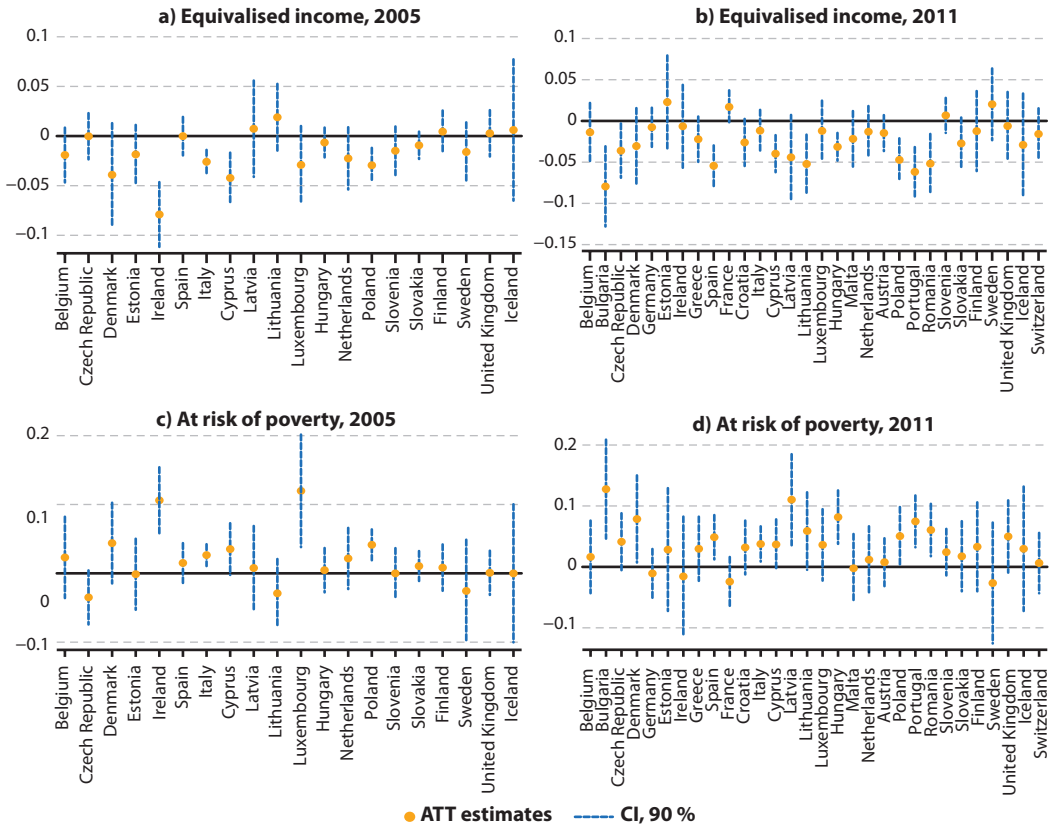
provided in Figure 25.1 (parts (c) and (d)), are more directly comparable.

In the 2005 survey, Luxembourg and Ireland are the two countries revealing the highest penalty of growing up poor (around 10-12 percentage points higher probability to be poor as an adult) while there is no significant effect in the other countries, with the exception again of Poland and Italy, which show a significant impact of around 2 percentage points.

These results are confirmed in 2011 for Italy and Poland. Denmark, Spain, Latvia and Hungary and now show significant impacts and we can see that among the countries that now belong to our sample, Bulgaria, Portugal and Romania show a significant impact ranging from 5 to 15 percentage points.

Unfortunately, the numbers are again not perfectly comparable from one sample to the other for the reasons explained above.

**Figure 25.1: Average treatment effect on the treated (ATT) estimation, country data, 2005 and 2011**



NB: 90 % confidence intervals of the Average Treatment Effect on the Treated Estimation for the equivalised income and risk of poverty, in the 2005 and 2011 samples, respectively.

Reading note: There is no statistically significant increase in the risk of poverty for children growing up in poverty in Belgium in both our 2005 and 2011 samples, while in Italy those children experience a significant decrease in their income in our 2005 sample but not in our 2011 sample.

Source: Authors' computation, UDBs of August 2009 (part (a) and (c)) and August 2014 (part (b) and (d)).

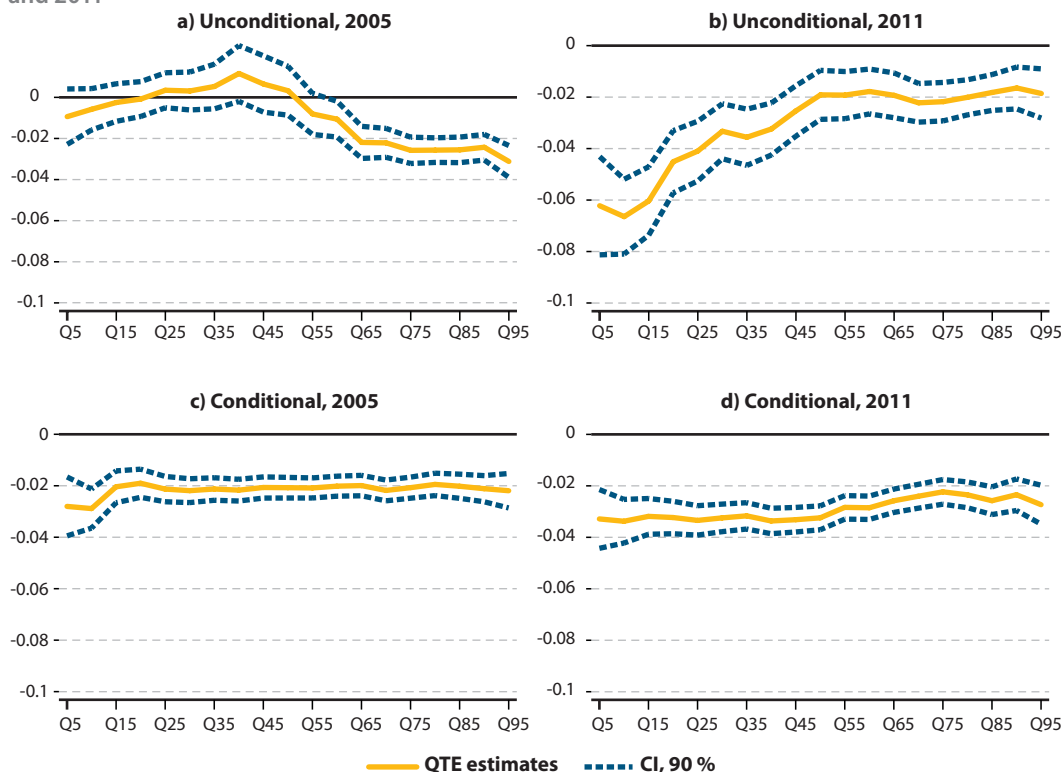
Recalling the simple difference in means between income levels and between the probabilities of being income-poor (in adulthood) presented in Table 25.2, it is worth noting that once we control for all the available confounders factors, many countries for which these simple differences were significant, do no longer show any significant impact (e.g. Belgium, Greece, France and the United Kingdom).

### 25.4.2 Quantile treatment effect

In this final section, we apply Quantile Treatment Effects (QTE) to identify the potentially heterogeneous effects of growing up in poverty at different

points of the income distribution. This allows us to uncover potential differences between children at the top and the bottom of the income distribution. However, in interpreting these results we need to keep in mind that the QTE cannot be assigned to a particular individual in the distribution; it rather consists in a measure of the change in incomes at a given quantile of the distribution due to experiencing poverty. Hence, the QTE on distributions does not coincide with the distribution of QTE, unless there are no changes in the ranking of the individuals due to exposure to poverty in childhood. Nevertheless, with this analysis we can exclude the presence of significant and consistent heterogeneous impacts of growing up in poverty.

**Figure 25.2:** Quantile treatment effect estimation on equivalised income, pooled data, 2005 and 2011



NB: 90 % confidence intervals of the Quantile Treatment Effects Estimation.

Reading note: Experiencing financial problem in childhood decreases the equivalised income of individuals belonging to the lowest 10 % of the income distribution (Q10) by almost 7 % in the pooled sample of 2011.

Source: Authors' computation, UDBs of August 2009 (part (a) and (c)) and August 2014 (part (b) and (d)).

We analyse conditional (on the values of the regressors) and unconditional quantile treatment effects. Figure 25.2 (a, b) shows the results of the impact of being poor as a child on the whole population (unconditional quantile treatment effect) for 2005 and 2011, respectively. These unconditional QTE are estimated following Firpo (2007), who proposes a semi-parametric procedure. This estimation technique requires two steps. In the first step, a non-parametric estimator of the propensity score of observation  $i$  is estimated. Unlike the PS matching method previously implemented, the PS estimated in the context of QTE is non-parametrically derived by implementing a logistic power series approximation (Koenker and Bassett (1978), Heckman and Robb (1986), Hahn (1998), Hirano, Imbens and Ridder (2003)). Then 'the difference between

the treated and the control group in quantiles of the marginal distribution' is computed (Firpo, 2007). The models presented in column (c) and (d) implement instead Koenker and Bassett (1978) conditional quantile regression under randomisation on observables. These specifications differ because they impose different structures of the variables governing the heterogeneity in the impact of experiencing poverty. More precisely, with the unconditional quantile we can explore whether the impact of experiencing poverty on income in adulthood varies depending on the individuals' total characteristics. And with the conditional quantile, we can study how this impact varies for given observed individuals' characteristics. Individuals who have high income level conditional on a specific level of individual characteristics (conditional QTE) may not

be the same individuals as those who have high income levels in the whole (*total*) sample (unconditional QTE).

These results are in line with the ones reported in Table 25.3, showing a significant decrease in the equivalised income in adulthood due to exposure to poverty in childhood. In addition to the average results presented above, this distributional analysis gives us interesting insights as this decrease is evident and consistent in magnitude through the entire distribution of the conditional QTE estimates, which results in fairly flat trends for both years under consideration. More heterogeneity can be seen once we look at the unconditional effect. In particular, while for the 2005 sample we can see an inverse U-shaped trend where the middle-low income (from the 25th to the 55th quintile) seems unaffected by growing up in poverty, we notice a clearly decreasing trend for the 2011 sample, where the lower the income quantile, the higher the impact of experiencing financial difficulties in childhood. Altogether, these estimates provide strong evidence that, irrespective of the quantile the individuals belong to, being poor in childhood leads to lower levels of income later in life in our pooled sample. The same heterogeneity among countries that we have shown in the average impact can be found in this distributional analysis<sup>(216)</sup>. For example in 2005 in Italy, the impact of growing up in poverty is higher for individuals belonging to the lower quintile (Q5-Q10) or higher quintile (Q90-Q95) of the income distribution than for the ones belonging to the median (Q50), while in Ireland the highest impact can be seen for the individuals belonging to the quintile of the income distribution closer to the median (Q30-Q50) and in Luxembourg a significant impact can be found only for the individuals belonging to the lower half of the distribution (Q10-Q45).

## 25.5 Conclusions

In this chapter, we studied the causal relationship between growing up in a poor household and the individual's economic outcomes as an adult, namely equivalent disposable income and proba-

bility of being poor. We contributed to the existing literature on intergenerational transmission of poverty by providing a formal assessment of the magnitude of the causal impact of parental economic conditions on the future outcomes of their children. We did so by means of different econometric techniques, like propensity score matching and quantile treatment effects procedure in a wide-ranging cross-country comparison.

The EU-SILC 2005 and 2011 modules currently represent the best data source to assess whether experiencing financial problem as a child has an impact or not on alternative outcomes later in life in the European context. Nonetheless, even if the 2011 module contains a wider range of questions on parents' characteristics and family condition than the 2005 one — which constitutes an improvement (see Whelan et al, 2013 for issues relative to the 2005 survey) — comparability across countries and over time, between the two modules, has been affected<sup>(217)</sup>. Moreover, the validity of the EU-SILC data relies on the level of accuracy provided by respondents when answering to the questions. No external validity test on these data was carried out at the moment. Only a comparison with administrative records available at the country level would allow us to check more in depth the quality and features of EU-SILC data.

If we consider all the countries analysed in this chapter as a whole (i.e. when pooling all the national datasets together), our results show a decrease in the equivalised income and an increase in the probability of being at risk of poverty in adulthood, for people who were exposed to financial problems during childhood. Looking at individual countries, we see that this impact is statistically significant for at least one outcome in 1 year (2005 and/or 2011), in Bulgaria, Czech Republic, Denmark, Ireland, Spain, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Poland, Portugal and Romania.

Moreover, when we look at potentially heterogeneous effects of growing up in poverty at different points of the income distribution our estimates provide strong evidence that experiencing financial difficulties in childhood leads to lower levels of

<sup>(216)</sup> Country results are available from the authors upon request.

<sup>(217)</sup> For example, respondents to the survey of 2011 had additional options, in the list of possible answers to select, that were not included in the 2005 survey.

income later in life in our pooled sample, irrespective of the quantile the individuals belong to. While, as for the average impact, we found substantial country differences in the heterogeneous effects in both samples.

These results highlight the importance of developing policies aimed at tackling the intergenerational transmission of poverty. At the same time, they show substantial differences across countries, which may point to some good policy practices that could if not eliminate the long-term impact of growing up in a poor household at least reduce it. These practices need to be further explored and understood so they can possibly be tested in other countries confronted with similar difficulties.

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# Technical issues in the development of household social surveys





# 26

## Standard error estimation and related sampling issues

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and Tim Goedemé <sup>(218)</sup>

### 26.1 Introduction

Given that all the indicators based on EU-SILC are sample estimates, they should be reported along with estimates of standard errors and confidence intervals, particularly if the indicators are used for policy decisions. It is crucial to take the sampling variance into account when using sample estimates to monitor poverty and social exclusion, otherwise small changes in estimates may be wrongly interpreted as real changes in the population. Commission Regulation (EC) No 28/2004 of 5 January 2004, regarding the detailed content of intermediate and final EU-SILC Quality reports, requires that standard error estimates shall be provided by countries along with the EU-SILC main target indicators. In this chapter, we develop a practicable set of recommendations for computing standard errors both at data producers' level (National Statistics Institutes — NSIs) and data users' level (non NSIs).

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### 26.2 Variance estimation approach

#### 26.2.1 Description

The computation of standard errors for estimates based on EU-SILC is confronted with many challenges. Standard error estimation should reflect as much as possible the complexity of the EU-SILC surveys, otherwise estimates may be severely biased. The complexity of EU-SILC arises from, among other factors, the national sampling designs involving stratification, geographical clustering, unequal probabilities of selection and post-survey weighting adjustments (re-weighting for unit non-response and calibration to external data sources <sup>(219)</sup>) and rotation. There are also complex cross-sectional and longitudinal indicators and indicators of net changes. Furthermore, different methods of imputation are used across countries. There are also confidentiality issues and limited resources in terms of budget, staff and time at national and at EU level. Standard errors estimates also depend on the availability of accurate and well-documented sample design variables (Goedemé, 2010, 2013, 2013a).

<sup>(219)</sup> Calibration consists of adjusting the sampling weights to known population totals or counts from external sources (e.g. population census). It modifies the sampling weights such that the new calibrated weights reproduce exactly these totals or counts. For example, calibrated weights reproduce exactly the population totals/counts of age-gender population groups. These weighting adjustments are expected to reduce the variance of survey estimates when the auxiliary information is correlated with the study variables.

**Table 26.1: EU-SILC sampling design by country, 2012**

<b>Without stratification</b>	
Simple random sampling	Denmark, Iceland, Malta, Norway
Systematic sampling	Sweden
<b>With stratification</b>	
Stratified simple random sampling	Austria, Cyprus, Germany, Lithuania, Luxembourg, Slovakia, Switzerland
Stratified and systematic sampling	Estonia
Stratified two-stage	Croatia, Italy, Latvia, the Netherlands, Portugal, Slovenia
Stratified multi-stage	Belgium, Bulgaria, Czech Republic, Ireland, Greece, Spain, France, Poland, Romania, United Kingdom
Stratified two-phase	Hungary, Finland

Source: Eurostat, 2012 EU-SILC Comparative Quality report (available on CIRCABC).

The complex structure of EU-SILC samples suggests that we should not use naïve variance formulae based upon the assumption that sample observations are independently and identically distributed, but rather to go further by taking account of the complex design features such as stratification, clustering, unequal selection probabilities, re-weighting for unit non-response and calibration to external data sources (see Table 26.1). If these features are not taken into account, standard errors can be under-estimated, thus resulting in wrong interpretations.

Given the growing number of requests for EU-SILC-based statistics, the proposed approach produces standard error estimates for any set of target indicators, including breakdowns. The variance estimation approach involves a trade-off between statistical accuracy and operational efficiency. The proposed approach is general enough to be valid under most of the EU-SILC sampling designs, which is a challenge considering the range of sampling designs used in EU-SILC (see Table 26.1). In addition, the approach is simple to implement with standard statistical software (SAS, SPSS, Stata, etc.) and requires minimal computing power.

Re-sampling approaches like Bootstrap or Jackknife are flexible enough to be applicable to the sampling designs and the target indicators used in EU-SILC (Verma and Betti, 2011). However, the computational effort may be considerable, which is not desirable when standard error estimates need to be produced quickly for a large number of target

indicators, including breakdowns. That is why we propose to use direct variance estimators (Berger, 2004). The main assumption underlying such estimators is that sample units have been selected with replacement, which considerably simplifies the estimation of the variances. Sampling with and without replacement are approximately equal as far as variances are concerned when the sampling fraction, i.e. the ratio of the sample size to the population size, is negligible. Note that this is the case with nearly all the EU-SILC sampling designs. Furthermore, those direct estimators can be easily extended to cover multi-stage designs by using the well-known ‘ultimate cluster’ approximation (e.g. Särndal, Swensson and Wretman, 1992). With the ultimate cluster approach, the variance between PSUs as identified in the sample (‘ultimate clusters’) is used as an approximation of the total sampling variance. If the ratio of selected clusters at the first stage of the sampling process to the total number of clusters in the population is small, subsampling within these clusters adds relatively little to the total sampling variance (for a mathematical elaboration, see e.g. Kish, 1965). Under these conditions, limiting the calculation to the variance between ultimate clusters, as expressed in the formula below, results in only a slight underestimation of the total sampling variance. The main advantage of the ultimate cluster approach is that it considerably simplifies the estimation of the sampling variance, while also limiting data needs on the sampling design of the primary sampling units.

Consider a population  $U$  consisting of  $N$  identifiable units such as households or individuals. Let  $s$  denote a sample of size  $n$  drawn from  $U$  using a probabilistic design so that each unit  $k$  has a known inclusion probability  $\pi_k$ . Suppose we wish to estimate the total  $\theta = \sum_{k \in U} y_k$ , where  $y_k$  is the value of a study variable  $y$  for unit  $k$ . The study variable  $y$  can be a continuous (e.g. household income), or a categorical variable (e.g., employment status). If  $y$  is a dichotomous variable, then  $\theta$  is a count. Let  $\hat{\theta}$  be an estimator of  $\theta$ , for which an estimate of the standard error is required. The variance of  $\hat{\theta}$  is estimated from the variation between the estimated Primary Sample Unit (PSU) totals of  $y$ :

$$\hat{V}(\hat{\theta}) = \sum_{h=1}^H \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} (y_{hi\cdot} - \bar{y}_{h\cdot\cdot})^2 \quad (1)$$

where  $y_{hi\cdot} = \sum_{j=1}^{m_{hi}} \omega_{hij} \cdot y_{hij}$  and  $\bar{y}_{h\cdot\cdot} = n_h^{-1} \left( \sum_{i=1}^{n_h} y_{hi\cdot} \right)$ .

The symbol  $h$  is the stratum label and  $H$  the number of strata. If there is no stratification, the whole target population  $U$  can be regarded as a single stratum ( $H = 1$ ). The symbol  $i$  is the label of the PSU. We have  $n_h$  PSUs within the  $h$ -th stratum. The symbol  $j$  is the household label within PSU  $i$  of stratum  $h$ , with a total of  $m_{hi}$  households. For single stage sampling designs, each household can be regarded as a PSU. The quantity  $\omega_{hij}$  is the sampling weight for household  $j$  in PSU  $i$  of stratum  $h$ . The quantity  $y_{hij}$  is the value of the study variable  $y$  for household  $j$  in PSU  $i$  of stratum  $h$ .

Note that if  $n_h = 1$  for some strata, the estimator (1) cannot be used. A solution is to collapse strata to create 'pseudo-strata' so that each pseudo-stratum has at least two PSUs. A common practice is to collapse strata which are similar with regard to the target variables of the survey (Ardilly and Osier, 2007).

The estimator (1) is valid for linear indicators, i.e. means, totals and proportions. However, most of the EU-SILC key indicators are nonlinear (e.g. the median income, the persistent risk of poverty or the Gini coefficient). In order to estimate the variance of nonlinear indicators, the linearisation approach may be used (Deville, 1999, Demnati and Rao, 2004, Wolter, 2007, Osier, 2009). The principle

is to approximate a nonlinear indicator by a linear form by retaining only the first-order term of a Taylor expansion. The variance of the linear approximation can be used as an approximation of the variance of the nonlinear indicator considered. The linearisation procedure is justified on the basis of asymptotic properties of large samples and populations (Demnati and Rao, 2004). Assuming  $\theta$  is a complex nonlinear indicator, the variance of an estimator  $\hat{\theta}$  of  $\theta$  is estimated by:

$$\hat{V}(\hat{\theta}) = \sum_{h=1}^H \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} (z_{hi\cdot} - \bar{z}_{h\cdot\cdot})^2 \quad (2)$$

where  $z_{hi\cdot} = \sum_{j=1}^{m_{hi}} \omega_{hij} \cdot z_{hij}$ ,  $\bar{z}_{h\cdot\cdot} = n_h^{-1} \left( \sum_{i=1}^{n_h} z_{hi\cdot} \right)$  and  $z_{hij}$  is the value of a linearised variable.

The estimators (1) and (2) are similar. In (2), the study variable  $y$  is replaced by the linearised variable  $z$ .

For example, if  $\theta = \left( \sum_k y_k \right) \left( \sum_{k \in U} x_k \right)^{-1} = YX^{-1}$

is the ratio of two population totals, then we have

$$z_k = X^{-1} (y_k - \theta \cdot x_k) \text{ for all } k.$$

The differences  $(y_{hi\cdot} - \bar{y}_{h\cdot\cdot})$  in (1) and  $(z_{hi\cdot} - \bar{z}_{h\cdot\cdot})$  in (2) can be seen as the residuals of the linear regression of the PSU aggregates  $y_{hi\cdot}$  and  $z_{hi\cdot}$  on the dummy variables for each stratum category (Berger, 2005). This provides a quick and easy way to compute the variance of both cross-sectional and longitudinal measures using basic statistical techniques.

The approach proposed reflects most of the features of the sample design. A specific approach is needed to measure how the calibration weighting (Deville and Särndal, 1992) affects the variance. In EU-SILC, calibration is expected to have significant effect for the Nordic countries like Denmark, Finland and Sweden which use powerful calibration variables from income registers. As shown by Deville and Särndal (1992), the effect of calibration on variance estimation can be taken into account by replacing the study variable by the residuals from the linear regression of the study variable using the calibration variables as regressors. Such an approach is easy to implement as long as the calibration variables are available in the EU-SILC mi-

cro-data files along with the initial weights before calibration or, equivalently, the calibration adjustment factors (also called *g*-weights). The calibration adjustment factors are the ratios of the final weights after calibration to the initial weights. Unfortunately, hitherto the latter are not available in the EU-SILC UDB.

## 26.2.2 Extension to estimators of changes between two time points

Monitoring changes or trends in indicators over time is of key importance in many areas of economic and social sciences. Since the launch of the Europe 2020 strategy, EU-SILC has been increasingly used for policy targeting; it is the source of one of the five Europe 2020 headline targets, the EU social inclusion target. In order to monitor trends towards agreed policy goals, we compare two cross-sectional estimates for the same study variable taken on two different waves or occasions. Yet, interpreting differences between point estimates may be misleading if temporal correlations between indicators are not properly taken into account. The aim is to judge whether the observed change is statistically significant.

This would be relatively straightforward if estimates were based upon independent samples, as in that case there is no covariance between survey sample estimates. However, nearly all the EU-SILC countries have adopted a 4-year rotating structure as recommended by Eurostat, where individuals are interviewed for a maximum of 4 years and 25 % of the sample is refreshed every year with new individuals. In most countries non-negligible covariance between estimates can be expected even over longer time intervals. For some countries, the covariance can be expected to be different from zero over more extended periods, either because households remain longer in the sample (e.g. Luxembourg), or because rotation is implemented within PSUs rather than at the level of PSUs (e.g. Belgium) (see Goedemé, 2013a).

Standard error estimators for changes between two time points, taking covariance effects into account, were proposed in the statistical literature — see e.g. Muennich and Zins (2011), Qualité and Tillé (2008) and Wood (2008). Yet, none of those estima-

tors seem, in our view, general, accurate as well as flexible enough to be implemented in the context of an EU-wide undertaking such as EU-SILC. The regression-based approach described in the previous section can be easily extended to cope with estimators of changes between two time points (Berger and Priam 2016, Oguz Alper and Berger 2015).

Suppose we wish to estimate the change  $\Delta$  between two population totals  $\theta_1 = \sum_{i \in U_1} y_{1i}$  and  $\theta_2 = \sum_{i \in U_2} y_{2i}$  at years 1 and 2, where  $y_{1i}$  and  $y_{2i}$  denote respectively the values of the variable of interest at 1 and 2. For example,  $\theta_1$  may be the total number of persons who are at risk of poverty or social exclusion at year 1 and  $\theta_2$  may be the same indicator calculated at year 2. In that case,  $y_{1i} = 1$  ( $y_{2i} = 1$ , resp.) for  $i$  at risk of poverty or social exclusion at 1 (at risk of poverty or social exclusion at 2, resp.),  $y_{1i} = 0$  ( $y_{2i} = 0$ , resp.) otherwise. The change  $\Delta$  is estimated by:

$$\hat{\Delta} = \hat{\theta}_2 - \hat{\theta}_1$$

Where  $\hat{\theta}_1 = \sum_{i \in s_1} \omega_{1i} \cdot y_{1i}$  and  $\hat{\theta}_2 = \sum_{i \in s_2} \omega_{2i} \cdot y_{2i}$  are the estimates of  $\theta_1$  and  $\theta_2$  based on the cross-sectional samples  $s_1$  and  $s_2$  at Waves 1 and 2. The quantities  $\omega_{1i}$  and  $\omega_{2i}$  denote respectively the sampling weights at Waves 1 and 2. Using these notations, the variance of  $\hat{\Delta}$  is given by:

$$\begin{aligned} \text{Var}(\hat{\Delta}) &= \text{Var}(\hat{\theta}_2 - \hat{\theta}_1) \\ &= \text{Var}(\hat{\theta}_2) + \text{Var}(\hat{\theta}_1) - 2 \text{Cov}(\hat{\theta}_2, \hat{\theta}_1) \\ &= \text{Var}(\hat{\theta}_2) + \text{Var}(\hat{\theta}_1) - 2 \sqrt{\text{Var}(\hat{\theta}_2)} \sqrt{\text{Var}(\hat{\theta}_1)} \rho(\hat{\theta}_2, \hat{\theta}_1) \end{aligned}$$

The cross-sectional variances  $\text{Var}(\hat{\theta}_1)$  and  $\text{Var}(\hat{\theta}_2)$  are calculated using expression (1). The correlation  $\rho(\hat{\theta}_2, \hat{\theta}_1)$  between the cross-sectional estimators is certainly the most difficult part to estimate. As said previously, this term cannot be ignored as the survey waves in EU-SILC are time-correlated. The estimator proposed by Berger and Priam (2016) is based upon the residual matrix of a multivariate regression model. The model includes covariates which specify the stratification. In addition, interaction terms specify the rotation of the sampling designs:

$$\begin{pmatrix} y_{1i} \\ y_{2i} \end{pmatrix} = \sum_{h=1}^H \begin{pmatrix} \beta_h^{(1)} z_{1h,i} + \beta_h^{(2)} z_{2h,i} + \beta_h^{(12)} z_{1h,i} z_{2h,i} \\ \gamma_h^{(1)} z_{1h,i} + \gamma_h^{(2)} z_{2h,i} + \gamma_h^{(12)} z_{1h,i} z_{2h,i} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \quad (3)$$

Where  $i \in s = s_1 \cup s_2$  and the residuals  $\varepsilon_i = (\varepsilon_{1i}, \varepsilon_{2i})^T$  follow a bivariate distribution with mean zero and an unknown variance-covariance matrix. The  $z_{1h,i}$  and  $z_{2h,i}$  are (dummy) design variables which specify the stratification:

$$z_{1h,i} = \begin{cases} 1 & \text{if } i \in s_{1h} \\ 0 & \text{otherwise} \end{cases} \quad z_{2h,i} = \begin{cases} 1 & \text{if } i \in s_{2h} \\ 0 & \text{otherwise} \end{cases}$$

The quantities  $\beta_h^{(1)}, \beta_h^{(2)}, \gamma_h^{(1)}, \gamma_h^{(2)}, \beta_h^{(12)}$  and  $\gamma_h^{(12)}$  are regression parameters that need to be included into the model.

The correlation between the estimated regression residuals  $\varepsilon_{1i}$  and  $\varepsilon_{2i}$  gives an estimate of the correlation  $\rho(\hat{\theta}_2, \hat{\theta}_1)$  between  $\hat{\theta}_1$  and  $\hat{\theta}_2$ . Berger and Priam (2016) show that the estimator is design-consistent. Simulation studies have shown that the proposed estimator outperforms the traditional estimators proposed in the literature. Yet, the approximation is based on the assumption that the sampling fractions are negligible, which may not hold in practice. Furthermore, using the ‘ultimate cluster’ approximation and the linearisation procedure, this approach can be easily extended to cope with multi-stage sampling designs and nonlinear indicators.

## 26.3 Numerical results

We implemented the proposed regression-based approach to compute standard error estimates for key EU-SILC cross-sectional measures, longitudinal measures and measures of changes. The first indicator considered is the at-risk-of-poverty-or-social-exclusion indicator (AROPE) and its three sub-indicators: the at-risk-of-poverty rate (AROP), the severe material deprivation rate (SMD), and the share of individuals aged less than 60 years living in (quasi-)jobless households (QJ) — i.e. households

with very low work intensity (see Chapters 1 and 3 of this volume). AROPE is the indicator used for the Europe 2020 headline social inclusion target. The change in the AROPE between 2 years is also considered. We also consider the persistent at-risk-of-poverty rate, which is the core EU-SILC longitudinal indicator. The persistent risk of poverty is defined as having an equivalised disposable income below the at-risk-of-poverty threshold in the current year and in at least two of the preceding 3 years.

The computations were kindly made by Eurostat using the EU-SILC *Production Database* (rather than the *Users’ Database* which is available to the scientific community). In this case, the correct stratification variable was used <sup>(220)</sup>. However, the impact of calibration and imputation on the standard error estimates is not taken into account as sufficient information on calibration and imputation is not available in the EU-SILC production datasets.

### 26.3.1 Cross-sectional measures

#### Yearly estimates

Table 26.2 shows the estimates of the standard error for AROP, SMD, QJ and AROPE. The standard error estimates for the AROPE lies between 0.5 and 1 percentage point in most of the countries, which means that the absolute margin of error for the indicators (based on normality assumption) lies between +/-1 and +/-2 percentage points. The standard errors are greater than 1 point in Bulgaria, Croatia, Latvia, Lithuania and Romania; while they are lower than 0.5 point in Finland and Germany.

As far as the AROPE’s three sub-indicators are concerned (AROP, SMD, QJ), the standard error estimates appear lower than those calculated for the AROPE because, by definition, the AROPE indicator reaches higher values than its three components. For example, the estimated standard errors for the SMD are relatively low for some countries (e.g. 0.1 percentage point for Switzerland and 0.2 point for Finland, Germany, Norway and Sweden).

<sup>(220)</sup> We would like to thank Emanuela Di Falco and Emilio Di Meglio (Eurostat’s Unit F4 ‘Income and living conditions; quality of life’) for making this possible.

**Table 26.2:** Standard error estimates for the at-risk-of-poverty-or-social-exclusion indicator (AROPE) and its three sub-indicators (AROP, SMD and QJ), 2013 (percentages and percentage points)

	At-risk-of-poverty rate (AROP)		Severe material deprivation rate (SMD)		Share of individuals living aged < 60 living in (quasi-)jobless households (QJ)		At-risk-of-poverty-or-social-exclusion (AROPE)	
	Indicator value (%)	Estimated standard error (pp)	Indicator value (%)	Estimated standard error (pp)	Indicator value (%)	Estimated standard error (pp)	Indicator value (%)	Estimated standard error (pp)
Belgium	15.1	0.77	5.1	0.44	14.0	0.81	20.8	0.86
Bulgaria	21.0	0.97	43.0	1.13	13.0	1.04	48.0	1.13
Czech Republic	8.6	0.51	6.6	0.44	6.9	0.55	14.6	0.61
Denmark	12.3	0.97	3.8	0.50	12.9	0.96	18.9	1.00
Germany	16.1	0.33	5.4	0.23	9.9	0.29	20.4	0.35
Estonia	18.7	0.62	7.6	0.46	8.4	0.49	23.5	0.69
Greece	23.1	0.78	20.3	0.81	18.2	0.78	35.7	0.88
Spain	20.4	0.60	6.2	0.43	15.7	0.54	27.3	0.64
France	13.7	0.52	5.1	0.32	7.9	0.44	18.1	0.53
Croatia	19.5	0.90	14.7	0.90	14.8	0.86	29.9	1.02
Italy	19.1	0.46	12.4	0.46	11.0	0.38	28.4	0.53
Cyprus	15.3	0.65	16.1	0.72	7.9	0.52	27.8	0.82
Latvia	19.4	1.10	24.0	1.05	10.0	0.55	35.1	1.15
Lithuania	20.6	0.96	16.0	0.88	11.0	0.81	30.9	1.07
Luxembourg	15.9	0.91	1.8	0.28	6.6	0.52	19.0	0.93
Hungary	14.3	0.76	26.8	0.94	12.6	0.84	33.5	0.89
Malta	15.8	0.69	9.5	0.59	9.0	0.58	24.0	0.81
Netherlands	10.4	0.74	2.5	0.40	9.4	0.63	15.9	0.93
Austria	14.4	0.61	4.2	0.40	7.8	0.49	18.8	0.66
Poland	17.3	0.50	11.9	0.42	7.2	0.30	25.8	0.56
Portugal	18.7	0.82	11.0	0.68	12.2	0.70	27.4	0.93
Romania	22.4	1.06	28.5	1.20	6.4	0.57	40.4	1.22
Slovenia	14.5	0.47	6.7	0.33	8.0	0.39	20.4	0.52
Slovakia	12.8	0.68	10.2	0.58	7.6	0.58	19.8	0.74
Finland	11.8	0.38	2.5	0.18	9.0	0.41	16.0	0.42
Sweden	14.8	0.51	1.4	0.18	7.1	0.45	16.4	0.53
United Kingdom	15.9	0.51	8.3	0.42	13.2	0.56	24.8	0.66
Iceland	9.3	0.61	1.9	0.30	6.2	0.56	13.1	0.69
Norway	11.0	0.48	2.0	0.24	6.4	0.45	14.2	0.53
Switzerland	14.5	0.54	1.0	0.14	4.1	0.36	16.4	0.57

*Reading note:* For Austria, the value of the AROP in 2013 is 14.4 %, with a standard error of 0.61 percentage points (pp), the value of the SMD is 4.2 % (standard error: 0.40 pp), the value of the QJ is 7.8 % (standard error: 0.49 pp) and the value of the AROPE is 18.8 % (standard error: 0.66 pp).

*Source:* EU-SILC Production Database.



### Measures of changes

In Tables 26.3a, 26.3b, 26.3c and 26.3d, we present the standard error estimates for changes in the AROPE and its three sub-indicators (AROP, SMD and QJ) between 2012 and 2013. Standard errors estimates use the regression-based approach explained in Section 26.2.2.

The associated margins of error for the changes, based on the normality assumption, are also presented. They represent half the length of the confidence intervals for the differences. If a confidence interval does not include 0, the difference between 2012 and 2013 is statistically significant (at the 5 % level of confidence). The estimated standard errors obtained look plausible. The seemingly low standard errors in Belgium may be due to the sample rotation being implemented within the PSUs rather than at PSU level. Furthermore, the low values in France compared to the other countries is likely to result from the combined effect of a pretty high sample size and a panel of longer duration (9 years instead of 4 years in most EU-SILC countries). Finally, the values in the Netherlands might come from the use of powerful auxiliary information (income registers) to compute the sampling weights.

### 26.3.2 Longitudinal measures

Table 26.4 presents confidence intervals (at 95 % confidence level) for the persistent at-risk-of-poverty rates based upon the Central Limit Theorem (CLT). Under normality assumption, these intervals are centred at the estimated values of the indicator and their half-lengths are given by 1.96 times the estimated standard errors. Overall, the precision of the persistent at-risk-of-poverty rate appears to be lower than the precision of the AROPE. There are several possible reasons for this. For the longitudinal component of EU-SILC, the achieved sample size is lower than for the cross-sectional component: the longitudinal sample sizes range from about 1 000 individuals in Iceland to 11 000 in France. This is caused mainly by the rotating design used in most of the countries (25 % of the sample is refreshed every year with new individuals), but also by lost individuals and attrition (see *inter alia* Chapters 22 and 27 of this volume). Another expla-

nation is that the persistent at-risk-of-poverty rate is lower than the cross-sectional at-risk-of-poverty rate (AROP) or the AROPE indicator. Finally, the higher dispersion of the longitudinal sampling weights, which are adjusted at each wave for attrition and calibration to external data sources, is likely to reduce the precision of the persistent risk of poverty.

## 26.4 Imputation and other sources of variability

The proposed approach does not take into account the imputation variability. However, some variables have been heavily imputed, with imputation techniques which vary from one country to another. For simplicity, imputed values have been treated as true values. However, this may lead to a severe under-estimation of the variance, particularly when the proportion of imputed values is important (Rao and Shao, 1992). Direct variance formulas are usually very complex (Deville and Särndal, 1994) and method-specific. For example, Berger and Escobar (2016) proposed an approach to estimate the variance of change in the presence of hot-deck imputed values. As variance estimation under imputation is not straightforward, it does not seem realistic to try to estimate the imputation variance on a streamlined basis, especially when the imputation methods vary greatly from one country to another and, in some cases, even from one income component to another. Nevertheless, the imputation variance may be estimated occasionally with the SAS software SEVANI developed by Statistics Canada (Beaumont and Bissonnette, 2011) or the multiple imputation technique as implemented in the Eurosystem Household Finance and Consumption Survey (HFCN, 2013). Furthermore, the proposed approach cannot reflect non-sampling sources of variability such as measurement, coverage or processing errors. In the absence of standard error estimates for non-sampling errors, indicators related to the amount of those errors (level of processing errors, share of substituted units, etc.) could be published in order to describe the effect of those sources (Eurostat, 2013, Section 3.2).

**Table 26.3a: Estimated standard errors and margins of error for estimators of net change in the AROPE between 2012 and 2013**  
(percentages and percentage points)

	Value 2013 (%)	Value 2012 (%)	Difference 2013-2012 (pp)	Estimated standard error for the difference 2013-2012 (pp)	Margin of error (pp) = 1.96*SE	Statistical significance of change (95 % confidence level)
Belgium	20.8	21.6	-0.8	0.04	0.08	Y
Bulgaria	48	49.2	-1.2	0.51	1.01	Y
Czech Republic	14.6	15.3	-0.7	0.32	0.63	Y
Denmark	18.9	18.9	0.0	0.62	1.23	N
Germany	20.3	19.6	0.7	0.22	0.44	Y
Estonia	23.5	23.4	0.1	0.36	0.71	N
Greece	35.7	34.5	1.2	0.44	0.88	Y
France	18.1	19	-1.0	0.12	0.23	Y
Croatia	29.9	32.5	-2.7	0.58	1.15	Y
Italy	28.4	29.9	-1.5	0.41	0.80	Y
Cyprus	27.8	27.1	0.7	0.36	0.71	N
Latvia	35.1	36.2	-1.1	0.48	0.94	Y
Lithuania	30.8	32.4	-1.6	0.68	1.34	Y
Luxembourg	18.9	18.3	0.6	0.34	0.67	N
Hungary	33.5	32.4	1.1	0.74	1.45	N
Malta	24	23	0.9	0.34	0.67	Y
Netherlands	15.9	14.9	0.9	0.07	0.14	Y
Austria	18.7	18.4	0.3	0.50	0.99	N
Poland	25.8	26.7	-0.9	0.32	0.62	Y
Portugal	27.4	25.2	2.1	0.43	0.85	Y
Romania	40.3	41.7	-1.3	0.12	0.25	Y
Slovenia	20.3	19.5	0.8	0.20	0.40	Y
Slovakia	19.7	20.5	-0.8	0.51	1	N
Finland	15.9	17.2	-1.2	0.31	0.61	Y
Sweden	16.4	15.6	0.7	0.31	0.61	Y
United Kingdom	24.7	24.1	0.6	0.06	0.13	Y
Iceland	13	12.6	0.4	0.41	0.81	N
Norway	14.1	13.7	0.4	0.33	0.65	N
Switzerland	16.4	17.5	-1.1	0.30	0.60	Y

NB: Calculations not possible for Spain (break in series) and Ireland (missing data at the time of extraction). 'Y' means 'yes', and 'N' means No.

Reading note: The difference in AROPE between 2012 and 2013 is 0.3 percentage point (pp) in Austria, with a margin of error of +/-0.99 pp. As the confidence interval includes 0, we can say the difference between 2012 and 2013 is not statistically significant (at 95 % confidence level).

Source: EU-SILC Production Database.

**Table 26.3b:** Estimated standard errors and margins of error for estimators of net change in the at-risk-of-poverty (AROP) rate between 2012 and 2013 (percentages and percentage points)

	Value 2013 (%)	Value 2012 (%)	Difference 2013-2012 (pp)	Estimated standard error for the difference 2013-2012 (pp)	Margin of error (pp) = 1.96*SE	Statistical significance of change (95 % confidence level)
Belgium	15.0	15.2	-0.2	0.02	0.04	Y
Bulgaria	20.9	21.2	-0.2	0.45	0.89	N
Czech Republic	8.5	9.6	-1.0	0.25	0.5	Y
Denmark	12.3	13.1	-0.8	0.61	1.19	N
Germany	16.1	16.0	0.0	0.20	0.41	N
Estonia	18.6	17.5	1.1	0.32	0.64	Y
Greece	23.1	23.0	0.0	0.36	0.72	N
France	13.6	14.1	-0.4	0.15	0.29	Y
Croatia	19.5	20.3	-0.8	0.51	1.01	N
Italy	19.1	19.4	-0.3	0.35	0.7	N
Cyprus	15.3	14.7	0.6	0.30	0.58	Y
Latvia	19.3	19.2	0.2	0.43	0.86	N
Lithuania	20.5	18.6	2.0	0.62	1.22	Y
Luxembourg	15.8	15.1	0.7	0.33	0.66	Y
Hungary	14.2	14.0	0.3	0.62	1.23	N
Malta	15.7	15.0	0.7	0.30	0.59	Y
Netherlands	10.4	10.0	0.3	0.02	0.05	Y
Austria	14.3	14.3	0.0	0.46	0.91	N
Poland	17.2	17.0	0.2	0.29	0.57	N
Portugal	18.7	17.9	0.8	0.35	0.69	Y
Romania	22.4	22.5	-0.2	0.16	0.31	N
Slovenia	14.4	13.5	0.9	0.18	0.37	Y
Slovakia	12.8	13.2	-0.4	0.46	0.91	N
Finland	11.8	13.2	-1.4	0.29	0.57	Y
Sweden	14.7	14.1	0.6	0.30	0.6	N
United Kingdom	15.8	16.0	-0.1	0.08	0.15	N
Iceland	9.2	7.9	1.4	0.38	0.74	Y
Norway	10.9	10.0	0.9	0.31	0.61	Y
Switzerland	14.4	15.9	-1.5	0.29	0.58	Y

NB: Calculations not possible for Spain (break in series) and Ireland (missing data at the time of extraction)

Reading note: The difference in AROP between 2012 and 2013 is 0 percentage point (pp) in Austria, with a margin of error of +/-0.91 pp. As the confidence interval includes 0, we can say the difference between 2012 and 2013 is not statistically significant (at 95 % confidence level).

Source: EU-SILC Production Database.

**Table 26.3c:** Estimated standard errors and margins of error for estimators of net change in the severe material deprivation (SMD) rate between 2012 and 2013 (percentages and percentage points)

	Value 2013 (%)	Value 2012 (%)	Difference 2013-2012 (pp)	Estimated standard error for the difference 2013-2012 (pp)	Margin of error (pp) = 1.96*SE	Statistical significance of change (95 % confidence level)
Belgium	5.1	6.3	-1.2	0.11	0.22	Y
Bulgaria	43.0	44.1	-1.1	0.50	0.99	Y
Czech Republic	6.5	6.6	0.0	0.22	0.43	N
Denmark	3.8	2.8	1.0	0.30	0.59	Y
Germany	5.3	4.8	0.5	0.15	0.3	Y
Estonia	7.5	9.3	-1.8	0.24	0.48	Y
Greece	20.3	19.4	0.8	0.39	0.78	Y
Spain	6.1	5.8	0.3	0.33	0.65	N
France	5.0	5.2	-0.2	0.10	0.2	Y
Croatia	14.6	15.9	-1.2	0.50	0.98	Y
Italy	12.4	14.4	-2.0	0.36	0.72	Y
Cyprus	16.1	14.9	1.1	0.31	0.61	Y
Latvia	24.0	25.6	-1.6	0.41	0.81	Y
Lithuania	16.0	19.8	-3.8	0.58	1.14	Y
Luxembourg	1.7	1.3	0.5	0.09	0.18	Y
Hungary	26.7	25.7	1.1	0.76	1.5	N
Malta	9.5	9.1	0.4	0.24	0.47	N
Netherlands	2.4	2.3	0.2	0.01	0.03	Y
Austria	4.2	4.0	0.2	0.31	0.62	N
Poland	11.8	13.4	-1.6	0.23	0.45	Y
Portugal	10.9	8.6	2.3	0.33	0.66	Y
Romania	28.4	29.9	-1.4	0.07	0.14	Y
Slovenia	6.6	6.6	0.0	0.11	0.22	N
Slovakia	10.2	10.4	-0.2	0.40	0.79	N
Finland	2.4	2.9	-0.5	0.13	0.26	Y
Sweden	1.4	1.2	0.1	0.12	0.23	N
United Kingdom	8.2	7.7	0.05	0.49	0.1	Y
Iceland	1.9	2.3	-0.5	0.17	0.35	Y
Norway	1.9	1.7	0.2	0.15	0.3	N
Switzerland	0.9	0.8	0.1	0.09	0.18	N

NB: Calculations not possible for Ireland (missing data at the time of extraction).

Reading note: The difference in SMD between 2012 and 2013 is 0.2 percentage point (pp) in Austria, with a margin of error of +/-0.62 pp. As the confidence interval includes 0, we can say the difference between 2012 and 2013 is not statistically significant (at 95 % confidence level).

Source: EU-SILC Production Database.

**Table 26.3d: Estimated standard errors and margins of error for estimators of net change in the (quasi-)joblessness indicator between 2012 and 2013 (percentages and percentage points)**

	Value 2013 (%)	Value 2012 (%)	Difference 2013-2012 (pp)	Estimated standard error for the difference 2013-2012 (pp)	Margin of error (pp) = 1.96*SE	Statistical significance of change (95 % confidence level)
Belgium	14.0	13.9	0.09	0.10	0.19	N
Bulgaria	13.0	12.5	0.50	0.50	0.98	N
Czech Republic	6.9	6.8	0.10	0.30	0.58	N
Denmark	12.9	11.3	1.60	0.60	1.17	Y
Germany	9.9	9.9	0.00	0.20	0.39	N
Estonia	8.4	9.1	-0.69	0.30	0.58	Y
Greece	18.2	14.2	4.00	0.40	0.78	Y
Spain	15.7	14.3	1.40	0.40	0.78	Y
France	7.9	8.4	-0.50	0.20	0.39	Y
Croatia	14.8	16.8	-2.00	0.50	0.98	Y
Italy	11.0	10.3	0.69	0.30	0.58	Y
Cyprus	7.9	6.5	1.40	0.20	0.39	Y
Latvia	10.0	11.7	-1.70	0.30	0.58	Y
Lithuania	11.0	11.4	-0.40	0.50	0.98	N
Luxembourg	6.6	6.1	0.50	0.20	0.39	Y
Hungary	12.6	12.8	-0.20	0.70	1.37	N
Malta	9.0	9.0	0.00	0.20	0.39	N
Netherlands	9.4	8.9	0.50	0.20	0.39	Y
Austria	7.8	7.7	0.09	0.40	0.78	N
Poland	7.2	6.9	0.30	0.20	0.39	N
Portugal	12.2	10.1	2.10	0.30	0.58	Y
Romania	6.4	7.4	-1.00	0.10	0.19	Y
Slovenia	8.0	7.5	0.50	0.20	0.39	Y
Slovakia	7.6	7.2	0.39	0.40	0.78	N
Finland	9.0	9.3	-0.30	0.30	0.58	N
Sweden	7.1	5.7	1.40	0.30	0.58	Y
United Kingdom	13.2	13.0	0.19	0.10	0.19	Y
Iceland	6.2	6.1	0.10	0.30	0.58	N
Norway	6.4	7.1	-0.69	0.30	0.58	Y
Switzerland	4.1	3.5	0.60	0.20	0.39	Y

NB: Calculations not possible for Ireland (missing data at the time of extraction).

Reading note: The difference in (quasi-)joblessness between 2012 and 2013 is 0.09 percentage point (pp) in Austria, with a margin of error of +/- 0.78 pp. As the confidence interval includes 0, we can say the difference between 2012 and 2013 is not statistically significant (at 95 % confidence level).

Source: EU-SILC Production Database.

**Table 26.4:** Confidence intervals for the persistent at-risk-of-poverty rate, 2010-2013 (%)

	Persistent at-risk-of-poverty rate (%)	Confidence interval	
		Lower	Upper
Belgium	8.7	6.61	10.85
Bulgaria	13.4	10.05	16.83
Czech Republic	4.1	3.01	5.20
Denmark	5.1	1.74	8.53
Germany	10.6	9.39	11.72
Estonia	9.3	7.45	11.18
Ireland	7.9	5.13	10.73
Greece	12.4	11.45	13.37
Spain	12.1	10.20	13.98
France	8.5	7.41	9.54
Croatia	13.2	9.99	16.45
Italy	13.2	11.52	14.89
Cyprus	10.0	7.97	11.97
Latvia	12.1	9.86	14.31
Lithuania	10.2	8.02	12.29
Luxembourg	9.2	5.97	12.35
Hungary	8.0	7.86	8.22
Malta	8.5	5.99	11.07
Netherlands	6.5	3.45	9.59
Austria	8.9	7.00	10.90
Poland	9.0	7.53	10.56
Portugal	11.7	9.46	13.98
Slovenia	7.5	6.12	8.85
Slovakia	7.1	4.78	9.35
Finland	7.0	5.79	8.12
Sweden	7.6	5.70	9.45
United Kingdom	7.8	5.84	9.79
Iceland	2.7	1.09	4.36
Norway	6.2	4.77	7.57

*NB:* Missing data for Romania, no sample design variables for France (household id used as PSU id).

*Reading note:* For Austria, the persistent at-risk-of-poverty over 2010-2013 is 8.9 %. The confidence interval based on the Central Limit Theorem is [7.0, 10.9].

*Source:* EU-SILC Production Database.

## 26.5 Conclusions

The proposed variance estimators are simple and flexible, yet theoretically sound. They can accommodate a wide class of sampling designs using standard statistical techniques. It is not necessary to develop a specialised computer package for the implementation of the proposed approach as it can be implemented with standard statistical procedures in R, SAS, SPSS or Stata. It can also be extended to complex estimators through linearisation. However, as the linearisation procedure is justified on the basis of asymptotic properties, variance estimates may not be reliable if the sample size is not sufficiently large.

The numerical results obtained using this approach seem plausible, although they have to be interpreted with caution given the lack of sampling design information in the EU-SILC UDB and potential quality problems with the current design variables. Concrete recommendations were made for better recording of sampling design variables in EU-SILC (Goedemé, 2013a), which are currently implemented for new waves of EU-SILC.

The proposed approach can be implemented with any rotating longitudinal survey as long as the sampling fraction is negligible. Berger (2004a) proposed a variance estimator for change which is more complex and can be used with large sampling fractions. With a small sampling fraction, Berger and Priam (2016) showed that the estimator proposed in this paper is asymptotically equal to the Berger (2004a) estimator.

The estimated standard errors presented in this chapter show that sampling variance should remain an issue of concern for data producers, researchers and policy-makers using EU-SILC. In this chapter, we have focused on estimates for the total population, and it is likely that standard errors are (much) larger for estimates of (small) subpopulations. At the same time, the standard error estimates presented in this chapter also show that due to the rotational panel structure of EU-SILC, yearly changes in the indicators underlying the social inclusion EU target can be estimated with a reasonable degree of precision in most EU countries. This may strengthen the confidence we can have in the

trends revealed by these indicators. Even though much progress has been made over the past years with regard to estimating the sampling variance for EU-SILC indicators, continued efforts are required to further improve the quality of the sampling design variables, to evaluate how standard errors are affected by calibration and imputation, and to train researchers to correctly estimate the sampling variance when using EU-SILC. Progress is also needed in the estimation of non-sampling sources of variability such as measurement, coverage or processing errors.

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# 27

## Design and implementation issues to improve the research value of the longitudinal component of EU-SILC

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### 27.1 Introduction

EU-SILC represents a major investment on the part of EU Member States, and is the primary data resource for research and policy-making across the EU. As such, it is vital that the data are (1) of the highest possible quality, and (2) collected and made available in a form which maximises the potential for reliable, timely and policy-relevant research. This chapter summarises findings from two methodological research projects undertaken by the authors, which assessed aspects of the design and implementation of the longitudinal component of EU-SILC, and which made recommendations for future developments in the context of the revision of the EU-SILC legal basis.

The first of these projects relates to the implementation of EU-SILC following (or ‘tracing’) rules that determine which particular member(s) of sample households should be traced and re-interviewed, and under what circumstances <sup>(222)</sup>. The research, published in Iacovou and Lynn (2013), outlines the following rules as they are laid out in the regulations governing EU-SILC, and assesses (1) the ex-

tent to which these regulations are properly implemented in the different national surveys, and (2) the implications of the attrition resulting from non-follow-up of sample members on the representativeness and usefulness of the EU-SILC data. This work is summarised in Section 27.3.

The second project was carried out to inform the work of the EU Task-Force on the Revision of the EU-SILC legal basis <sup>(223)</sup>. A series of research papers were produced in the course of this project; these have been published as proceedings of the Task-Force (Eurostat, 2012-2012d). In this chapter, we discuss selected findings from these papers. In Section 27.4, we summarise findings regarding best practice in the minimisation of attrition in longitudinal surveys. We draw on a wide range of published research arising from both experimental studies in the field and empirical experiences in the implementation of longitudinal surveys, and make recommendations on how attrition in EU-SILC may be minimised in the future.

In Section 27.5, we summarise findings regarding the effectiveness of alternative sample rotation schemes for the longitudinal component of EU-SILC. This research is based on statistical considerations and draws on a consultation which surveyed the views of both national statistical agencies (who are responsible for collecting the data) and the research community (who are the primary users of the data). Recommendations for future developments are based on a joint consideration

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<sup>(222)</sup> This project began as part of the research programme ‘Analysis of Life Chances in Europe (ALICE)’, funded by the UK’s Economic and Social Research Council under grant number RES-062-23-1455, and was then extended under the Net-SILC2 programme.

<sup>(223)</sup> This was carried out for DevStat, as part of Specific Eurostat Contract No 10602 2012.004 — 2012 194 under the Framework contract No 61001 2008.001 — 2009 065 on a study for the Assessment of the future design of the EU-SILC longitudinal component.

of the costs and operational issues involved in administering a large-scale survey, and the needs of researchers.

## 27.2 The longitudinal component of EU-SILC

A description of key features of the longitudinal component of EU-SILC is necessary at this point, in order for the reader to be able to contextualise the analysis which follows. However, we will keep this description brief, since much of the necessary material is covered in detail in the other sources from which this chapter is drawn (principally Iacovou and Lynn, 2013 and Eurostat, 2012-2012d).

The recommended design for the longitudinal component of EU-SILC is a 4-year rolling panel, and in the majority of participating countries, this recommendation has been adopted <sup>(224)</sup>. Under this design, sample households are allocated to one of four 'rotational groups'. Each household remains part of the sample for 4 years, being interviewed on four annual occasions. Each year, all households in one of the rotational groups (the group that has just been interviewed for the fourth time) leave the sample, while a new set of households are interviewed for the first time. Thus, one-quarter of the sample (that is, one of the four rotational groups) is replaced each year.

It is a general requirement of EU-SILC that adult members of sample households are interviewed each year for 4 years. The meaning of this requirement is intuitively clear when a household remains at the same address between successive years, with no changes in composition. However, things become more complicated when a household relocates between waves, or otherwise changes its composition; all longitudinal household surveys incorporate a set of 'following rules' that determine which particular members of sample households should be traced and re-interviewed, and under what circumstances.

<sup>(224)</sup> Luxembourg originally implemented a 'pure' panel with no replacement, though has since moved to a 4-year panel; Norway has implemented an 8-year panel, and France a 9-year panel.

The rules relating to tracing in EU-SILC are clearly spelled out in Regulation (EC) No 1177/2003, Article 8 (Eurostat, 2003) which states:

'In the longitudinal component, individuals included in the initial sample, that is to say, sample persons, shall be followed over the duration of the panel. Every sample person who has moved to a private household within the national boundaries shall be followed up to the new location in accordance with tracing rules and procedures to be defined under the procedure referred to in Article 14(2).'

'Sample Persons' are defined by Article 2 of the same document as:

'...the persons selected to constitute the sample in the first wave of a longitudinal panel. They may comprise all members of an initial sample of households, or a representative sample of individuals in a survey of persons.'

A later Regulation (No 1981/2003, Eurostat, 2003a) clarifies the situation, making the following distinction between sample persons and other members of sample households:

- 'sample persons: means all or a subset of the members of the households in the initial sample who are over a certain age;
- 'co-residents (non-sample persons): all current residents of a sample household other than those defined above as sample persons;

This is an important distinction: most countries use household-based samples, and in these countries, sample persons are all those over the national age threshold living in a set of households at the time of the first wave of data collection. However, a minority of countries (Denmark, Finland, Iceland, the Netherlands, Norway, Slovenia and Sweden) use administrative registers as the basis for their surveys. In these countries, the initial sample is one of individuals. A large amount of data is taken from the administrative registers for all other members of the household of each sample person. In these 'register countries', the survey interview is carried out only with the sample person (often referred to as 'selected respondent'; see Chapters 2 and 28 of this volume); in these countries, all other adult household members are defined as 'co-residents'.

## 27.3 Empirical study of attrition on EU-SILC

In this section, we assess the extent to which EU-SILC is successful at re-interviewing sample members over multiple waves and, in particular, the extent to which sample members who move to a new address are successfully traced. We highlight differences between countries in the apparent success of tracing efforts and we discuss the implications for data analysis of the observed patterns of attrition amongst movers.

As described in section 27.2, the set of persons defined as sample members is established at the first wave for each panel. Thereafter, these same persons should be interviewed at each subsequent wave, so long as they remain in the same country and are not resident in an institution.

Our analysis is based on a data set that we have constructed by combining the longitudinal data files from the 2005 to 2010 EU-SILC data releases, using the most recent release of the data available at the time of writing (releases 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2). These cover the years between 2003 and 2010. We have selected observations in such a way that each survey record appears only once. Households are therefore eligible to appear in two waves (if their rotational group ended in 2005 or 2006 or started in 2009), three waves (if their rotational group ended in 2006 or started in 2008), or four waves (if their group started in 2004, 2005, 2006 or 2007). The data set thus constructed contains 3.37 million observations on over 1 million individuals in 608 000 households. Of these, 59 % were part of a rotational group which had been present in the data for four waves; 25 % were part of a group present in the data for 3 waves; and the remaining 16 % formed part of a group only present twice; these percentages vary between countries, with a larger percentage of observations being part of a full 4-year rotation in those countries which started the survey earlier. We exclude from our analysis any households that do not provide data in the first wave in which they were eligible for interview.

For households that participate in the survey in one year and are eligible to be included the next year, a range of outcomes are recorded in the data. These form three main groups: (1) households still in scope of the survey (meaning that at least one of the sample members in the household is still alive and living in a residential household in the country); (2) those that have moved out of scope (for example, because all sample members have moved into a residential home, or abroad, or have died); and (3) those recorded as not having been contacted. We add a further group (4) consisting of households that have simply disappeared from the sample (i.e., for which there is no entry in a year when an entry is expected). We find that 87 % of households who are contacted in one year are re-contacted the following year, and provide at least some information at interview. Just under 1 % of households move out of scope; 2 % are recorded as not being contacted, while 10 % are recorded as being in scope the following year, but do not provide information. The percentage of households who 'disappear' is small, and is only at all substantial in Austria (1.7 %) and Ireland (4.4 %). Overall, the lowest re-interview rates at the household level are found in the UK (75 %) the highest are found in Romania (98 %).

### 27.3.1 Household splits

We focus here on households where the sample members observed at one wave are no longer all in the same household at the next wave. We refer to such cases as 'household splits.' This situation is clearly associated with an increased risk of failing to interview all the sample members at the next wave as at least some, and possibly all, will have moved to a new address.

Household splits are conceptualised differently in register and non-register countries. In register countries, sample households contain only one sample person, with all other household members defined as co-residents. If a household in a register country splits, the household of the sample person remains as a sample household, regardless of whether the sample person remains at the same address or moves away, while any members of the original household who no longer live with the sample person are no longer part of the sample,

and are not followed. Thus, household splits are not recorded as such in the data, and the only means of identifying splits is to identify households in which some individuals who were resident at year  $t$  are no longer resident at year  $t+1$ .

In non-register countries, household splits fall into two categories: (a) those where one or more members of the 'parent' household are still living at the original address in year  $t+1$ , while one or more other members have moved to a new address, and (b) those where all members of the 'parent' household have moved away from the original address. In the first case, the people remaining at the original address are considered to form the 'original' household, while those who have moved to a new address are considered to form a 'split-off' household. In the second case, one of the two or more new households is designated as the 'original' household, while the other(s) are designated as split-off household(s); this is done on the basis of an identified household reference person. In our analysis, we do not distinguish between households where some people stay at their old address and households where everybody moves, since the second group (where all household members move) constitutes only around 5 % of observed cases <sup>(225)</sup>.

Identification of household splits in non-register countries is not simple, as there are different means of recording them. If all countries followed the survey protocols precisely, each split would be detectable in two ways. First, for a split occurring between Waves  $t$  and  $t+1$ , the original and split-off households would both be recorded at Wave  $t+1$  in the household register (D) file. Second, any sample member(s) who had moved to form the split-off household would be recorded in the individual register (R) files of the 'parent' household at  $t+1$ , as a member who had left the household. It should be possible to identify households where splits had taken place by either of these means, and they would be equivalent. However, there is considerable inconsistency in implementing these protocols. Overall, we identify 4.05 % of Wave  $t$  households to have split by Wave  $t+1$ . However, of these splitting households, only 14.1 % are correctly recorded in

the data files as described above. In 26.9 % of cases the split-off household is recorded but the movers do not appear in the individual register of the parent household. In 50.0 % of cases, the movers are listed but the split-off household is not recorded. And in 9.0 % of cases we have inferred a split as sample members have simply disappeared from the individual register without any split-off household being recorded <sup>(226)</sup>.

In register countries, we estimate that 7.0 % of households split between  $t$  and  $t+1$ . The means by which these can be identified is different from that for non-register countries, as described above. Of the split households, 73 % are households in which some household members are recorded at  $t+1$  as no longer living in the household, while 27 % are inferred to have split as some members of the Wave  $t$  household have simply disappeared from the household roster.

A potential source of inconsistency lies in the fact that the percentage of individuals reported as 'temporarily absent' from a household varies markedly between countries. For households in the second, third and fourth years of their rotation, the percentage ranges from zero in France, Malta, the Netherlands and Sweden, up to 4 % in Spain, 7 % in Cyprus and 9 % in Hungary. Although these differences may reflect genuine differences in household circumstances between countries, it is likely that they also reflect some differences in survey practice. Where a household member is reported as temporarily absent, we do not define this as constituting a household split (until such time, if at all, as the individual disappears from the household register, or is reported as no longer a member of the household). This may contribute to under-estimation of the overall numbers of household splits in countries like Cyprus and Hungary. Furthermore, our analysis implicitly assumes that the proportion of households that split amongst households that provide no data at all at  $t+1$  is the same as that

<sup>(225)</sup> It is likely that the actual proportion of household splits which result in all household members moving to new addresses is higher than this, but that a higher proportion of these households are lost between waves.

<sup>(226)</sup> We have only inferred a split when at least one of the people who disappear from the household register is aged 60 or younger, as older people are more likely to have died than moved out. Our estimates of rates of re-interview of sample members involved in splits are therefore, if anything, conservative as some genuine movers have been omitted from the base. The remaining individuals who disappear from the rosters are predominantly aged in their twenties, suggesting that these are indeed *bona fide* departures from the household.

amongst observed households. If anything, splits may be more likely amongst non-responding households, so this too may contribute to an under-estimation of household splits.

Table 27.1 summarises the percentages of adult sample members who were successfully re-interviewed at  $t+1$ . Overall, we estimate the re-interview rate to be around 67 % in households that have split, compared to 84 % in households that have not split. It is clear, then, that EU-SILC is less successful at following sample members when a household splits.

Moreover, re-interview rates vary considerably between countries (Iacovou and Lynn, 2013, appendix A6). In non-register countries, re-interview rates for adult sample members in a split-off household in the year following a split range from 0 % in Ireland and 11 % in Slovakia, to 38 % in Cyprus and 40 % in Italy. The re-interview rates for sample members who stay in the original household display less variation, ranging from 83 % in Belgium, up to 99 % in Romania, Ireland, Greece, Malta and Cyprus. Overall re-interview rates for all adult sample members following a household split (that is, those who remain in the original household and those who move away) range from 65 % (Belgium, Ireland, Latvia and

the United Kingdom) to 78 % (Cyprus). In register countries, the re-interview rate amongst all household members is lower by design than in the survey countries; our estimates of the percentage of sample members re-interviewed after a household split range from 52 % (Norway) to 63 % (Slovenia).

Although re-interview rates in split-off households are low, this does not have a big impact on overall survey attrition rates. This is because only around 7 % of individuals experience a household split in any one year, and because, of those, the sample members who remain in the original household following the split have high relatively re-interview rates. However, these low follow-up rates may be problematic for certain types of analysis: they have the potential to create serious difficulties for the analysis of certain household transitions, and of the dynamics of particular groups of people going through these transitions.

In all countries, the failure to observe all persons who should in principle have been followed could introduce bias if the non-respondents are significantly different from the respondents. They clearly are different in at least one respect: they are much more likely to have moved home. Other differences are likely if the circumstances of the household split

**Table 27.1: Adult re-interview rates in EU-SILC, 2003-2010**

	In splitting households			In non-splitting households	Total
	Adults who remain in 'original' household	Adults who form a split-off household	All adults	All adults	All adults
<b>Non-register countries</b>	95.9 %	26.3 %	71.6 %	84.5 %	83.7 %
(N)			(98 972)	(1 584 716)	(1 683 688)
<b>Register countries</b>	98.1 %	0.0 %	57.2 %	81.6 %	79.1 %
(N)			(50 283)	(476 898)	(527 181)
<b>All countries</b>	96.6 %	16.6 %	66.8 %	83.9 %	82.7 %
(N)			(149 255)	(2 061 614)	(2 210 869)

*NB:* Included in the category 'non-splitting households' are households for whom no information is collected at Wave  $t+1$  (non-contacts and refusals). Some of these may, in fact, have split.

*Reading note:* Cell entries represent the percentage of adults (aged 17+) eligible for re-interview the following year, who actually were re-interviewed (so, for example, in the non-register countries, 95.9 % of adults who remained in the 'original' household following a household split were re-interviewed). *N* indicates the number of sample members (assumed to be) eligible for re-interview; co-residents are excluded from the analysis. Analysis is unweighted.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2.

tend to contribute to the propensity to be successfully re-interviewed. An additional problem is simply that the sample sizes available for analysis may be significantly reduced, causing an increase in the variance of estimates.

A further consideration in register countries is that, by design, we never observe more than one part of a Wave  $t$  household at Wave  $t+1$  following a between-wave split. This limits the analysis possibilities as there is never complete information at Wave  $t+1$  about all the members of the Wave  $t$  household, if the household has split.

### 27.3.2 Whole-household moves

In the previous section, we have demonstrated that re-interview rates are substantially lower for sample members who form a split-off household following a household split than for other household members. The rules that define how a household is designated as 'original' or 'split off' imply that all split-off households must have moved to a different address to the one at which the Wave  $t$  interviewing took place, while it is likely that a large majority of original households at the wave after a household split will still reside at the same address. Thus, we can deduce that it is moving home that strongly predicts a lower re-interview rate, rather than splitting *per se*.

It is not only household splits that lead to moving home. Sometimes, a whole household will move home without the composition of the household changing. Such moves have not been the subject of our analysis, but it seems reasonable to assume that the re-interview rate amongst sample members in such households is also likely to be lower than that amongst people who are still at the same address at the time of the next wave. It would be useful for further research to examine the extent to which this is true and to which this varies between countries. This could lead to an assessment of the extent to which the overall sample is biased towards 'stable' households (those that neither split nor move) and of the limitations of analysis of phenomena that are to greater or lesser extent associated with moving home, such as changing job, moving from education to employment, or getting married.

### 27.3.3 Effect on the study of transitions

In this section we assess the effect of failing to follow people after a household split on substantive analysis. We focus on two transitions of particular substantive interest, namely young (16-35) adults' departure from the parental home, and the breakdown of a marital or cohabiting relationship. These almost inevitably involve a household split, and are numerically the most important transitions associated with household splits. As shown in Table 27.2, these two transitions together account for almost three quarters of all observed household splits. Young single adults moving out of a home in which their parents are not resident account for a further 10 % of household splits, while older adults (36-50) leaving their parents' home account for an additional 3 %. The relative prevalence of each transition type varies between countries, but in all countries the two transitions on which we focus here account for over 60 % of all household splits. The proportion associated with a young adult leaving the parental home ranges from 37.7 % in Sweden and 39.0 % in Norway to 63.8 % in the Netherlands and 66.5 % in Ireland, while the proportion associated with divorce or separation ranges from 5.2 % in Ireland to 23.8 % in Finland and 29.3 % in Sweden (Iacovou and Lynn, 2013, appendix A7).

In order for the analyst to assess whether a particular household has split, the sample members in that household need to have responded to two survey waves: one just prior to the split, and one just after the split. If a household experiencing a split is as likely as any other household to respond to both waves, fairly accurate estimates can be made of the percentages of households or individuals making a transition of interest.

In the case of home-leaving, this may be the case. While home-leaving is frequently eventful, and may have associated stresses, it is considered to be in the natural order of things, and is not usually preceded by particularly stressful circumstances. Therefore, there is no particular reason to believe that a household from which a young person leaves home would be less likely than average to respond to the survey either before or after the young person's departure. As EU-SILC records information on

**Table 27.2: Transition types associated with a household split (EU-SILC 2003-2010)**

	N	%
(1) Young adult (16-35) leaving parental home	20 581	52.7
(2) Divorce or relationship separation	6 649	17.0
(3) Both (1) and (2) in the same year	1 599	4.1
(4) Older adult (36-50) leaving parental home	1 235	3.2
(5) Young single adult (16-35) leaving non-parental household	3 823	9.8
(6) Elderly adult (60+) moving to an institution	433	1.1
(7) Indeterminate — missing partner or parent identifiers	709	1.8
(8) Other	3 991	10.2
<b>Total</b>	<b>32 923</b>	<b>100.0</b>

*NB:* The unit of analysis is the household, not the individual, and the base is all Wave *t* households that had experienced a split by Wave *t*+1.

*Reading note:* 52.7 % of all household splits arise as the result of a young adult aged 16-35 leaving the parental home.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4 and 2010v2.

**Table 27.3: Re-interview rates (2003-2010) for sample members in split-off households, by type of household split (non-register countries) (%)**

Non-register countries	Men			Women		
	Re-interviewed	Moved out of scope	Still in scope but not re-interviewed	Re-interviewed	Moved out of scope	Still in scope but not re-interviewed
Young adult (16-35) leaving parental home	28.6	21.1	50.3	33.1	17.7	49.2
Divorce or relationship separation	17.0	17.5	65.4	23.5	16.2	60.3
Older adult (36-50) leaving parental home	28.8	15.3	56.0	33.5	15.0	51.6
Young single adult (16-35) leaving non-parental h/h	11.6	10.3	78.0	15.8	12.4	71.8
Elderly adult (60+) moving to an institution	-	100.0	-	-	100.0	-
Indeterminate — missing partner or parent identifier	0.9	0.0	99.1	1.4	0.0	98.6
Other	30.0	7.2	62.7	31.9	11.0	57.1

*Reading note:* Of men moving to split-off households as the result of a young adult leaving home, 28.6 % were re-interviewed the following year.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2.

all household members who have moved away between one wave and the next, a response from the parental household, before and after the young person leaves home, is sufficient to identify the departure of the young person. The information provided by the parental household can also be used to study factors associated with the timing of home-leaving.

However, to investigate the effects of leaving home on subsequent events in young people's lives, or the living conditions of young people who have recently left home, the young people themselves need to be traced and re-interviewed. If re-interview rates are low amongst young home-leavers, these estimates are likely to be unreliable.

**Table 27.4: Location of interviewed sample members (2003-2010) whose household has split, by type of household split (register countries) (%)**

Register countries	Men		Women	
	At the same address	Moved to a different address	At the same address	Moved to a different address
Young adult (16-35) leaving parental home	89.3	10.7	89.0	11.0
Divorce or relationship separation	56.0	43.9	56.2	43.8
Older adult (36-50) leaving parental home	51.7	48.2	52.8	47.3
Young single adult (16-35) leaving non-parental h/h	87.5	12.5	87.3	12.7
Elderly adult (60+) moving to an institution	70.0	30.0	72.3	27.7
Indeterminate — missing partner or parent identifier	96.6	3.4	97.6	2.4
Other	37.7	62.3	35.8	64.9

*NB:* The unit of analysis here is the individual who moved; more than one such individual may be present in a household which splits. Where an individual falls into more than one category, they are prioritised as follows: (1) institutionalisation; (2) divorce or relationship separation; (3) young or older adult leaving parental home, or young adult leaving other home (all mutually exclusive); (4) missing partner or parent identifier; (5) other.

*Reading note:* Of men interviewed following a household split which occurred as the result of a young adult leaving the parental home, 89.3 % were living at the same address as before the split, while 10.7 % had moved to a different address.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2.

In the case of relationship splits, the couple is likely to be under considerable stress both at the wave prior to the household split and the wave subsequent. In addition, tracing movers after a split may be challenging, particularly if the partner who has not moved is unwilling or unable to assist with this. Thus, there may be a higher risk of non-response at both waves. As observations are needed at both waves in order to estimate the percentages of couples splitting up, there may be a risk that EU-SILC substantially under-represents couples who separate <sup>(227)</sup>.

In the analysis that follows, we examine re-interview rates in situations where a household split can be identified from the data. These will tend to be over-estimates of the true re-interview rates when households split as survey non-response will have caused some splits to not have been identified. In Table 27.3 it can be seen that re-interview rates in non-register countries are low following every type

of household split, but are highest in the case of an adult leaving the parental home, at around 29 % for men and 33 % for women. Following a divorce or separation, re-interview rates are only 17 % for men and 24 % for women.

Table 27.4, dealing with register countries, is organised differently, because there is no distinction between people who remain members of the original household or who become members of a split-off household. Instead, we present the percentages of sample members whom we observe in separating households, according to whether they are at their original address at  $t+1$  or have re-located to a new address.

In the case of young adults leaving the parental home, only 11 % of the re-interviewed sample are 'movers' — i.e. the young adults. In the register countries, young adults about to leave the parental home live, on average, with approximately two other people who would be eligible to be the sam-

<sup>(227)</sup> It may be possible to assess the degree of under-representation by comparing the incidence of divorce in EU-SILC with official divorce statistics.



ple person <sup>(228)</sup>. Thus, if movers and stayers were equally likely to be re-interviewed, we would expect to observe about 33 % of the followed sample moving to a new address; roughly speaking, the 11 % we actually observe suggests that the re-interview rate amongst young adults who leave their parents' home may be only around one-third that of the parents (and other adult household members) whose household they have left.

In the case of divorce and relationship separation, 56 % of those interviewed at *t+1* are living in the original address, while 44 % have moved. This may imply that the fieldwork agencies in these countries are somewhat less successful in following up movers than stayers following divorce or separation; however, this interpretation should be treated with caution, since the percentage of people we would expect to remain at the original address is not known exactly. In around 25 % of households experiencing relationship splits, more than two adults are present in the household; to the extent that these 'extra' adults (mainly adult children) are more likely to remain at the original address than to move, we would expect over 50 % of sample members to be at the original address in the year following the split. On the other hand, in a proportion of partnership dissolutions, all household members move to other addresses, which would push the expected percentage remaining at the original address downwards.

Tables 27.5 and 27.6 present re-interview rates for young home-leavers and for 'movers' in separating couples respectively, by country and by the sex of the mover (i.e. for sample members in the split-off household rather than in the original household). Data are not presented for register countries, due to the estimation difficulties outlined previously. Also presented are the percentages of people who are indicated as having moved out of scope — in the case of the two groups we are considering, this is predominantly moving to another country.

The first point to note is that in some countries a large proportion of movers actually move out of scope. This is particularly the case with young

male home-leavers — around one half of all young male home-leavers in Lithuania and Poland move abroad, while the same is true of around one third of male home-leavers in Bulgaria, Latvia, Luxembourg and Slovakia, and significant percentages of young people in other countries which joined the EU in or after 2005. This phenomenon is also evident in the case of relationship separation, with over half of those in Bulgaria, and substantial numbers in several other countries, moving out of scope following a separation <sup>(229)</sup>. Moving out of scope is clearly not the only reason for low re-interview rates among people undergoing a household split, but it is clearly a contributory factor, and raises the question of whether, in the context of a cross-national longitudinal survey, people moving across national borders within the EU should be traced and re-interviewed in their new country of residence.

In the case of divorce or separation (see Table 27.5), the re-interview rate amongst movers is less than 10 % in eight countries; between 10 % and 20 % in five more; and over 30 % in only one country (Italy). Considering that a substantial proportion of households undergoing divorce or separation will not be identified in the data at all, due to a higher probability of non-interview either before and/or following the split, these figures indicate that, with the possible exception of a handful of countries, EU-SILC is probably not suitable for any longitudinal analysis of individuals who leave their households following a relationship breakdown. Note that the same is not necessarily true of individuals who remain living in their original households following a divorce or separation <sup>(230)</sup>.

The re-interview rates for young adults leaving home (see Table 27.6) are low too, but considerably higher than the rates for separating couples. There are ten countries in which fewer than 20 % of male leavers are interviewed and six countries in which fewer than 20 % of female leavers are interviewed, but there are also four countries in which

<sup>(228)</sup> The figure of 2 is the actual average number of eligible sample persons (in most of the register countries, it is not common to live with multiple eligible siblings, and in some cases only one parent is present).

<sup>(229)</sup> As far as we can tell these *are* genuine separations rather than temporary arrangements where one partner works away, since temporary arrangements would have been coded as 'temporarily absent' in variable *rb200*.

<sup>(230)</sup> In the register countries, it is not possible to assess the percentages which are followed, though we observe that re-interview rates are somewhat lower amongst movers than amongst stayers.

**Table 27.5: Re-interview rates for people leaving their original household for divorce or relationship separation, by country and sex (2003-2010)**

(%)

	Men		Women	
	Percentage re-interviewed	Percentage moving out of scope	Percentage re-interviewed	Percentage moving out of scope
Belgium	26.7	4.8	33.6	3.2
Bulgaria	7.1	51.8	10.5	54.7
Czech Republic	24.4	8.4	29.3	3.3
Estonia	26.5	17.7	33.6	13.8
Ireland	0.0	7.1	0.0	9.5
Greece	6.0	11.9	5.5	9.9
Spain	17.1	10.2	28.1	10.5
France	27.7	5.9	38.3	6.1
Italy	30.9	12.8	30.6	13.2
Cyprus	28.2	23.1	19.6	37.0
Latvia	4.8	23.0	8.6	23.8
Lithuania	3.3	31.5	14.8	34.4
Luxembourg	20.3	35.0	19.8	29.2
Hungary	11.5	7.9	19.2	8.8
Malta	16.7	5.6	8.3	8.3
Austria	21.3	14.9	26.6	13.6
Poland	4.6	35.6	15.5	32.6
Portugal	13.5	36.9	23.9	19.7
Romania	0.0	27.3	20.0	30.0
Slovakia	3.5	11.8	3.1	13.9
United Kingdom	14.2	6.5	24.8	5.6
<b>All</b>	<b>17.0</b>	<b>17.5</b>	<b>23.5</b>	<b>16.2</b>
<b>N (number interviewed, year after split)</b>	505		542	

*Reading note:* Of Austrian men who moved out of their original household due to divorce or separation, 21.3 % were re-interviewed following the household split, while 14.9 % moved out of scope.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2.

the re-interview rates exceeds 40 % for men and seven countries in which it exceeds 40 % for women. There are two countries in which re-interview rates for young adults leaving home are around or above 50 % (Italy and Cyprus).

Finally, we assess whether young home-leavers who are not followed may be considered as 'missing at random', or whether the characteristics of those re-interviewed after the split differ systematically from the characteristics of those not re-interviewed. We compare those who were interviewed and those who were not in terms of six key indi-

vidual or household characteristics. These characteristics are: employment status (% with a job), sex (% female), mean household size, mean age, education (% with a degree), and income (% living in households whose equivalised income was in the lower two income quintiles for their country of residence). All characteristics are measured at the interview prior to the young person leaving home <sup>(231)</sup>. These results are presented in Tables 6a

<sup>(231)</sup> Clearly, we cannot use characteristics measured in the year after the young person leaves home, because these are not measured for anyone who is not re-interviewed.

**Table 27.6: Re-interview rates for young people (16-35) leaving home, by country and sex, EU-SILC 2003-2010**

(%)

	Men		Women	
	Percentage re-interviewed	Percentage moving out of scope	Percentage re-interviewed	Percentage moving out of scope
Belgium	32.2	5.6	36.9	4.2
Bulgaria	18.4	38.4	31.1	28.2
Czech Republic	33.7	17.3	32.0	17.6
Estonia	40.1	18.6	43.0	19.5
Ireland	0.0	23.9	0.0	16.7
Greece	18.3	22.0	22.6	5.8
Spain	37.9	5.1	42.6	6.1
France	41.7	9.7	44.1	8.1
Italy	48.1	9.4	51.1	6.6
Cyprus	52.8	18.0	63.4	15.7
Latvia	9.4	38.3	16.8	30.6
Lithuania	12.5	55.1	19.0	54.0
Luxembourg	23.6	31.8	30.2	26.9
Hungary	16.7	15.5	25.1	15.8
Malta	21.0	12.6	41.7	4.6
Austria	36.3	12.0	34.5	11.1
Poland	14.7	48.8	19.2	43.3
Portugal	38.7	23.5	40.3	17.2
Romania	12.4	20.2	11.6	23.3
Slovakia	8.6	31.9	15.8	28.3
United Kingdom	18.7	10.7	30.1	11.8
<b>All</b>	<b>28.6</b>	<b>21.0</b>	<b>33.1</b>	<b>17.7</b>
N (number interviewed, year after split)	2 346		2 561	

*Reading note:* Of Austrian men aged 16-35 who moved out of their parents' household, 36.3 % were re-interviewed after leaving home, while 12 % moved out of scope.

*Source:* Authors' computation, UDBs 2005v1, 2006v2, 2007v4, 2008v4, 2009v4, and 2010v2.

and 6b of Iacovou and Lynn (2013); these tables are not reproduced here for reasons of space.

We find that young adults who are successfully followed are more likely in most countries to have a job, more likely to be female, more likely to have lived in a larger household, likely to be a little older and to have a university degree, and less likely to live in a low-income household.

There is no clear difference between countries with very low re-interview rates and countries with higher re-interview rates; two countries in particular (Spain and the UK) have more significant differences be-

tween the two samples than other countries, and only three countries (Austria, Estonia and the Czech Republic) have no significant differences between groups on any of the indicators. The use of weights makes little difference to these findings.

Thus, it must be concluded that the missing at random assumption does not hold. Moreover, the characteristics of those who are lost to non-response differ between countries, so between-country comparisons may be particularly compromised. The evidence suggests that only in a handful of countries (notably Estonia, Spain, France, Italy, Cyprus and Portugal,) are young people re-interviewed in sufficient

numbers to make analysis of the life trajectories of young home-leavers worthwhile. Furthermore, in most of these countries, with the notable exception of Spain, differences in observable characteristics between those who were and were not re-interviewed appear to be modest.

However, EU-SILC is a cross-national survey designed to facilitate comparative research into incomes, wellbeing and family life across all countries of the EU. Although limited research on young adult home-leavers is possible with EU-SILC, true cross-national comparative research is simply not possible in respect of young home-leavers, and no such analysis, comparative or otherwise, is possible regarding relationship dissolution. With respect to Esping-Andersen's (1990 and 1999) welfare regime typology, one welfare regime type (the social-democratic regimes) cannot be analysed because the survey design in register countries means that it is not possible to reliably estimate transition rates, and because it appears that re-interview rates are very low in the case of young people who move home. And among the countries of Eastern Europe which joined the EU after 2005, re-interview rates are so low that it also becomes extremely problematic to include them in the analysis. So, while the data enable a reasonable comparison to be made of young adult home-leavers between the Southern European countries, analysts might have hoped for much more from EU-SILC. The situation could be improved in future by amending the sampling and following rules in register countries and by implementing better procedures to maximise re-interview rates in all countries. Such procedures are outlined in the next section of this chapter.

## 27.4 Minimising sample attrition <sup>(232)</sup>

There are two main reasons why it is desirable to make efforts to minimise sample attrition on EU-SILC. First, a higher rate of attrition implies a larger number of interviews required at the first wave in order to achieve the target longitudinal sample size. Second, if sample members who drop

out before the end of the panel differ systematically from those who continue responding, longitudinal estimates can be biased. Thus, implementing methods to control attrition can both save survey costs and improve the research value of the data.

Lepkowski and Couper (2002) identify three stages in the process of obtaining response from sample members: location, contact and cooperation. These three stages take place at each wave, and attrition will occur if any of the stages is unsuccessful. To minimise attrition, it is therefore necessary to implement measures that reduce the risks of failing to locate, failing to make contact, or failing to gain cooperation. Fortunately, there are many such measures available; the best practice is to employ a broad range of these measures. They may be categorised into three types:

- Anticipatory measures are implemented at, or before, the wave prior to the wave at which there is risk of attrition. An example would be collecting extra contact information at Wave 1 in order to aid the process of making contact at Wave 2;
- between-wave measures are implemented subsequent to the previous wave but prior to the wave at which there is risk of attrition. An example is to send a mailing to all sample members to motivate them to want to take part again;
- in-wave measures are implemented during the wave at which there is risk of attrition. An example would be calling at neighbouring houses in the event that no reply can be obtained at the previous known address of a sample member.

### 27.4.1 Locating sample members

To minimise the risk of failing to locate longitudinal sample members who were interviewed at a previous wave (Couper and Ofstedal, 2009), best practice involves these key elements:

- Every opportunity should be taken to collect information that may help to locate a sample member in the future, in the event that he or she should move;

<sup>(232)</sup> This section is based on Eurostat (2012b).

- A range of information should be collected, rather than relying on just one or two types of information;
- The information should be stored systematically in a database which permits relevant information to be supplied in a timely manner to the people who need it (interviewers, field managers, office staff);
- Timely action should be taken in response to particular situations (a sample member reporting an intention to move, an interviewer reporting that a sample member cannot be found, etc.).

### 27.4.2 Making contact with sample members

Some of the measures taken to assist with locating sample members can also increase the chances of making contact. For example, collecting mobile phone numbers at Wave 1 will not only make it easier to locate someone who has moved by the time of Wave 2 but will also make it easier to make contact with someone who has not moved but is not often at home. Additionally, best practice at each wave should involve interviewers being required to make at least a certain number of visits, and to spread these over different days of the week, times of day, and weeks, in order to maximise the probability of making contact.

The wealth of information collected at previous waves can be used in various ways to help make contact with sample members. This includes both socio-demographic characteristics collected in the survey and paradata about the fieldwork process (Kreuter, 2013). Prior to fieldwork, such information can be used to identify cases with a heightened risk of being hard to contact. This may enable prioritisation of fieldwork (Calderwood et al., 2012) or appropriate allocation of interviewers to sample cases. Interviewers may be able to plan their work more effectively if they are supplied with information about the numbers, days and times of unsuccessful (non-contact) visits at previous waves and the days and times when contact was successfully made.

The use of different modes of approach may also help. People who cannot be contacted easily

face-to-face may perhaps be contacted by telephone or email instead. Telephone and email approaches can be used to make appointments for a face-to-face visit, or at least to ascertain when may be a good time for a visit.

### 27.4.3 Obtaining the cooperation of sample members

The overall experience of being approached and participating in the survey at one wave will have a big influence on the chances of a sample member agreeing to be interviewed again at the next wave. In particular, sample members' experiences at EU-SILC Wave 1 are likely to form the major determinant of willingness to take part again subsequently. Almost every aspect of the design and implementation of the survey can have an impact on the propensity to agree to participate, from the name of the survey, through to the appearance and manner of the interviewer. However, a design feature that has a positive effect for some sample members may have a negative effect for others (Groves et al., 2000). Researchers can take advantage of this by targeting some aspects of the survey process to the particular characteristics of respondents (Lynn, 2016).

The role of the interviewer cannot be over-emphasised. Thorough training of interviewers in refusal avoidance and good practice to encourage participation (Morton-Williams, 1993) is essential.

Several other design features also influence cooperation rates. The use of modest-value respondent incentives is beneficial. The types of incentives used on panel surveys and the results of studies into their effects are reviewed in Laurie and Lynn (2009). In some cases, an incentive can actually reduce the overall cost of a survey, as interviewers find it easier to persuade people to take part and have to make fewer visits as a result (Lynn et al., 1998).

Between-wave mailings should be designed to motivate respondents to take part again. Fumagalli et al. (2012) found that this is more likely to happen if the contents of the mailing are relevant to the sample member. Most surveys with annual waves have two or three between-wave mailings: a post-wave 'thank you', a between-wave mailing

(with some findings and a request for updated contact details), and a pre-wave advance letter.

### 27.4.4 Checklist of best practices

Prior to the start of the first wave of fieldwork with a new panel:

- A sample management database should be created. This can be used for managing fieldwork at each wave, tracing between waves, and keeping-in-touch exercises.
- Information that might help with tracing should be collected from the sample frame or from other sources if possible. Such information should be stored in the sample management database.
- Procedures for in-wave tracing should be developed and all necessary materials produced. For field tracing, details must be included in interviewer training. For office tracing, appropriate personnel must be identified/recruited and trained.
- Attention should be paid to the choice of interviewers and to interviewer training. It is particularly important on a panel survey that the interviewer leaves a favourable impression.

At each wave:

- An advance letter should be mailed to each sample member. If possible, a small incentive should be included.
- Sample members at high risk of being non-contacts should be given priority (attempted first) in the field.
- Interviewers should make at least a certain number of visits — ideally seven — to each sample address, on different days of the week, times of day, and weeks, before accepting a non-contact.
- Interviewers should be supplied with data from previous waves that may help them to make contact at the current wave or to gain cooperation.
- After a number of non-contact calls to an address, a calling card should be left.

- Alternative modes of contact — such as email or phone — should be considered for sample members who have not been contacted after seven attempts.
- When a mover is identified, the interviewer should ask current residents of the address (and, if necessary, neighbours) whether they know the new address of the mover. Interviewers should be equipped to hand a prepared mailing to the new/other resident/neighbour, for them to address and mail to the mover.
- If a mover's new address is not obtained in the field, other tracing procedures should be initiated promptly. These should include phone calls to numbers provided previously by the sample member and, if necessary, emails, hard-copy mailings and database searches.
- When a mover's new address is obtained, it should be issued promptly to a field interviewer.

At each wave other than the last wave for each panel:

- Each sample member should be asked to provide: home telephone number, mobile telephone number, work telephone number, email address, and address and phone number of at least one 'stable contact'.
- Each sample member should be asked if they expect to move in the next 12 months. If 'yes', they should be asked if they know when or where they will move. If they already know where, the new address should be recorded. If they know when but not where, the expected month of the move should be recorded.
- Each sample member should be asked to inform the National Statistical Institute (NSI) if they change address. They should be given a reply-paid postcard, a Freephone telephone number and an email address to which they can write. A small incentive might be offered for reporting an address change.

Between waves:

- Relevant information collected during fieldwork should be copied to the sample management database.

- A mailing of all sample members should take place. If possible, this mailing should be targeted, with the content differing between sample subgroups.
- Whether or not the mailing is targeted, the contents should be thoughtfully designed to maximise the sample member's interest in the survey.
- If resources allow, additional targeted interventions, such as a phone call to sample members estimated to have the highest risk of losing contact, are desirable.
- Other regular tracing procedures should be considered, such as routine searches of commercial databases or electoral registers.

## 27.5 Design options for the longitudinal component of EU-SILC

The previous sections of this chapter have been concerned with the implementation of the four-wave rotating panel which has been, since the inception of EU-SILC, the recommended design for the longitudinal component. In this section, we consider possible alternatives to this design, assessing their strengths and weaknesses in relation to cost, operational issues, and the usefulness and quality of the resulting data.

The possible alternatives to a four-wave rotational design are outlined in detail in Eurostat (2012a). The range of possible alternatives is extremely large, including variations in panel length, the frequency with which new panels are introduced, the extent to which questionnaire content differs between years and between different sections of the sample; the extent to which retrospective questioning is used as an alternative to year-by-year contemporaneous interviews; and 'hybridisation' of surveys (for example, splitting the sample into 'short' and 'long' panels, in an attempt to combine the advantages of different designs).

In our consultations with National Statistical Institutes ( $N=18$ ) and with members of the research com-

munity ( $N=131$ ), the issue of the length of the panel was clearly the most important of all these considerations; neither group of stakeholders appeared to feel that there was any particular benefit in altering any of the other parameters, and in particular the 1-year interval between interviews.

In terms of the choice of panel lengths, the possible alternatives are as follows:

- a) A cross-sectional survey with no longitudinal component (effectively, this is equivalent to a panel length of 1);
- b) A longitudinal survey with a shorter panel component of two or three waves;
- c) The current arrangement, with a panel length of four waves;
- d) A longitudinal survey with a longer panel component (five or more waves);
- e) A 'perpetual' panel, where sample households are never replaced; this is technically equivalent to an infinite panel length.

We identify a range of advantages and disadvantages associated with different panel lengths. These are listed below; there are several important trade-offs to be considered.

### 27.5.1 Opportunities for research

In terms of the potential opportunities for research, there was a fairly strong consensus on the part of the research community that a longer panel was better than a shorter panel. Some respondents noted that as they only ever performed cross-sectional research, the four-wave panel design was completely adequate for their purposes, and indeed they would be perfectly happy with a repeated cross-sectional survey. However, of the respondents who were interested in doing longitudinal research, virtually all expressed a preference for a longer panel; some noted that the current 4-year design afforded such limited opportunities for longitudinal research that it was, for their purposes at least, almost useless.

This feedback is entirely consistent with a growing body of literature on longitudinal analysis. Kalton and Citro (2000, p. 41) note that 'the longer the

panel lasts, the greater is the wealth of data obtained for longitudinal analysis'. Jenkins (2011), in his analysis of income dynamics in Britain, demonstrates that an understanding of many aspects of dynamics would not be possible without at least 8 years of data (indeed, he argues (p. 183) that even with 17 years of data, as he had available from the British Household Panel Survey, there remain necessary assumptions that restrict the interpretation that can be put on findings). Duncan (2000) finds it necessary to compare successive 5-year periods to identify stability of income of American families, implying that at least 10 years of data are needed. Hernández-Quevedo et al. (2010) indicate that 4-wave data severely restricts the ability to analyse the determinants of health outcomes in Europe, pointing out that dynamic models are unreliable with (a maximum of) only four observations per person and that it is hard to ascribe causality. Till and Eiffe (2010), in their work identifying factors leading to the onset or alleviation of material deprivation (MD), also conclude that longer periods of observation would be desirable, and would enable researchers to more fully identify the sequences of events that lead to changes in MD status.

### 27.5.2 Non-response and attrition bias

As discussed earlier in this chapter, steps may be taken to minimise attrition; but it cannot be completely eliminated. Attrition can become a more serious problem the longer the length of the panel, and is potentially most serious in a 'perpetual' panel without replacement. The most obvious consequence of attrition is progressively smaller sample sizes over the life of the panel. However, where some or all of the attrition occurs via not-at-random processes, as is likely to be the case in most conceivable real-life contexts, it may give rise to a sample which is not only small, but also non-representative (see Chapter 22 of this volume, on some of the implications of attrition). Where the degree of attrition is not too severe, it is possible to use weights to adjust for selective attrition; however, this becomes progressively more difficult when attrition has occurred steadily over a period of many years.

The decisions as to (a) whether the data can be used at all, and (b) if so, whether and how best to adjust for attrition, should depend on both the degree of attrition and the remaining sample size. In common with most decisions in research practice, there are no hard-and-fast rules here, but a reasonable rule of thumb is to exercise considerable caution when attrition rates exceed 50 %, and to make decisions based on sample sizes as well as attrition rates. For example, in our analysis of young people leaving home (Table 27.6 and associated discussion), we proposed that the Portuguese sample (with re-interview rates of 38.7 % for men and 40.3 % for women) was potentially usable, whereas the Austrian sample (with only slightly lower re-interview rates, but a smaller sample overall) was not.

A rotating panel will still suffer from attrition, but this will be limited by the repeated introduction of new panels. Additionally, when the survey is 'mature', it will attain a steady state. The sample will not be entirely representative of the population, due to non-response and attrition; however, we may expect that the characteristics of the sample will be broadly the same from year to year, and that year-on-year comparisons will thus be more reliable.

It is important to note that although a rolling sample is likely to embody a greater degree of year-on-year consistency, it does *not* necessarily follow that a shorter panel would result in a lesser degree of non-response bias, since the degree of such bias depends on the relative likelihood of non-response at the first wave and subsequent interviews.

### 27.5.3 Variance of estimates

One major advantage of rotating panel designs is that they reduce the variance of estimates of net change between two time periods, compared with the use of independent cross-sectional samples. It is entirely possible to construct an estimate of net change from two independent samples: for example, one could estimate the net change in unemployment rates using a repeated cross-sectional survey. In this case, each of the two cross-sectional estimates of the unemployment rate would be subject to sampling variance, and the sampling



variance of the difference between the two estimates would be equal to the sum of the variances of each cross-sectional estimate. This variance can be reduced by using a rotating panel design, as the variance of the estimated change is reduced by an amount equal to the covariance between the two measures, which is positive in the case of dependent samples. The longer the panel, the smaller the contribution made in each wave by a 'new' sample, and the smaller the variance.

### 27.5.4 Practicalities of data collection

In the course of our consultation, a perception was evident among several NSI respondents, that following sample members over longer periods of time might make the survey more demanding to implement; several of our respondents noted that even under the current arrangements, they found implementing the tracing and following rules the most difficult aspect of their work on EU-SILC, and that this difficulty would be compounded if the panel length were to increase.

Other NSIs, however, did not share this perception. Some survey managers argued that a shortening of the panel length would increase both non-response and potential costs, since obtaining response from a new sample, about whom little or nothing is known, for the first time is more challenging than obtaining response from people who have already taken part in the survey previously and about whom quite a lot is known. A rotating design with a larger number of waves would imply that in any one year a smaller proportion of the total sample would be being approached for the first time. Consequently, a larger proportion of the total survey effort would consist of re-approaching people interviewed previously; although a proportion of these would have to be traced after moving house, the net effort involved may well be lower.

The consultation was anonymous, so we do not know how the individual NSIs answered, but it is likely that these differences may be driven by substantial variability between NSIs in the degree of pre-existing expertise with longitudinal surveys. There seems to be a strong case, therefore, for a greater degree of sharing of experience and best

practice between NSIs; this would be the case even if the survey were to remain in its current form, and should definitely occur if the length of the panel were to be extended.

### 27.5.5 SWOT analysis and recommendations

The final part of the Eurostat project involved a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. A full account of this is presented in Eurostat (2012c and 2012d). The report concluded that several features of EU-SILC were working well and required no change; the major change recommended was an extension of the panel length from 4 to 6 years. This would permit a broader range of analyses and greater power to identify the precursors, causes and effects of various dynamic processes such as changes in income poverty, MD, (quasi-)joblessness and changes in health status; EU-SILC would provide a unique opportunity to make cross-national comparisons of these processes, causes and effects and to better understand variation between Member States.

However, there are also potential disadvantages associated with larger numbers of waves, relating to problems with attrition. There are ways in which these problems may be minimised; we propose that following rules and procedures for minimising non-response should be re-specified and should in future be better monitored, with greater support provided to NSIs to help them to understand and to correctly implement the procedures.

## 27.6 Conclusions

In this chapter, we have reviewed the legislation relating to the following rules of EU-SILC, and have examined the ways in which the following rules are implemented in different countries. We found that the following rules are interpreted and implemented very differently in the different Member States of the EU, particularly in respect of individuals or whole households who change address between one survey year and the next; and we illustrated that this may have important implications for

research on groups of people who have a higher-than-average risk of moving. We also discussed 'best practice' in relation to minimising attrition in longitudinal surveys, identifying a number of procedures that could help to reduce attrition on EU-SILC. We support the suggestion of Glaser et al. (2015) that EU-SILC would benefit from countries sharing best practice in this regard. Finally, we discussed the findings of a project evaluating the challenges of producing the EU-SILC longitudinal data from the perspective of National Statistical Institutes, and the value of the longitudinal component from the perspective of the research community. Based on all this evidence, we recommend (a) a shift to a 6-year rotating panel, rather than the current 4-year panel; (b) a tighter specification of the following rules, and more rigorous monitoring of their implementation; and (c) a greater degree of information-sharing between NSIs and other experts, with the particular aim of supporting those NSIs with less expertise in administering longitudinal social surveys.

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# 28

## The use of registers in the context of EU-SILC

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### 28.1 Introduction

A key feature of EU-SILC is output harmonisation. This gives national statistical institutes flexibility of implementation at the national level, with variation in data collection methods, coupled with systematic monitoring of data quality and the degree of comparability within and across countries. Countries implementing the EU-SILC surveys are split between 'register countries' and 'survey countries'. This chapter reviews the use of registers in combination with interviews in EU-SILC. It is based on the contributions from the international Workshop on the Use of Registers in the Context of EU-SILC held in December 2012 in Vienna (Jäntti, Törmälehto and Marlier, 2013).

While the acronym EU-SILC stands for EU *Statistics on Income and Living Conditions*, the EU-SILC data need to be collected at least in part with a sample survey, because subjective questions on living conditions and their joint distributions with income and other domains are essential for the output of the whole instrument. The use of registers in EU-SILC is therefore to be seen as part of a wider strategy of multi-mode data collection; in other words, registers complement rather than

substitute data collected in statistical surveys (see chapter by Di Meglio and Montaigne in Jäntti et al., 2013).

The current trend in European statistics (including EU-SILC) is to encourage the use of administrative data. Nowadays, one could well split the EU-SILC countries into three groups instead of just two. The first group consists of the 'old' register countries, where the use of registers affects quite profoundly the design and implementation of the survey. The second group consists of countries that have started using or will use income data from registers extensively, but have mostly maintained other features of their survey implementations. The third group consists of countries that rely, by necessity, largely on interview-based income data.

Since the launch of EU-SILC, Denmark, Finland, Iceland, the Netherlands, Norway, Slovenia, and Sweden have been thought of as the 'register countries'. Recently, there has been a further expansion in the use of register data in EU-SILC, in particular on regular income components such as wages and salaries, pensions, and social benefits. The group of EU-SILC countries that derive income data from registers now includes countries such as Austria, France, Latvia, Spain, and Switzerland. The measurement of income data from registers is the area where the benefits of register data are most imminent, both in terms of quality and costs. An important difference is that these 'new' register countries are not using the so-called *selected respondent design*, which is the distinct feature of the 'old' register countries.

We will discuss these two groups in this chapter, but it is important to note that the third group (the

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survey countries) is a large one, and includes countries such as Germany, Greece, Poland, Portugal and the United Kingdom. These countries may have legal and actual barriers to access and/or link register data to the EU-SILC sample, and the quality of the register data may not be fit for purpose due to low quality of the available registers. Even then, there may be some scope for utilising register data for EU-SILC purposes, at least for quality assessments. Examples of such evaluation and cross-validation studies are provided in Jäntti et al. (see chapters by Lunn and McKay, Cifaldi and Neri, Liégeois et al.).

The chapter is organised as follows. First, some general quality considerations are briefly discussed, followed by a review of the implementations in the 'selected respondent' or 'old' register countries. Then, some experiences of the 'new' register countries are reviewed. Finally, the last section provides a summary and conclusions.

## 28.2 EU-SILC and data integration: general considerations

Access to administrative and statistical registers can influence the design, production and quality of sample surveys in several ways. The use of income data from registers implies a decrease in the length of the questionnaire and less quantitative questions. This makes less costly modes of collections, such as telephone or web interviewing, viable alternatives to face-to-face interviewing. Yet, these alternatives may constrain the type of data that can be collected in the interviews, and in this way reduce the flexibility of the register-based implementations.

Income is at the very core of EU-SILC and interview-based income data typically suffer from item non-response. In EU-SILC, in order to allow for complete case analysis, missing items are imputed (with a single imputation). Countries with no or only limited access to register-based income data have to devote quite some effort to imputation of non-response. Consequently, the great benefit of using register-based income data is the reduced need

for imputations. Registers also provide a wide pool of auxiliary information for further adjustments of the sampling weights, in order to improve the accuracy of the estimates. However, consistency checks and editing, weighting and construction of the target variables may become more time consuming. The use of register income data also implies paying more attention to disclosure risk in the micro data.

The combined use of survey and register data affects the total survey error, and effectively expands the traditional survey error sources to those related to registers (single sources) and data integration from multiple sources. The linkage and alignment of multiple sources introduces an additional second phase source of errors, in addition to the sources of error in any single source (Zhang, 2012). Both surveys and registers have errors related to measurement (variables) and errors related to representation (units). The various types of errors, such as unit errors (e.g. different household definitions) and measurement errors (e.g. under-reporting of income), are discussed in detail e.g. in Jäntti, Törmälehto and Marlier (2013).

In the case of EU-SILC, the great expectation is that register-based income data are more accurate and cheaper to collect, and the whole survey becomes much less burdensome for the respondents. Nevertheless, the errors that occur in surveys may also occur in registers, and the values available from surveys and registers may differ from the ideal values, for various reasons (Bakker, 2011). It should be kept in mind that there is variation within countries across different register sources, and possibly even across variables within a single register source in a country.

In general, measurement errors in the register sources depend on the administrative data collection process, and the involvement and interest of the registered person or unit (Bakker, 2011). Some administrative register data are collected with survey-like techniques, through self-administered questionnaires (e.g., tax forms), which are processed into electronic format. The person may have an interest of registering very accurate data, but could also intentionally provide false data. A classic case of the latter is tax evasion (Matsaganis et al., 2013); for instance, self-employment income self-declared in the tax forms can contain intentionally underreported data. Some administrative register

data come directly from electronic administrative systems without the direct involvement of a person. As an example, wages and salaries based on electronic data transmission between employers and tax authorities can be very accurate. Different types of data may be included even in the same register, in particular in the tax register(s).

EU-SILC always needs a questionnaire-based data collection, and the use of registers obviously has an impact on the questionnaire. Some survey questions may be completely replaced with register variables, with the obvious benefit of a shorter and possibly cognitively less burdensome questionnaire. Some adaptation of the questionnaire is typically needed. For instance, when Statistics Austria started to use income data from registers, it also adapted its questionnaire not only by deleting questions but also by changing the remaining questions because their context had changed, as well as by adding new questions to fill in the gaps in the register incomes (see chapter by Heuberger et al. in Jäntti et al., 2013).

A critical precondition for using registers is that the existing legislation does not prevent their use for the intended purpose. As a related matter, respondent consent is usually required in surveys before unit-level data from registers may be linked to interview-based data. Administrative data sources require a great deal of work on harmonisation of populations and units, common identifiers and the record linkage process, and derivation of variables. One of the most important constraints in using registers is *timeliness*; late availability of registers and the required processing time may not allow using registers to meet the required EU-SILC data transmission deadlines.

## 28.3 The 'old' register countries

As noted in the introduction, the group of 'old' register countries includes the Nordic countries, the Netherlands, and Slovenia. Broadly speaking, these countries in EU-SILC take income data mostly from registers, sample individuals and not addresses, have shorter questionnaires with a focus

on qualitative questions, use telephone interviews (or, in the case of Denmark, also web interviews), and apply the selected respondent (SR) design. In this design, a pre-defined set of personal variables are collected only for a representative sub-sample of adults (aged 16 and above) instead of all adults. The 16+ individuals drawn from the frame are 'selected respondents', and the household is defined around the selected person. Since individuals are randomly pre-selected from the sampling frame, the respondents constitute a representative sample of the population of 16+ individuals. The results are generalised to the cross-sectional target population with special weights.

In the longitudinal part, where the individual is the unit of analysis, only the initially selected respondents are the sample persons followed in the subsequent waves. The split-off members, i.e. the initial co-residents, are not followed, which is an important practical simplification. The SR registers countries using the standard 4-year design also must select an extra sample to cover population of 14 and 15 year olds.

The SR design of EU-SILC was tailored for the register countries in the transition from the European Community Household Panel (ECHP) to EU-SILC. Although the minimum effective sample size is defined to be larger in the SR design, it reduces respondent burden and cuts costs because not all household members need to be interviewed and cheaper modes of collection (telephone or web interviews) can be used. The limits of telephone interviews and data collection from a proxy respondent, in particular, may restrict the type of data to be collected. For instance, reliable data on cognitively burdening and/or sensitive issues (e.g., wealth, event histories) are very difficult to collect by telephone and/or proxy interview.

For the users of cross-national data, the SR design complicates the analysis somewhat. Data from register countries have to be analysed separately if the SR variables are used. Joint analysis with household-level variables or with personal variables collected for all adults is not straightforward. The user may have to restrict their analysis to the sub-sample of selected respondents using the appropriate weights, when such variables are analysed separately or jointly with other types of variables. This

leads to a loss in efficiency due to full clustering effect, which is partly compensated by the larger minimum effective sample sizes required from SR register countries.

Helgeson (in his chapter included in Jäntti et al. 2013) reviews how the use of register data affects EU-SILC in the *Nordic countries*. The Nordic countries have used administrative data for statistical purposes since at least the mid-1960s, and also have long traditions in integrating sample surveys and registers. All Nordic countries sample individuals rather than addresses, and follow the SR design. The surveys in these countries benefit from well-established system of basic registers, which usually consist of three or four registers. Denmark, Finland, Iceland and Norway have organised their data in three basic registers: a *Population register*, a *Register of buildings and dwellings*, and a *Business register*. Sweden has built up a statistical system based on four basic registers: *Population Register*, *Activity Register*, *Real Estate Register*, and *Business Register*. The *Population and dwelling registers* are more (Denmark, Finland and Norway) or less (Iceland and Sweden) developed, which has implications for the use of the registers in creating households for EU-SILC. In a few years' time, though, all Nordic countries will be using similar population registers which will imply similar production processes for EU-SILC in all these countries.

Despite the many similarities, there are some differences in the EU-SILC implementations between the Nordic countries. The sampling is performed slightly differently. Denmark, Norway and Sweden use simple random sampling while Finland uses a stratified two-phase sampling. Iceland uses post-stratified simple random sampling. All Nordic countries mainly use Computer Assisted Telephone Interviews (CATI) as the main method for interviewing— except in Denmark, where now almost 6 in 10 interviews are performed through web interviews (Computer Assisted Web Interviews (CAWI)). The fieldwork is set up differently. In Denmark, Finland, Iceland and Norway the fieldwork takes place during the first part of the year. Sweden performs a continuous survey throughout the year. Also the countries have sometimes interpreted the regulations regarding EU-SILC slightly differently. Since EU-SILC is an output-harmonised survey, there is

also room for choosing methods adapted to the local circumstances (see chapter by Helgeson in Jäntti et al., 2013).

In *Slovenia*, EU-SILC is the first sample survey where administrative sources were used, starting in 2005. From the outset, all the conditions for using administrative sources needed to be resolved — the legal basis, the quality of the administrative data, timeliness of the data, etc. The experience of Slovenia highlights the potentially significant start-up costs of integrating register and survey data. The main problem of using administrative sources in Slovenia is timeliness, although the situation has improved over the years (see chapter by Inglič in Jäntti et al., 2013).

In *the Netherlands*, because of the common labour variables, EU-SILC has been integrated in the Labour Force Survey as an additional panel wave. The Dutch Labour Force Survey is conducted according to a rotating panel design, in which respondents are interviewed five times at quarterly intervals. Households that have taken part in the fifth wave are recruited for the EU-SILC survey. Statistics Netherlands has access to a wide range of administrative data which are integrated in the overarching social statistics database on which all output of social, regional and spatial statistics is or will be based in the future (e.g. income). Through the so-called satellite on income and wealth, EU-SILC is provided annually with register data on income and wealth. (see chapter by Huynen et al. in Jäntti et al., 2013.)

Apart from replacing variables in surveys, register data also improve the efficiency of the survey process in the Netherlands by streamlining the data collection and supporting more efficient sampling schemes. Moreover, register data contribute to improving the quality of the output of household surveys by providing auxiliary variables for weighting purposes. The income calibration variables used in EU-SILC are based on the Income Panel Survey. Since the 2012 Wave of EU-SILC, the calibration variables are based on the social statistics database, which covers the entire population in the Netherlands. The at-risk-of-poverty rate, based on the national definition of equivalised income, is one of the calibration variables. (Huynen et al., op. cit.)



The register countries who use the ‘selected respondent’ design tend to have a comprehensive system-based approach to using registers for statistics and many also have a long tradition in using registers for surveys. Legal and actual access to using registers is well established, and technical issues (e.g., concerning record linkage) have in general been solved.

It should be noted that many of the ‘old’ register countries such as Denmark, Finland, Norway, the Netherlands and Sweden are increasingly producing income inequality and income poverty indicators from entirely register-based sources. These sources are not restricted by the sample size and can provide highly disaggregated regional and longitudinal information. In such countries, EU-SILC may not be the national reference source on income distribution, but a source for multidimensional, cross-nationally comparable living condition indicators <sup>(234)</sup>.

## 28.4 The ‘new’ register countries

The transition to register data is not easy and may take years, since it may require adaptation of the legal basis, careful quality assessments, and changes to the production processes. In other words, there may be significant start-up costs, as already highlighted in the case of Slovenia. We next review some experiences and findings of the ‘new’ register countries — which include Austria, France, Latvia, Spain and Switzerland — and to some extent also other countries such as Italy with more mixed strategies.

The main difference to the ‘old’ register countries is that in the transition, these ‘new’ register countries mostly have not adopted the selected respondent design, i.e., they have not changed the basic designs, including the mode of collection, or the practice of interviewing all adults. The challenges related to various technical and quality aspects (units not linked, coverage problems, quality of

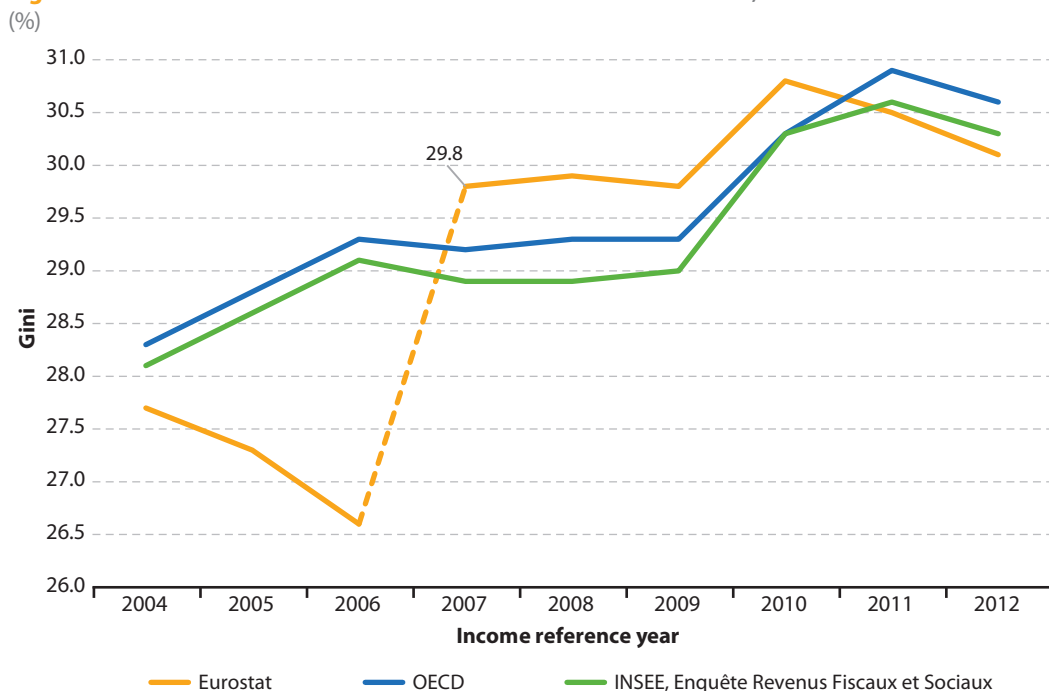
e.g. self-employment income) exist but seem to be manageable using mixed or combined approaches. Within-country comparability across time is generally an issue; the transition to registers tends to lead to breaks in (at least some) time series.

National statistical agencies typically conduct evaluations of register-based and interview-based income data before more extensive use in statistical production. Taken together, the results of such evaluations suggest that differences between survey- and register-based estimates in inequality and poverty can be of a substantial order of magnitude (see for instance Statistics Austria, 2014; Méndez Martín, 2015; Nordberg et al., 2004).

In *France*, administrative data have been used to complement survey data since 1956 (see chapter by Burricand in Jäntti et al., 2013). In EU-SILC, the transition to register-based income data took place in 2008, and unfortunately overlapping measurement of both interview and register data was not feasible. A test conducted in 2005 before the transition suggests that interview- and register-based estimates of mean and median wages as well as wage dispersion are quite close. At-risk-of-poverty rates using the two sources suggest a high agreement in estimates, with about 13 % income-poor for both sources and a very high degree of overlap. The differences are small, for the most part, but can be large at the ends of the distribution. As EU-SILC is used especially to examine the income and living conditions of the disadvantaged populations, what happens in the lower tail of the distribution is particularly important.

The transition had only a small impact on the main cross-sectional indicators on income poverty but led to an increase in the income inequality indicators. This is due to both improved coverage and increased accuracy of income. For instance, between 2007 and 2008, the source of real estate income changed from surveys to registers and the aggregate amounts collected doubled. There is some evidence that an increase in overall income inequality in France between those years was driven by the change in sources. Despite the break in time-series, the transition from survey to register data in France was an important step toward increased quality (Burricand, op. cit.).

<sup>(234)</sup> This is one the main reasons for the differences in these countries between OECD and Eurostat inequality estimates, and it is obviously not a good thing for the quality of EU-SILC.

**Figure 28.1: Gini coefficient in France in three different data sources, 2004-2012**

*NB:* In the case of Eurostat and INSEE, the equivalence scale used is the so-called OECD-modified scale which takes account of both the household size and the age of household members (see Chapter 3 in this volume). In the case of the OECD, the equivalence scale is the square root of the household size (independent of the age of household members).

*Reading note:* After the transition to register data in EU-SILC in France, the level and change in income inequality are fairly consistent with the national source (Enquête Revenus Fiscaux et Sociaux).

*Source:* Eurostat, OECD, INSEE.

In France, there is a break in data series in 2008 following the transition to register data. For instance, the Gini coefficient increased by 3.2 percentage points, which seems almost like a level shift and 2008 is therefore rightly flagged as a break in time series in the Eurostat web-database.

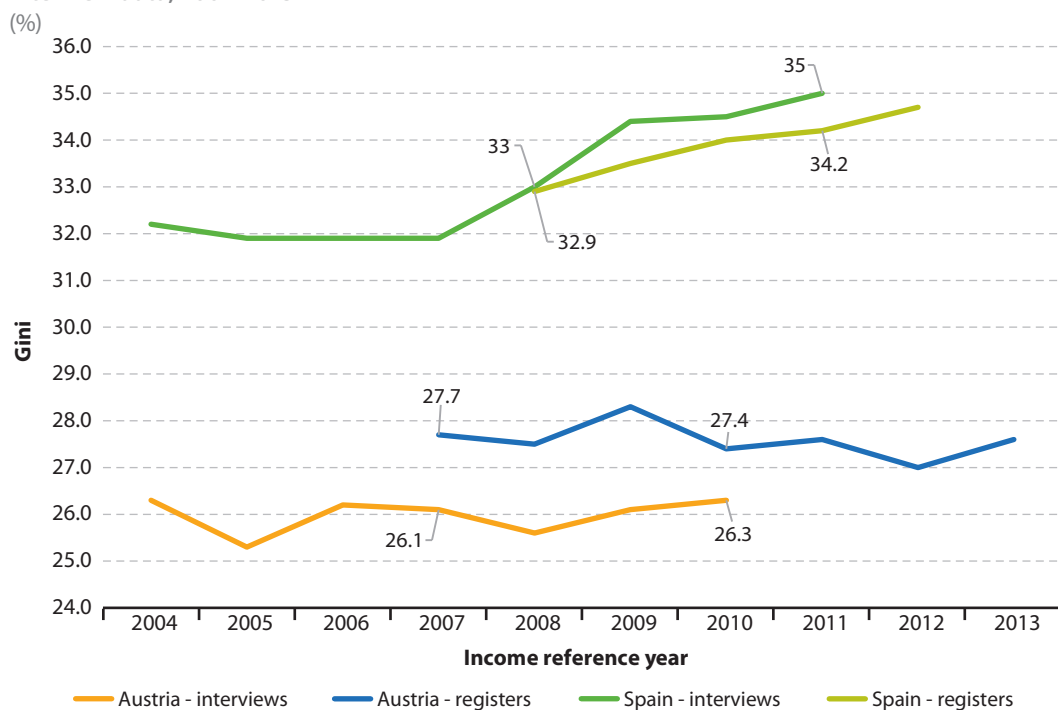
The change to register data improves coherence of different data sources, as illustrated in Figure 28.1 in the case of France. The national source for income inequality is based on register-data, and this source has been used also by the OECD in its income distribution database. After the transition to register data in EU-SILC, its level and change in income inequality is fairly consistent with the national source.

In *Austria*, the transition to using register data was fully implemented in EU-SILC 2012. The use of register data has reduced response burden, non-response and survey error, and data editing. An evaluation

pilot was conducted in 2010 (see chapter by Heuberger et al. in Jäntti et al., 2013). The change in data source affected significantly the income-based indicator included in the Europe 2020 social inclusion target, and consequently Statistics Austria decided to revise the EU-SILC data sets 2008-2011, i.e. back to the baseline year for these indicators (Statistics Austria, 2014). The switch to register data on wages, salaries and transfers increased income inequality compared to using only interview-based data, as shown in Figure 28.2. The at-risk-of-poverty rate increased markedly as well, while average income remained almost unchanged.

In *Spain*, the use of administrative data for the construction of income variables was implemented in EU-SILC 2013 (Méndez Martín, 2015). Spain uses a 'mixed' model, wherein income data are taken from both registers and questionnaires, depending

**Figure 28.2: Gini coefficients in Austria and Spain based interview data and combined register/interview data, 2004-2013**



*Reading note:* In Austria, the Gini coefficient based on interviews was 26.1 % in 2007, whereas it was 27.7 % based on register data.

*Source:* Statistics Austria 2014, Méndez Martin 2015, Eurostat.

on data quality. The Spanish experience of transition also confirms that legal barriers need to be overcome first, that timeliness can be an important constraint, and that breaks in time series may emerge (see chapter by Méndez Martin in Jäntti et al., 2013).

Regarding potential breaks in time series, an evaluation based on 2007 data suggested that the use of administrative records had an impact on indicators that rely on income level estimates, as it significantly increases their level (Méndez Martin, *ibid*). Following this, overlapping measurement was conducted in EU-SILC 2009 to 2012. The comparisons show that change to register data decreased income inequality and poverty risk somewhat, while average income level increased by around 15 % (Méndez Martin, 2015). Figure 28.2 illustrates the impact on the Gini coefficient in Spain, which

is more modest and in the opposite direction compared to Austria. As in Austria, the Spanish EU-SILC data sets will be revised back to the baseline year 2008 for income-based Europe 2020 social inclusion indicator (2009-2012 data already revised at the time of writing this chapter).

In the Spanish EU-SILC the publication of provisional results was implemented in the 2010 survey. In October of the survey year (4 months after data collection) some basic monetary and non-monetary indicators were already published. However, administrative data are available around November of the survey year. This makes publication of provisional indicators difficult, although the publication of the final results is less affected.

The Spanish case is an example of a way to overcome shortcomings in registers by measuring a variable either from interviews or from registers. If

there is *a priori* knowledge about the coverage error of units in the registers, the questionnaire may be designed to collect data only from such units. This reduces respondent burden which may bring significant benefits. Méndez Martín (in his chapter included in Jäntti et al., 2013) outlines the strategy in Spain wherein, e.g., capital incomes questions are filtered so they are asked only of Basque Country households, because it is known, *a priori*, that these are not covered in the registers.

In *Italy*, EU-SILC data quality has been improved through multiple-source data collection strategy since 2004 (see chapter by Consolini and Donatiello in Jäntti et al., 2013). One option to improve data quality is to measure the variable both from interviews and from registers for all units, i.e. to use a mixed method. For example, the Italian Statistical Office (ISTAT) has matched self-employment incomes, pensions and employment income to the EU-SILC sample. The inclusion of administrative data produces a substantial increase in the estimate of average income and the number of self-employed earners, while the increase for employees is less pronounced. Using a mixture of survey and register information, as opposed to only survey information, produces data with a mostly close correspondence to each other. Both the poverty rate and the Gini coefficient are lower in the former case, by a not unsubstantial margin. Poverty is 19.6 % and the Gini coefficient 31.3 % when also register information is included. When not, poverty is 21.4 % and the Gini is 33.0 %. The misclassification rates are also not small, implying substantial re-ranking in the income distribution.

## 28.5 Conclusions

Access to registers influences the design and production of household sample surveys in several ways. The main benefits stem from replacing survey questions with register data. This leads to shorter questionnaires and lower data collection costs, reduced response burden, and often more accurate measurement of quantitative variables, in particular income data. With less item non-response, there is less need for imputation. Moreover, the net-to-gross conversion of income data can be avoided in

EU-SILC. Sampling designs, non-response analysis, and weight adjustments using auxiliary data can be improved on. There is much more scope for data validation and quality control. There are also potential indirect benefits — for instance, the lower response burden may lead to higher response rates.

There may also be challenges and negative influences. These include validity errors, reduced control and flexibility over data content, problems in obtaining respondent consent, a possible increase in proxy answers, constraints of telephone interviews, fragmentation of questionnaires, and possible mixed and multiple mode effects. Further errors and/or need for data editing may result from changes to the survey questionnaire, record linkage, and especially record linkage failure. More production time also needs to be devoted to consolidating different data sources and resolving conflicts (micro-integration). The register-based datasets tend to carry a higher disclosure risk, which needs to be monitored. Timeliness may be one of the most important challenges, since registers imply some delays related to late availability and processing of administrative data.

Many countries now have access at least to a sub-set of income data from registers. In the short run, the greatest potential gains may stem from replacing survey questions on social benefits and employment income with valid register data in as many EU-SILC countries as possible. However, it is likely that many countries need in the foreseeable future to rely mostly on survey-based income data. The main obstacles to increasingly relying on register data are mostly related to national legal barriers, governance and register infrastructures, and timeliness, rather than the more technical issues, such as record linkage. Timely estimates of inequality and poverty are in high demand, and there is a trade-off between timeliness and the use of administrative data in EU-SILC.

For those who analyse cross-national data, the pertinent question is to what extent the flexible use of data sources reduces the intra-country total survey errors but introduces additional bias in cross-country comparisons. Could it be, for instance, that the low relative poverty rates in the Nordic countries are related to better measurement of social benefits from registers and not only to their welfare-state

regime? Or to what extent do the different longitudinal following rules in the register-based EU-SILC implementations affect the transition and mobility estimates derived from the data?

The research findings suggest that the differential use of registers may affect comparability across countries, while country-case studies tend to show that the transition to register income data may affect within-country comparability across time. The results of studies based on unit-level comparisons indicate that the biases using survey income tend to be larger, and that the biases are correlated with income.

The data integration process should, in particular, pay attention to the internal consistency of the data, because EU-SILC is used both as a descriptive and an analytical data source, with a focus on joint distributions and interdependencies across its many dimensions. Given this, it seems that even more monitoring and documentation of data quality and comparability is needed. The EU-SILC flag variables, which provide metadata for each data variable, do not currently carry information on whether the data source is a register. It would be most useful to have this fundamental information included in the EU-SILC flags. This is also important for the survey-based variables, since the proxy rates may vary by variable in the 'selected respondent' countries.

It would also be very useful to systematically document exactly which administrative income variables are included in each of the EU-SILC income variables, in particular in the case of social benefits. The link is necessary at national level in order to derive EU-SILC income data from administrative data, and it would be good if this mapping could be made available.

In a broader quality context, there are some important trade-offs to consider with administrative data as well. Following the economic crisis of the past years, timely indicators on inequality and poverty for policy monitoring are more important than ever before. In many countries, registers are in conflict with timeliness due to late availability of administrative data. The first trade-off may then be between timeliness and accuracy, and timeliness may have to be prioritised at the cost of accuracy. Second, with even more variation in the EU-SILC

implementations, there is a trade-off between comparability and flexibility of implementation. The differences in survey versus register data do have implications for cross-country comparability; the selected respondent design prevents some analyses that require intra-household data, and likely variation in mode and context effects remains a concern in output-harmonised surveys. For practical reasons, however, a de-centralised *ex ante* harmonised survey such as EU-SILC may have to accept a somewhat lower degree of comparability.

In terms of the substantial content of EU-SILC, extending register-based measurement of social benefits to as many countries as possible could be one important and practical objective. This would reduce substantially the length of 'survey country' questionnaires and would improve the quality and comparability of important EU-SILC variables and the associated indicators. Moreover, the discrepancies in data sources and validity issues may be of much less concern for these income sources than, say, with self-employment income.

In the early 2000s, the EU-SILC legislation was written considering variation in data collection practices in Member States. The revision of the EU-SILC legislation is expected in the near future. The revised framework and the detailed guidelines should obviously not *prevent* the utilisation of registers. This warrants careful consideration of the target populations, data collection units, contents, modalities, reference times and so forth in such a way that they can be implemented in any multi-mode design at a decentralised level.

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# 29

## Planned future developments of EU-SILC

Emilio Di Meglio and Didier Dupré <sup>(235)</sup>

### 29.1 Introduction

The current crisis has generated a number of challenges for official statistics and, in particular, for social statistics. Policy makers have turned to statistics to have the necessary toolbox to timely and reliably describe the current situation and patterns in order to take informed, timely and effective policy measures. In this context, there is increasing demand from stakeholders for new developments in EU-SILC, as main data source for comparative analyses and indicators on income and living conditions in the EU, so as to ensure the correct monitoring of the evolution of poverty and social exclusion phenomena.

In the meantime, resources available to statistical authorities are under pressure in several Member States and only coordinated efforts for achieving modern and cost effective solutions are viable ways forward. Modernisation of social statistics is indeed a key solution identified to meet the growing needs of users (see Section 29.3 below). The revision of EU-SILC is part of this process carried out by the European Statistical System.

EU-SILC is however a complex survey involving different challenging methodological problems. The contribution from researchers is therefore a vital element for making EU-SILC a scientifically sound, effective and high quality instrument. Hence, results of the methodological work on EU-SILC undertaken in the framework of the 'Second Network for the Anal-

ysis of EU-SILC' (Net-SILC2) are being implemented in the production process of EU-SILC data.

This chapter complements Chapter 2 in this book on the current EU-SILC survey by describing the planned developments of EU-SILC in the framework of the modernisation of social statistics. In addition, it illustrates how recent Net-SILC2 research has contributed to the improvement of the EU-SILC process.

### 29.2 Policy context

Since the launch of the Europe 2020 strategy, the importance of EU-SILC has grown further: one of the five Europe 2020 headline targets is entirely based on EU-SILC data (the EU social inclusion target, which consists of lifting at least 20 million people in the EU out of the risk of poverty and exclusion by 2020; see Chapters 1 and 3 in this book). It has been planned to improve the measurement of the target in the context of the mid-term review of the Europe 2020 strategy, by revising the basket of material deprivation (MD) variables in EU-SILC. This basket is the basis for the calculation of the severe MD indicator, one of the three components of the indicator on poverty and social exclusion used for the EU social inclusion target (see Chapter 10 in this book).

The social consequences of the economic and financial crisis have given increased importance to income and living conditions data. In particular, the lack of timely data on the extent of poverty and social exclusion has become a burning issue, especially for countries where the crisis has hit hardest.

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In the conclusions of the December 2010 Employment, Social Policy, Health and Consumer Affairs Council (EPSCO), EU countries' ministers for social affairs recognised the importance of this issue and invited 'the Commission to support, in collaboration with the Member States, the timely availability of valid indicators to monitor the social dimension of the Europe 2020 strategy'.

The 'Social Investment Package' <sup>(236)</sup>, adopted in February 2013, urging countries to put more emphasis on social investment to achieve the EU social inclusion target, also increased the demand for timely and reliable data on the social situation in Europe.

Moreover, the 'Beyond GDP' debate has drawn attention to the need to complement GDP measures with indicators that encompass environmental and social aspects of progress <sup>(237)</sup>. In the social area, more data are needed on distributional aspects and household perspective.

Finally, the European Commission recently underlined the need to consider social indicators at a par with macroeconomic indicators. There is also a need to integrate information on income, consumption and wealth, and to link them with national accounts in order to support integrated analysis at the macroeconomic level. Therefore, the policy relevance of EU-SILC is likely to continue to grow in the future, increasing the need for further improvements in the quality and timeliness of EU-SILC data.

## 29.3 Modernisation of social statistics

The legal context of EU-SILC is expected to change in the near future. In September 2011, the European Statistical System Committee adopted the Wiesbaden Memorandum on a 'New conceptual

<sup>(236)</sup> Communication from the Commission 'Towards Social Investment for Growth and Cohesion — including implementing the European Social Fund 2014-2020', available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0083:FIN:EN:PDF>.

<sup>(237)</sup> Communication from the Commission 'GDP and beyond — Measuring progress in a changing world', COM(2009) 433 of 20.8.2009, available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0433:FIN:EN:PDF>.

design for household and social statistics' <sup>(238)</sup>. This memorandum calls for progress towards an overall common architecture for European social statistics together with actions on sampling frames, administrative data sources, measurement of the quality of life and the living conditions of population subgroups, time use and household budgets. In line with these orientations, Eurostat has been working on the modernisation of social statistics. The main objectives are to increase responsiveness to users' needs, quality and efficiency.

The programme includes actions towards better integration of data collections, with standardisation of variables and modules, wider use of administrative data sources and improved statistical frames. It covers social microdata collections (collections based on samples), population statistics (including census) and administratively-based statistics and accounts. The ongoing revision of EU-SILC is part of this programme.

As far as the collection of microdata is concerned, it is planned that a Framework European Parliament and Council Regulation on 'Integrated European Social Statistics' will cover all surveys stipulating their common elements. Then, delegated and implementing acts will set up more specific elements for one or more data collections.

## 29.4 Planned developments for EU-SILC

### 29.4.1 Objectives of EU-SILC revision

In view of the aforementioned growing data needs, the EU-SILC instrument needs to be improved in a number of areas:

- Data timeliness, in particular in the context of the crisis (when it is necessary to closely monitor the social situation and the impact of policies) and of the 'European Semester'.

<sup>(238)</sup> Available at: [https://www.destatis.de/EN/AboutUs/Events/DGINS/Document\\_Memorandum.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/EN/AboutUs/Events/DGINS/Document_Memorandum.pdf?__blob=publicationFile).



- Early estimates of relevant social indicators, as is already the case for national accounts and price statistics.
- Regional data in the context of the monitoring of EU regional policy and after 2020 for the allocation of funds, on the basis of indicators derived from EU-SILC, as well as the regional dimension of the Europe 2020 strategy.
- Poverty and social exclusion dynamics (including transitions, persistence, etc.).
- Multidimensional aspects of living conditions, poverty and social exclusion. There are several requests that cannot any longer be accommodated in the current flexibility mechanism of the ad hoc modules. For example, the need for more information on children, on access to services, on vulnerability, on consumption and wealth, on the structure of the households, on quality of life and well-being issues, and on health. The need for more breakdowns of social benefits and transfers, social transfers in kind, etc. More generally, data needs will continue to evolve, and increased flexibility is required.
- Development of social indicators in the context of the EU macroeconomic assessment (for instance, in the Macroeconomic Imbalance Procedure where so far the 'at-risk-of-poverty-or-social-exclusion' (AROPE) indicator used for the EU social inclusion target, and its components, are only included as auxiliary indicators) and more generally a better integration of social and macroeconomics data.
- Increased use of administrative data for EU-SILC income components and the often associated problems of delays. New data collection modes and sources will also be considered (web interviews, matching).
- maintain the stability of the main indicators, with adapted frequency;
- keep a cross-cutting approach, allowing to jointly analyse different social phenomena;
- allow analysis at regional level with sufficient precision;
- ensure adequate accuracy and quality of measurements;
- adapt to multi-modes and multi-sources data collections;
- allow better integration of EU-SILC data, with data coming from other European Statistical System surveys;
- ensure consistency among the different elements of the instrument (e.g. frequency of non-annual modules and length of the longitudinal component).

All of this, while not increasing costs and respondents' burden.

## 29.4.2 Approach to EU-SILC revision

This section presents the main directions retained for the revision of EU-SILC, which is based on a balanced package of measures.

The content of EU-SILC will be further *modularised* and the periodicity of collection of the thematic modules will be adapted with a view to better meeting increased analytical and monitoring needs. Currently, EU-SILC collects every year about 135 'non-technical' variables from households and/or registers plus about 20-25 in ad hoc thematic modules. In the revised EU-SILC, the objective is to reduce to around 115 the number of variables collected each year. These core variables (the EU-SILC 'nucleus') would cover income, key labour information and MD — as part of the Europe 2020 framework — as well as key variables on health, childcare, education, housing costs and quality of life. The space left empty by the removal of the 40-45 other variables will be used for fixed rotating modules with a periodicity of either 3 years (for the variables dealing with labour, health, children and housing) or 6 years (for the other variables:

As a consequence, the objective of the planned EU-SILC revision is to re-design EU-SILC so as to:

- increase EU-SILC responsiveness to new policy needs, currently and for the future;
- deliver data faster and provide information useful for the production of early estimates;

social participation, quality of life, access to services, wealth, debt, consumption, intergenerational transmission of disadvantages and possibly past experience of homelessness). Each module will contain about 20-25 variables. Some of the 6-year modules will be dedicated to new policy needs and will be changing. In the first wave, respondents will also be asked about 'stable variables' (e.g. country of birth and education of parents, in the context of migration and intergenerational transmission). (see Table 29.1.)

*Timeliness* has become a crucial issue. To improve timeliness, it is planned: a) to issue all EU-SILC data much more quickly than is currently the case (in June of year  $N+1$  instead of December of year  $N+1$  (with  $N$  being the survey year), i.e. 6 months earlier); b) to make available MD items (and all other available non-income data, if possible) at the end of the survey year  $N$  or at the very beginning of year  $N+1$ ; c) to introduce elements in the data collection that would be useful to estimate the evolutions of income distribution; and d) to maximise the possibilities of micro-simulation (see Section 29.4.3) for early estimates. In relation to the latter and also to respond to increased policy needs, the ultimate target is to issue all EU-SILC data (including income

information) by the end of year  $N$  or very beginning of year  $N+1$ .

Users are more and more interested in analysing *trajectories* into and out of poverty and social exclusion. Consequently, it is planned to extend the rotational panel from 4 to 6 years, so as to have better estimates of longer phenomena (the persistent risk of poverty indicator will then be based on a sample size double than what is currently feasible) and more appropriate data to study transitions and recurrences of poverty and social exclusion. However, some further analysis and tests are still needed before this extension can possibly be implemented. The proposed rotational scheme is shown in Figure 29.1.

The *regional dimension* of EU-SILC is becoming increasingly important. To allow for more regional breakdowns, on a country-based approach, a combination of several solutions will be used by Member States, including re-design of the sample, modelling and calibration, and in some cases, increased sample size.

The possibilities of *linking and matching data* with other data collections or estimates will be improved. For instance: harmonisation of variables including a household grid, additional information

**Table 29.1: Structure of the contents of the revised EU-SILC**

Nucleus (variables asked every year) (Europe 2020, main indicators)	YEAR	Every 3-year modules Max. 20 var. each	Every 6-year modules Max. 20 var. each
Income (Revised) material deprivation	1	Children	Quality of life, social and cultural participation
Economic activity	2	Health	New policy needs 1
Demography Education Childcare	3	Labour and housing conditions	Over-indebtedness, wealth, consumption
Housing costs Health	4	Children	New policy needs 2
Quality of life	5	Health	Access to services, social transfers in kind
Variables only collected in the first wave Miscellaneous	6	Labour and housing conditions	Intergenerational and homelessness? New policy needs 3

**Figure 29.1: 6-year rotational model**

	Time					
	1	2	3	4	5	6
Panel 1	Wave 6					
Panel 2	Wave 5	Wave 6				
Panel 3	Wave 4	Wave 5	Wave 6			
Panel 4	Wave 3	Wave 4	Wave 5	Wave 6		
Panel 5	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	
Panel 6	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
Panel 7		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Panel 8			Wave 1	Wave 2	Wave 3	Wave 4
Panel 9				Wave 1	Wave 2	Wave 3
Panel 10					Wave 1	Wave 2
Panel 11						Wave 1

for a better estimation of social transfers in kind, short modules on wealth and (if feasible) on consumption. The collection of a limited number of variables on consumption and wealth highly correlated with total consumption and wealth would allow for a better understanding of the links between income, consumption and wealth. Further needs for integration and reconciliation of social and macroeconomics data and indicators will also be taken into account.

*Accuracy requirements* will be expressed in a way that facilitates compliance assessment based on the standard error to be achieved. The aim is to achieve a precision of +/- 1 percentage point (pp) for the largest Member States and +/-1.5 pp. for the smallest ones for the main indicators (in particular for the AROPE indicator) at national level, and between +/- 2.5 and +/- 4 pp. at regional level (for a 95 % confidence interval). An accuracy requirement will also be placed on the longitudinal component.

An integrated approach to the use of *registers and multi-mode data collection* will be promoted, for instance by allowing whenever possible, interview time compatible with Computer Assisted Telephone Interview (CATI), when income is available in registers, and/or Computer Assisted Web Interview

(CAWI). This integrated approach should take into account the possible comparability issues related to registers and multi-mode data collection as well as timeliness issues related to the use of registers (see also Chapter 28 in this book).

*Other elements* such as the Quality reports (see Chapter 2 in this book), the tracing rules (Chapter 27), the metadata on sources of data, etc. will also be improved. Best practices will be promoted.

Finally, EU-SILC data and *macroeconomic data* will be better integrated. The exact elements needed from EU-SILC for this purpose still need to be identified.

### 29.4.3 Use of results from research

The research community uses EU-SILC extensively. The Users' Database (UDB) is available to researchers and allows focused analyses and developments that are useful to the continuous improvement of the EU-SILC instrument. In particular, a lot of EU-SILC methodological work was undertaken in the framework of Net-SILC2. Some of the findings of this research are already applied, in the process of being applied, or under consideration for future developments in the EU-SILC production process. Three examples are shortly described below. More

details are given in the chapters of this volume that are specifically dedicated to these issues: a) standard error estimation of EU-SILC based indicators (see Chapter 26); b) improved measurement of MD (see Chapters 10 and 11); and c) micro-simulation and early estimates (see Chapter 19).

#### *a) Standard error estimation of EU-SILC based indicators*

Given the high policy relevance of EU-SILC, there is increasing demand from stakeholders for accuracy measures of the published indicators. As EU-SILC is a complex instrument involving different sampling designs in different countries, standard methods for calculating accuracy measures cannot be directly applied. Eurostat, building on the research performed by Net-SILC2 has put in place a relatively simple method for standard error estimation based on linearisation and the ultimate cluster approach, as presented in Chapter 26 of this volume. In the context of the revision of EU-SILC, and more generally the EU Framework Regulation on 'Integrated European Social Statistics' for all social microdata survey collections, accuracy requirements will be based on the standard error (see above for the accuracy requirements to be achieved). It is planned to use the calculation method explained in Chapter 26 to assess Member States' compliance to these accuracy requirements.

#### *b) Improved measurement of material deprivation*

AROPE is used in the context of the Europe 2020 strategy for monitoring progress towards the achievement of the EU social inclusion target (see Chapters 1 and 3 of this volume). One of the three sub-indicators used in the AROPE indicator is the share of the population living in a household that is severely materially deprived.

Net-SILC2 carried out in-depth analyses of 50 MD items available in the 2009 Wave of EU-SILC (this wave included a detailed ad hoc module dedicated to this subject). The Net-SILC2 study analysed the dimensional structure of the whole set of 50 items as well as their suitability, validity, reliability and additivity. The aggregation of MD items was also analysed in depth and robust indicators for the whole population and for children were pro-

posed (see Chapters 10 and 11 of this volume <sup>(239)</sup>). On this basis, Member States and Eurostat agreed on a list of seven new MD variables for the whole population (to be used together with six of the nine EU-SILC MD variables included in the current indicator of severe MD) and 13 MD variables for children (to be used with five household items) for child-specific measures of MD. In order to test further their robustness and their behaviour over time, the proposed new variables were collected again in the 2013 Wave of EU-SILC on a voluntary basis (the variables for the whole population were collected in all but 3 Member States and the child-specific variables were collected in only a few countries) and in the 2014 Wave on a regulatory basis (variables for the whole population and for children). In 2015, variables for the whole population only were again collected. Based on the analysis of these variables and suggestions for alternative indicators for the whole population and for children, the EU Social Protection Committee and its Indicators Sub-Group will consider the adoption of improved indicators for MD. As from 2016, EU-SILC will collect the new items for the whole population routinely every year ('nucleus' variables). Children items will be collected in one of the every-3-year modules of the revised EU-SILC (see Table 29.1).

#### *c) Micro-simulation and early estimates*

As explained above, in order to improve the timeliness of EU social indicators, model-based estimations provide a solution to answer the policy demand for 'nearly real time' information on poverty and social exclusion and on the evolution of income distribution. For example, estimating by means of now-casting or forecasting methods some key indicators such as the Europe 2020 headline indicators or other indicators makes it possible to have social indicators available at a similar time as economic indicators for recent reference periods. This is particularly true for income-based indicators as at the time of the collection of the EU-SILC data in year  $N$ , the latest full year over which income data are available is year  $N-1$ . Except in two countries, a full year is indeed needed for

<sup>(239)</sup> See also: Guio, A.-C., Gordon, D. and Marlier, E. (2012), *Measuring material deprivation in the EU: Indicators for the whole population and child-specific indicators*, Eurostat methodologies and working papers, Publications Office of the European Union, Luxembourg.

a full coverage of household income due to, e.g., non-regular earnings or benefits as well as self-employed income<sup>(240)</sup>. Hence, when EU-SILC data become available in year  $N+1$ , only income of year  $N-1$  is available, while for non-income related conditions data concerning year  $N$  are available. However, early estimates need to be developed together with the measures aimed at improving significantly the EU-SILC data timeliness; it is indeed essential to reduce the time lag between the release of estimates and that of the final figures, as the former cannot replace the latter for a full and final analysis.

One promising avenue in this field is micro-simulation, a methodological approach that is becoming increasingly used at national and EU levels to build policy scenarios. Micro-simulation can draw together information from microdata, policy changes and external information (e.g. on labour market evolutions) in order to forecast at micro-level (each individual or household) the evolution of certain indicators. In the case of EU-SILC, micro-simulation models allow to take into account changes in tax and benefit policy, employment changes and demographic changes and to project them to a period of time posterior to the survey reference year, filling in this way the temporal gap between the income reference period and the release of the data.

In the framework of Net-SILC2, the possibility of using EUROMOD to evaluate the effects of policy and other changes on the prospects for meeting the EU social inclusion target was explored (see Chapter 19 of this volume). In particular, the use of EUROMOD for now-casting EU-SILC based indicators was tested. EUROMOD is based on EU-SILC data and the EU-SILC instrument is being adapted to better respond to the information needed for the EUROMOD model; other information collected in EU social surveys could possibly also be improved for this purpose. The EUROMOD tests and the EU-SILC improvements will be highly valuable in the context of the analysis of the feasibility to use micro-simulation for computing and releasing early estimates of EU-SILC based indicators to satisfy the increasing policy demands.

## 29.4.4 Implementation

The main re-design of EU-SILC (in particular its content) requires a new EU legal act. Therefore, for the content and the panel length of EU-SILC, changes might be introduced in the context of the EU Framework Regulation on 'Integrated European Social Statistics' which might be adopted by the European Parliament and the EU Council of Ministers around 2018.

However, progress on timeliness and regionalisation will be gradual, with national action plans over the next years starting in the context of the current EU-SILC. In the first months of 2015, for the reference year 2014, early MD data were received for 17 Member States and one EFTA country. These data were published in a Eurostat Statistics Explained article on 'Material deprivation statistics — early results' in April 2015 (however, one should keep in mind that, in some cases, there may be discrepancies between provisional and final data). This followed a first exercise carried out in 2014 with data from the 2013 Wave.

Several countries are progressively implementing the June  $N+1$  deadline over the period 2014 to 2016 for EU-SILC data transmission. Ten countries were already able to transmit the 2014 cross-sectional data before the end of June 2015 (against seven Member States in 2014 for the 2013 data). As indicated above, this is only an interim target; the final target is that countries should deliver their data even earlier.

The EU-SILC Quality reports have been improved and are now sent via an IT application (metadata handler), which should contribute to further standardising quality reporting. Reflections are also ongoing on how to better describe the relations between income, consumption and wealth and on how to better reconcile EU-SILC microdata with macroeconomic aggregates from national accounts.

<sup>(240)</sup> The two exceptions are the United Kingdom and Ireland (see Chapter 2 of present volume).

## 29.5 Conclusions

Expectations on high quality and timely data to monitor and analyse the social situation across Europe have increased among policy-makers and other users, *inter alia* as a consequence of the economic crisis. EU-SILC is the main data source for comparative analysis and indicators on income and living conditions in the EU and is therefore particularly solicited for answering these growing demands.

An important objective of the revision of EU-SILC, which takes place in the broader context of the modernisation of social statistics, is to respond to these needs. Another important objective is to improve EU-SILC, while securing modern and viable foundations in the governance of the instrument in the European Statistical System. The full implementation of the revised EU-SILC will be achieved

by the end of the decade as it requires long and difficult processes both at legal and technical level. However, both Eurostat and the national statistical institutes in the EU Member States and neighbouring countries have already started implementing a number of changes in the current EU-SILC; in particular, in the fields of timeliness and regionalisation. Further integration with other sources of data relevant for the analysis of the social situation will also be explored, especially in the domains of national and sectorial accounts.

In view of the complexity of EU-SILC, it is essential to ensure that researchers actively participate in its revision and, more generally, in its improvement. In this chapter, and in a number of other chapters in this volume, a number of examples of concrete contributions from Net-SILC2 have shown the unique added value of such collaboration between the European Statistical System and the research community.

# Appendices







# Appendix

# 1

## List of Net-SILC2 members

The *second Network for the Analysis of EU-SILC* (Net-SILC2) brought together expertise from European Statistical System (ESS) bodies as well as from universities and research centres. It was coordinated by the Luxembourg Institute of Socio-Economic Research (LISER) and consisted of the following partners:

a) LISER: Francesco Andreoli, Michela Bia, Alessio Fusco, Anne-Catherine Guio, Eric Marlier (Net-SILC2 Project Director), Anne Reinstadler and Philippe Van Kerm

*Associated contributors: Luna Bellani (University of Konstanz, Germany) and Jean-Claude Ray (University of Nancy, France)*

b) Six National Statistical Institutes:

- Statistics Austria: Thomas Glaser, Elisabeth Kafka, Nadja Lamei, Lars Lyberg and Matthias Till
- Statistics Finland: Veli-Matti Törmälehto and Hannele Sauli
- Statistics France (INSEE): Sophie Ponthieux
- Statistics Luxembourg (STATEC): Guillaume Osier
- Statistics Norway: Rolf Aaberge, Audun Langørgen, Petter Lindgren and Henrik Sigstad
- Statistics UK (ONS): Paola Serafino and Richard Tonkin

c) Non-ESS (academic/ research) experts <sup>(241)</sup>:

- Freie Universität Berlin (Germany): Ulrich Rendtel
- Institute for Social and Economic Research of the University of Essex (UK): Maria Iacovou, Chrysa Leventi, Peter Lynn, Jekaterina Navicke, Olga Rastrigina and Holly Sutherland
- London School of Economics and Political Science (UK): Stephen Jenkins
- Luxembourg Income Study, Luxembourg: Guillaume Osier
- Nuffield College (UK): Anthony B. Atkinson (also London School of Economics and Political Science)
- Oxford Poverty and Human Poverty Initiative, Oxford University (UK): Sabina Alkire and Mauricio Apablaza
- University of Antwerp (Belgium): Vincent Corluy, Tim Goedemé and Frank Vandembroucke (also University of Amsterdam, The Netherlands)
- University of Bristol (UK): Eldin Fahmy, Viliami Fifita, David Gordon, Shailen Nandy and Marco Pomati

<sup>(241)</sup> Affiliations mentioned here are those at the moment when the Net-SILC2 grant was received. In the meantime, some Net-SILC2 members have moved to another research body. For the affiliation at the moment of the publication of this book, please see first footnote at the beginning of each chapter.



## List of Net-SILC2 members

- University of Southampton (UK): Yves Berger
  - Stockholm University (Sweden): Lars Lyberg
  - Swedish Institute for Social Research, Stockholm University (Sweden): Markus Jäntti
- d) Bank of Italy: Andrea Brandolini, Alfonso Rosolia and Eliana Viviano

# Appendix 2

## Country official abbreviations

EU-15 Member States ('old' Member States)		'New' Member States	
BE	Belgium	May 2004 Enlargement	
DK	Denmark	CZ	Czech Republic
DE	Germany	EE	Estonia
IE	Ireland	CY	Cyprus
EL	Greece	LV	Latvia
ES	Spain	LT	Lithuania
FR	France	HU	Hungary
IT	Italy	MT	Malta
LU	Luxembourg	PL	Poland
NL	Netherlands	SI	Slovenia
AT	Austria	SK	Slovakia
PT	Portugal	January 2007 Enlargement	
FI	Finland	BG	Bulgaria
SE	Sweden	RO	Romania
UK	United Kingdom	July 2013 Enlargement	
		HR	Croatia
<b>Other (non-EU) EU-SILC countries covered in some chapters</b>			
IS		Iceland	
NO		Norway	
CH		Switzerland	



# Appendix 3

## Other abbreviations and acronyms

<b>AF</b>	Alkire and Foster
<b>AROP</b>	At risk of poverty
<b>AROPE</b>	At risk of poverty or social exclusion
<b>CATI</b>	Computer Assisted Telephone Interviews
<b>CAWI</b>	Computer Assisted Web Interviews
<b>CH-MD</b>	Child-specific material deprivation
<b>CIRCABC</b>	Communication and Information Resource Centre for Administrations, Businesses and Citizens
<b>CLT</b>	Central Limit Theorem
<b>CTT</b>	Classical Test Theory
<b>EA</b>	Euro Area
<b>EC</b>	European Commission
<b>ECB</b>	European Central Bank
<b>ECEC</b>	Early childhood education and care
<b>ECHP</b>	European Community Household Panel
<b>ECOFIN</b>	EU Economic and Financial Affairs Council of Ministers
<b>EOp</b>	Equality of opportunity
<b>EPSCO</b>	EU Employment, Social Policy, Health and Consumer Affairs Council of Ministers
<b>ER</b>	Standard employment rate
<b>EU</b>	European Union
<b>Eurostat</b>	Statistical Office of the European Union
<b>EU-SILC</b>	EU Statistics on Income and Living Conditions
<b>FGT</b>	Foster Greer Thorbecke index
<b>FISIM</b>	Financial Intermediation Services Indirectly Measured
<b>GDP</b>	Gross domestic product
<b>GHDI</b>	Gross household disposable income
<b>GP</b>	General practitioner
<b>HBS</b>	Household Budget Survey
<b>HH or HHD</b>	Household
<b>HFC</b>	Household final consumption
<b>HFCN</b>	Household Finance and Consumption Network
<b>HFCS</b>	Household Finance and Consumption Survey
<b>HICP</b>	Harmonised Index of Consumer Prices
<b>HWER</b>	Household work-intensity-adjusted employment rate
<b>ICC</b>	Item Characteristic Curve

<b>ILO</b>	International Labour Office
<b>Iop</b>	Inequality of opportunity
<b>IR</b>	Imputed rent
<b>IRT</b>	Item Response Theory
<b>ISCED</b>	International Standard Classification of Education
<b>JAF</b>	Joint Assessment Framework
<b>JHR</b>	Jobless household rate
<b>LFS</b>	Labour Force Survey
<b>LISER</b>	Luxembourg Institute of Socio-Economic Research
<b>MD</b>	Material deprivation
<b>MEGE</b>	Monthly full-time equivalent gross earnings
<b>MPI</b>	Multidimensional Poverty Index
<b>n.a.</b>	Not available
<b>NA</b>	National accounts
<b>NA scale</b>	Needs-adjusted scale
<b>Net-SILC</b>	Network for the analysis of EU-SILC
<b>NPISH</b>	Non-Profit Institutions serving households
<b>NSI</b>	National statistical institute
<b>OECD</b>	The Organisation for Economic Cooperation and Development
<b>OLS</b>	Ordinary least square
<b>PAPI</b>	Paper and pencil interview
<b>pp</b>	Percentage point
<b>PPP</b>	Purchasing Power Parities
<b>PPS</b>	Purchasing Power Standard
<b>PSU</b>	Primary Sample Unit
<b>QJ</b>	(Quasi-)jobless
<b>QJ-ness</b>	(Quasi-)joblessness
<b>QTE</b>	Quantile Treatment Effects
<b>RCM</b>	Rubin's Causal Model
<b>S14</b>	Household sector (in the national accounts)
<b>S15</b>	Non-Profit Institutions Serving Households (in the national accounts)
<b>s.d.</b>	Standard deviation
<b>SDGs</b>	Sustainable Development Goals
<b>SMD</b>	Severe material deprivation
<b>SNA scale</b>	Simplified needs-adjusted scale
<b>SPC</b>	EU Social Protection Committee
<b>SR</b>	Selected respondent
<b>SSD</b>	Sum of the squared deviations
<b>STIK</b>	Social transfers in kind
<b>UDB</b>	Users' Database
<b>UN</b>	United Nations
<b>US</b>	United States
<b>WER</b>	Weighted employment rate
<b>WTID</b>	World Top Incomes Database

# Appendix

# 4

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# Monitoring social inclusion in Europe

EDITED BY ANTHONY B. ATKINSON,  
ANNE-CATHERINE GUIO AND ERIC MARLIER

The EU has not made any progress towards achieving its 'Europe 2020' social inclusion target, adopted in 2010, of lifting at least 20 million people from poverty and social exclusion by 2020. This book aims to contribute to our understanding of some of the substantive challenges facing 'Social Europe' and to the development of methods that can bring about new insights into issues related to income, deprivation and work.

The data on individuals and their households contained in the 'EU Statistics on Income and Living Conditions' (EU-SILC) are used to contrast the experience of European countries, drawing out lessons of potential value to all. The strengths and weaknesses of cross-sectional and longitudinal EU-SILC data are also examined, and recommendations for their further improvement are made — in relation to both data production and data analysis.

Therefore, this volume is intended not only for policy-makers and statisticians but also for all those concerned about the impact of economic, employment and social policies on people's lives and about the ways in which the social dimension of Europe — including the monitoring of the EU social inclusion target — could be strengthened.

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