Revising the EU material deprivation variables

ANNE-CATHERINE GUIO, DAVID GORDON,
HECTOR NAJERA, MARCO POMATI

2017 edition

STATISTICAL
WORKING PAPERS

eurostat

Revising the EU material deprivation variables

ANNE-CATHERINE GUIO, DAVID GORDON,
HECTOR NAJERA, MARCO POMATI

2017 edition

Manuscript completed in July 2017

Luxembourg: Publications Office of the European Union, 2017

PDF ISBN 978-92-79-70167-2 ISSN 2315-0807 doi:10.2785/33408 KS-TC-17-002-EN-N

Table of contents

1. Introduction([1])

In 2009, the then 27 EU countries and the European Commission adopted material deprivation (MD) indicators. These indicators are widely used by EU countries and the Commission to monitor progress in the fight against poverty and social exclusion at national and EU levels in the context of the EU cooperation in the social field. The main limitations of these MD indicators are the small number of items on which they rely and the weak reliability of some of these items.

A thematic ad hoc module on MD was included in the 2009 wave of the EU Statistics on Income and Living Conditions (EU-SILC). This module consisted of household items, adult items as well as items specifically focused on the deprivation of children. Guio, Gordon and Marlier (2012) and Guio et al (2016) proposed a theory based analytical framework for developing robust aggregate material deprivation (MD) indicators that could be used for analytical and monitoring purposes at national and EU levels (see Section 2). Two new MD indicators were developed, one for the whole EU population (i.e. people aged 0+) and one specifically focused on children, based on the application of this analytical framework to EU-SILC deprivation data (around 50 material deprivation items) collected in EU-SILC 2009 and derived from the UK Poverty and Social Exclusion Survey.

For the whole population, this systematic item by item analysis carried out at both EU and country levels identified an optimal MD indicator which consists of 13 deprivation items - six are already part of the current 9-item EU MD indicator and seven are new. Among the nine items included in the current EU MD indicators, three were identified as inadequate measures of deprivation in a number of countries (enforced lack of a washing machine, a TV and a telephone) and therefore were not retained. The other six items passed the tests across the whole EU. These were the inability of a household to:

- face unexpected expenses;
- afford a one week annual holiday away from home;
- avoid arrears (in mortgage or rent, utility bills or hire purchase instalments);
- afford a meal with meat, chicken or fish every second day;
- afford to keep the home adequately warm; and
- afford to have a car/van for personal use.

Seven items collected in the 2009 MD module also satisfactorily met the indicator quality criteria and contributed to a robust measure of MD across the EU.

These were the inability to:

1. replace worn-out clothes with some new ones;
2. have two pairs of properly fitting shoes;
3. spend a small amount of money each week on him/herself;
4. have regular leisure activities;
5. get together with friends/family for a drink/meal at least monthly;
6. have an internet connection; ([2])
7. replace worn-out furniture.

([1]) Anne-Catherine Guio is from the Luxembourg Institute of Socio-Economic Research (LISER, Luxembourg); David Gordon and Hector Najera are from the School for Policy Studies at the University of Bristol (United Kingdom) and Marco Pomati is from Cardiff University (United Kingdom). We would like to thank the Eurostat colleagues from the Unit "Income and Living Conditions, Quality of Life" for their support, as well as the National Statistical Institutes who agreed to give us access to specific EU-SILC datasets that allowed us to carry out the analyses presented in this report. We also want to thank E. Fahmy, D. Patsios and C. Pantazis (University of Bristol) and S. Nandy (University of Cardiff) who helped to develop the analytical methodology and undertook some analyses on the 2009 EU-SILC data. Our thanks go also to the colleagues from the European Social Policy Network (ESPN) and from Eurostat for their help in translating national questionnaires back to English, as well as to the members of the Eurostat Task-Forces on "material deprivation" and on the "revision of the EU-SILC legal basis" and the members of the Indicators Sub-Group of the EU Social Protection Committee (SPC) for very helpful comments on earlier versions of this document (the SPC is comprised of high-level officials from the relevant ministries in each Member State and reports to the EU Ministers in charge of social policy). These persons should not, however, be held responsible in any way for the present contents. Our thanks go also to Isabelle Bouvy for wonderful secretarial support. Finally, we wish to thank both the European Commission (Grant agreement 07142.2014.001-2014.245) and the UK Economic and Social Research Council (Grant RES-060-25-0052; "Poverty and Social Exclusion in the United Kingdom") for financial support.

([2]) In their initial analyses of the 2009 EU-SILC data Guio et al (2012) combined a lack of a computer at home with a lack of an internet connection into a single deprivation indicator. In this work we just focus on the lack of an internet connection as many people now access the internet using their smartphones, tablets, etc.

The first six items are collected at the adult level (for all persons aged more than 15 years). The last item is collected at the household level. These seven additional items needed for calculating the alternative indicator were collected in the 2013 wave of EU-SILC for a majority of countries on the basis of a gentleman's agreement and for all countries in the thematic ad hoc module on MD in 2014 (as along with some specific child deprivation measures). This allowed additional analysis. This report updates and extends the analyses by Guio et al (2012).

2. Conceptual and analytical frameworks

2.1 Conceptual framework

In 1975, the EU Council of Ministers agreed that the poor are *"the persons whose resources are so small as to exclude them from the minimum acceptable way of life in the Member State in which they live", with "resources" being defined as 'goods, cash income plus services from public and private sources'* (Council of the European Union, 1975). This definition includes both outcome elements ("the exclusion from the minimum acceptable way of life") and input elements ("...due to a lack of resources"). In 1985, the Council amended this definition and enlarged the concept of "resources" in order to take into account material, cultural and social aspects: *"the persons whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the Member State to which they belong"* (Council of the European Union, 1985).

In 1984, the Dublin European Council defined poverty in the European Union as:

"those persons, families and groups of persons whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the Member State to which they belong."

The EU definition of poverty is a multidimensional, dynamic and relative definition which was largely inspired by Peter Townsend's research during the 1960s 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, excluded from ordinary living patterns, customs or activities." (Townsend, 1979, p 31)

In Peter Townsend's scientific theory of relative deprivation, poverty can be defined as a lack of command of sufficient resources over time and "deprivation" is an outcome of poverty. For Townsend, deprivation is a relative phenomenon which encompasses both a lack of material goods and social activities:

"Deprivation takes many different forms in every known society. People can be said to be deprived if they lack the types of diet, clothing, housing, household facilities and fuel and environmental, educational, working and social conditions, activities and facilities which are customary, or at least widely encouraged and approved, in the societies to which they belong." (1987: p.126)

2.2 Analytical framework

The analytical framework used by Guio et al (2012) draws extensively on the 1999 Poverty and Social Exclusion (PSE) Survey deprivation indicator construction methodology (Gordon et al, 2000; Pantazis et al, 2006) and has been used to develop robust and comparable measures of deprivation for several British poverty surveys (Fahmy et al, 2011) and in many other countries. An important aspect of this methodology is that it facilitates the identification and selection of an optimal sub-set of deprivation items from the initial list of available items.

For identifying the final optimal list of MD items to be included in the indicator, four aspects are considered:

1. The suitability of each MD item, in order to check that the population 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 the EU population. These results are presented in Section 4.

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). These results are presented in Section 5.

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 undertaken using a Classical Test Theory (CTT) framework

(see Section 6), and complemented with additional tests on the reliability of each individual item in the scale based on Item Response Theory (see Section 7) and Omega analysis (Section 8).

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. These results are presented in Section 9.

Only the MD items that successfully passed these four steps were considered eligible for being aggregated into the final MD index (Section 10). This report also extends previous analyses by investigating in detail the quality of the data (Section 3) and the measurement invariance of items (see Section 11).

3. Quality and comparability of the data

Harmonising data collection and item definition is crucial to enhance the quality, comparability and robustness of the MD indicators at the EU level. Therefore, we analysed in detail the distribution of missing value (Section 3.1), the compliance with Eurostat guidelines (Section 3.2), as well as the distribution and the evolution of the items (Sections 3.3 to 3.5). All the problems identified, together with our proposals to best address them, were listed and discussed with Eurostat and the National Statistical Institutes. In this section, we provide a brief summary of this analysis.

3.1 Missing values

Table 1 presents the distribution of missing values at the item and country level, for the household and adult items. Note that in some register countries (Denmark, the Netherlands, Finland and Sweden), only one adult in each household (the so called "selected respondent") replied to the adult questionnaire.

In the UK and in Poland, 6-7% of the sample has missing information for some items. Roughly 2% of the adult sample in Latvia and in Croatia has missing information about the adult items. In the rest of the EU countries, the proportion of missing values is negligible. Additional analysis shows that almost all missing MD adult information is concentrated among the same adults (unit non-response). By contrast, the large majority of missing MD household data is not concentrated among the same households, as most households with missing information lack only one item.

In countries where the proportion of missing values is the highest, we tested the selectivity of missing information, i.e. are people lacking at least one item randomly distributed (Missing at Random), or do they have particular characteristics (Not Missing at Random)? No clear pattern could be identified.

3.2 Compliance with Eurostat guidelines and proposals for definition changes

1. **Unit of data collection:** The adult deprivation items have to be collected for all adults (except in selected respondent countries), i.e. each person aged 16 or over is supposed to reply to the adult MD questions. Yet, a few countries asked only a single question in the household questionnaire about the deprivation of all household members (Czech Republic (internet), Ireland, United Kingdom). This is very problematic in terms of international comparability and hampers analysis of the intra-household distribution of MD.

2. **Answer modalities:** In a few countries, the category "no for other reasons" was not collected:

   - In the Czech Republic, France, Netherlands, for the item related to furniture, in Iceland, for items such as pocket money, leisure, and internet.

   - In the UK, among the older population, for items such as clothes, shoes and pocket money (see below).

3. **Non-compliance with Eurostat guidelines:** We checked data comparability due to non-compliance with Eurostat guidelines, or due to lack of precision in the EU definition of the target variables. We have compared the EU definition (as provided in Eurostat-Doc065) and the national definition back translated into English. The problems we have identified were discussed with Eurostat. Alternative definitions for future data collection were agreed.

Table 1: Distribution of missing values by deprivation item for each country, 2014
(% of adults (for adult items) or % of whole population (for household items)

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Adult items																												
Clothes																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	.
Missing	1.1	0.1	.	0.1	1.0	0.6	0.4	.	0.6	1.6	2.6	.	.	2.1	0.8	0.0	.	0.2	0.0	0.2	7.4	0.0	.	.	.	0.1	0.3	4.3
Shoes																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	.
Missing	1.1	0.1	.	0.0	0.6	0.6	0.4	.	0.6	1.5	2.5	.	.	2.1	0.8	0.0	.	0.2	0.0	0.2	7.4	0.0	.	.	.	0.1	0.2	4.3
Friends																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	.
Missing	1.1	0.1	.	0.0	0.8	0.6	0.4	.	0.6	1.5	2.5	.	.	2.1	0.8	0.0	.	0.3	0.0	0.0	7.4	0.0	.	.	.	0.1	0.2	4.2
Leisure																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	.
Missing	1.1	0.1	.	0.0	1.1	0.6	0.5	.	0.6	1.5	2.5	.	.	2.1	0.8	.	.	0.3	0.0	.	7.4	0.0	.	.	.	0.1	0.2	4.3
Pocket money																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	
Missing	1.1	0.1	0.0	0.0	1.0	0.7	4.5	.	0.6	1.6	2.6	.	.	2.1	0.8	0.0	.	0.3	0.1	0.2	7.4	0.0	.	.	.	0.1	0.3	4.3
Internet																												
Not selected respondent	.	.	.	50.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	47.6	.	.	.	.	.	.	49.3	48.6	.
Missing	1.0	0.1	.	0.0	1.0	0.6	0.5	.	0.6	1.5	2.5	.	.	2.1	0.8	.	.	0.2	0.0	0.2	7.5	0.0	.	.	0.0	0.1	0.3	4.3
Household items																												
Furniture																												
Missing	0.1	.	.	0.1	0.5	.	0.1	.	0.0	0.4	.	.	.	.	.	0.1	.	0.1	0.3	0.0	.	0.0	.	.	.	0.3	1.4	6.6
Holidays																												
Missing	0.1	.	.	.	0.3	.	0.4	.	0.0	0.2	0.0	.	.	.	.	.	.	.	0.2	.	.	0.0	0.1	.	.	0.3	0.7	7.2
Proteins																												
Missing	0.0	.	.	.	0.3	.	0.4	.	.	0.1	.	.	.	.	.	.	.	.	0.0	.	.	.	0.1	.	.	0.1	0.2	0.0
Home warm																												
Missing	0.0	.	.	.	0.3	.	0.4	.	.	0.1	0.0	.	.	.	.	.	.	0.0	0.1	.	.	0.0	0.1	.	0.2	0.1	0.3	6.8
Unexpected expenses																												
Missing	0.0	.	.	0.3	0.6	.	0.4	.	0.0	0.4	0.0	.	.	.	.	0.1	1.0	0.0	0.3	0.0	0.0	0.0	.	.	.	0.6	2.5	0.3
Car																												
Missing	0.1	.	.	.	0.2	0.0	0.4	.	0.0	0.1	0.0	.	.	.	.	0.1	.	0.0	0.5	0.1	0.0	0.1	.	.	.	0.4	2.9	0.1

Note: see Annex 1 for country abbreviations. ":": No missing information. In some register countries (Denmark, Netherlands, Finland and Sweden), only one adult in the household (the so called "selected respondent") replies to the adult questionnaire.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Data quality in the UK:

From 2012, the EU-SILC data have been collected using the Family Resources Survey in the UK. This led to changes in the definition and phrasing of most material deprivation questions, causing a break in series but also problems of comparability with the other EU countries:

a. The items are collected using two different sets of questions for pensioners and non-pensioner respondents, which are not 100% comparable. Furthermore, for pensioners, the following nine response categories are used (rather than the three response categories recommended by Eurostat): (1) I do not have the money for this; (2) This is not a priority for me on my current income; (3) My health / disability prevents me; (4) It is too much trouble / too tiring; (5) There is no one to do this with or help me; (6) This is not something I want; (7) It is not relevant to me; (8) Other reason; (9) Do not know.

b. The adult items are collected for each family unit into one single question (i.e. not from every single adult in the family). Besides the comparability problem with other countries, this also does not allow investigation into the intra-household differences of deprivation.

c. Finally, some coding error led to the transmission of erroneous micro data for the new MD items. A revised dataset will be sent to Eurostat, but could not be made available when writing this report. Data for the UK are therefore not included in the next sections, in order to avoid leading to erroneous conclusions about the results of our tests. The national UK FRS data for 2013/14 were re-released in early 2016 with corrections to the MD adult items.

3.3 Distribution of answer categories at country level

Table 2 shows the distribution of answer categories for each country and each deprivation item. These results demonstrate the large variations in deprivation rates between countries and items. For example, the percentage of adults who have internet access varies between 45% in Romania and 92% in Denmark and the Netherlands.

Table 2: National distribution of answers to deprivation questions, 2014
(%)

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Adult items																												
Clothes																												
yes	89.9	48.4	87.1	87.1	91.6	82.5	86.4	98.1	88.4	89.2	71.7	71.5	78.6	60.9	69.2	95.4	60.7	87.2	93.2	90.6	80.1	79.2	64.9	87.7	77.2	92.7	94.9	88.1
no, can't afford it	8.1	42.4	6.4	6.2	5.6	10.3	10.2	1.3	9.1	9.1	15.3	15.0	16.6	29.4	23.1	4.1	29.7	9.4	5.3	5.3	12.8	19.0	31.6	10.0	11.3	4.1	2.2	10.2
no, for other reason	1.9	9.2	6.6	6.7	2.9	7.3	3.4	0.6	2.5	1.6	12.9	13.4	4.8	9.7	7.7	0.6	9.6	3.4	1.5	4.1	7.1	1.8	3.5	2.3	11.5	3.3	3.0	1.7
Shoes																												
yes	97.2	38.2	95.6	96.8	97.6	97.1	94.4	99.2	96.7	93.6	95.1	91.0	99.1	73.9	98.2	99.3	95.5	84.9	97.4	98.9	98.0	96.4	64.9	98.9	96.8	99.6	98.5	95.3
no, can't afford it	2.4	51.9	1.5	1.7	1.6	2.2	4.8	0.6	2.9	5.6	3.5	5.1	0.7	20.5	1.1	0.5	4.2	12.5	1.5	0.7	1.6	3.2	31.6	1.0	2.4	0.4	0.5	4.3
no, for other reason	0.4	9.9	2.9	1.5	0.8	0.6	0.8	0.2	0.5	0.9	1.4	3.9	0.2	5.7	0.7	0.2	0.4	2.6	1.1	0.4	0.3	0.4	3.5	0.1	0.8	0.0	1.0	0.4
Friends																												
yes	81.5	63.1	87.6	87.9	71.2	79.6	64.0	63.3	78.6	86.5	76.4	68.2	88.0	80.8	74.3	89.7	43.7	69.7	84.6	87.5	75.6	77.2	58.4	82.7	75.3	72.3	89.8	74.4
no, can't afford it	11.5	29.8	3.4	3.2	14.3	9.4	18.4	20.7	11.8	6.2	8.7	13.7	7.4	11.1	17.4	4.1	36.7	19.2	3.3	5.0	12.8	15.5	35.3	8.9	9.9	1.5	0.8	9.9
no, for other reason	7.0	7.2	9.0	8.8	14.6	11.0	17.6	16.1	9.6	7.4	15.0	18.1	4.6	8.1	8.4	6.2	19.6	11.1	12.0	7.6	11.6	7.3	6.3	8.3	14.9	26.3	9.5	15.8
Leisure																												
yes	70.1	23.8	59.9	70.1	65.1	66.2	75.4	30.6	57.8	50.5	37.7	41.1	46.5	55.1	34.4	69.8	24.5	49.4	71.8	66.1	42.1	35.7	22.0	36.7	52.9	65.4	59.4	72.3
no, can't afford it	13.5	37.5	6.7	7.1	12.5	8.3	12.0	26.1	17.9	14.3	9.3	20.8	21.2	24.9	35.2	4.0	32.6	27.0	10.6	12.0	22.5	20.6	56.0	22.2	12.8	3.2	4.2	16.0
no, for other reason	16.4	38.7	33.4	22.8	22.5	25.5	12.5	43.3	24.4	35.2	53.1	38.1	32.3	20.0	30.4	26.2	42.9	23.6	17.6	22.0	35.4	43.7	22.0	41.2	34.3	31.4	36.5	11.6
Pocket money																												
yes	84.2	52.8	74.3	89.0	81.1	86.3	81.6	34.5	71.3	79.8	58.0	65.9	87.7	80.2	71.5	82.7	63.1	54.9	76.7	80.6	75.9	69.0	37.1	89.1	67.6	97.8	93.4	79.8
no, can't afford it	11.2	40.3	8.8	9.0	12.2	9.0	16.1	44.8	16.9	15.5	22.0	18.0	8.6	16.3	22.5	5.6	27.3	31.3	7.7	9.2	14.7	17.9	54.8	9.4	16.9	1.4	5.1	18.8
no, for other reason	4.7	6.8	16.9	2.0	6.8	4.7	2.3	20.7	11.8	4.7	20.1	16.2	3.7	3.6	6.1	11.7	9.6	13.8	15.7	10.3	9.4	13.1	8.1	1.5	15.5	0.8	1.5	1.4
Internet																												
yes	84.6	51.1	80.3	91.8	84.0	81.8	82.7	64.2	71.8	81.8	59.6	58.7	62.9	69.5	68.1	86.8	63.2	77.5	91.8	83.6	80.2	63.9	44.6	74.7	74.1	81.6	88.1	86.5
no, can't afford it	3.6	19.3	3.5	1.0	4.5	4.3	5.7	10.8	10.1	2.7	3.8	7.7	5.2	9.9	7.4	1.3	11.7	4.8	1.4	1.6	4.3	8.9	29.4	3.1	6.4	1.7	1.1	11.4
no, for other reason	11.8	29.6	16.2	7.3	11.5	13.9	11.6	25.0	18.1	15.5	36.6	33.6	31.9	20.6	24.5	11.9	25.1	17.7	6.8	14.9	15.6	27.2	26.0	22.3	19.5	16.7	10.8	2.2
Household items																												
Furniture																												
yes	73.3	18.3	51.1	79.3	66.2	53.5	57.2	3.6	45.6	74.2	38.1	49.1	17.8	27.0	24.7	76.8	15.5	41.1	76.9	79.3	42.4	33.9	10.1	13.5	29.5	84.0	87.8	55.1
no, can't afford it	15.3	68.9	48.9	11.8	17.4	32.1	25.5	53.2	42.5	25.8	33.5	36.2	57.2	58.4	51.0	16.9	47.9	26.0	23.1	11.7	33.1	57.0	63.5	20.4	41.3	10.6	4.6	26.6
no, for other reason	11.5	12.8	.	8.9	16.4	14.3	17.3	43.3	11.8	.	28.4	14.7	25.1	14.6	24.3	6.4	36.6	32.9	.	9.1	24.5	9.1	26.3	66.1	29.2	5.4	7.6	18.4

Table 2 (continued)

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Holidays																												
yes	73.4	50.1	62.7	83.4	79.0	65.3	52.1	50.0	53.6	75.1	30.0	50.5	41.1	55.0	56.8	86.6	40.2	48.1	81.6	81.0	47.0	44.4	30.8	68.5	51.2	86.4	92.5	68.4
no, can't afford it	26.6	49.9	37.3	16.6	21.0	34.7	47.9	50.0	46.4	24.9	70.1	49.5	58.9	45.0	43.2	13.4	59.8	51.9	18.4	19.0	53.0	55.6	69.2	31.5	48.8	13.6	7.6	31.6
Proteins																												
yes	94.9	60.6	87.2	98.3	92.5	92.5	96.5	87.0	96.7	92.8	87.3	87.4	94.1	81.0	83.9	97.5	72.7	84.5	97.2	91.9	88.6	96.0	78.1	92.2	78.5	97.3	98.8	92.0
no, can't afford it	5.1	39.4	12.8	1.7	7.5	7.5	3.5	13.0	3.3	7.2	12.7	12.7	5.9	19.0	16.1	2.5	27.3	15.5	2.8	8.2	11.4	4.0	21.9	7.9	21.5	2.7	1.2	8.0
Home warm																												
yes	94.6	59.6	93.9	97.1	95.2	98.3	91.2	67.1	88.9	94.1	90.3	82.0	72.6	83.2	73.5	99.4	88.8	77.9	97.4	96.8	90.7	71.7	87.6	94.4	93.9	98.5	99.2	90.7
no	5.4	40.4	6.1	2.9	4.9	1.7	8.9	32.9	11.1	5.9	9.7	18.0	27.5	16.8	26.5	0.6	11.2	22.1	2.6	3.2	9.3	28.4	12.4	5.6	6.1	1.5	0.8	9.3
Unexpected expenses																												
yes	76.0	50.4	59.2	71.5	67.5	60.9	45.5	48.3	57.3	66.6	36.3	61.3	40.2	32.6	45.3	76.2	23.9	75.3	76.3	76.1	51.1	57.8	48.1	54.2	61.1	72.8	83.1	61.1
no, can't afford it	24.0	49.6	40.8	28.5	32.6	39.1	54.5	51.7	42.7	33.4	63.7	38.8	59.8	67.4	54.7	23.8	76.1	24.7	23.7	23.9	48.9	42.2	51.9	45.9	38.9	27.2	16.9	38.9
Car																												
yes	85.1	61.0	76.3	79.3	85.7	69.9	87.0	78.4	83.2	89.6	78.5	86.2	93.2	58.6	71.1	92.6	59.6	89.1	85.2	84.5	77.2	81.7	42.9	90.3	73.2	82.8	84.0	81.7
no, can't afford it	7.1	24.3	9.4	8.6	6.8	14.0	7.2	10.6	6.0	3.0	8.6	2.4	1.7	24.6	13.0	2.2	23.9	3.3	7.3	6,0	9.2	8.9	37.2	4.2	14.3	8.5	2.6	9.0
no, for other reason	7.9	14.7	14.3	12.1	7.6	16.1	5.8	11.0	10.9	7.5	12.9	11.5	5.1	16.8	15.9	5.2	16.5	7.6	7.6	9.6	13.6	9.5	19.9	5.5	12.5	8.7	13.4	9.3

Note: see Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation

3.4. Evolution of MD items between 2013 and 2014, cross-sectional data

This section looks at the change in deprivation rates between 2013 and 2014, at the item level (see Table 3).

Table 3: Changes (2014-2013) in the proportion of people having the different items or lacking them for financial reasons or for other reasons (pp)

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK
Furniture																														
Have		0.2	-1	-0.9		1.6		10.9	0.6	1	-0.3	0.7	-1.6	-0.7	-2.1	4.1	1.1	-0.5	2.2	3.3	9.9	-0.5	2	6	4.5	0.7			0.6	2.9
Unforced lack		0.7	0.1	-3.2		0.3		-0.5	-1.3	-2.4	-0.7	-0.7	-4.8	-0.9	-0.3	-1.8	-1.3	-4.6	-2.7	-4.6	-8.9	0.5	-2.5	-2.8	-4.6	-2.7			-6.4	-3.4
Other reasons		-0.9	0.7	4		-2		-10.5	0.8	1.4	1	0	6.3	1.7	2.3	-2.1	0.2	5	0.5	1.3	-1	0	0.5	-3.3	0.1	1.9			5.7	0.5
Home warm																														
Have	-0.5	0.4	4.6	3	0.1	0.5	1	1.2	-3.4	-3.1	-0.3	0.9	0.2	2.5	1.1	-0.4	1.1	2.7	1	4.3	1.3	0.3	0.3	2.3	-0.4	2.1	0	-0.7	-0.7	1.3
Unforced lack	0.5	-0.4	-4.6	-3	-0.1	-0.5	-1	-1.2	3.4	3.1	0.3	-0.9	-0.2	-2.5	-1.1	0.4	-1.1	-2.7	-1	-4.3	-1.3	-0.3	-0.3	-2.3	0.4	-2.1	0	0.7	0.7	-1.3
Holidays																														
Have	2.1	0.7	16.4	-2.1	2.2	1.4	1.1	13.2	-1.1	1.6	1.3	3.1	0.4	6.8	2.8	1.7	1.5	3.4	2.5	7.3	3.6	0.6	2	8.1	4.2	2.5	2.5	-0.6	0	1.7
Unforced lack	-2.1	-0.7	-16.4	2.1	-2.2	-1.4	-1.1	-13.2	1.1	-1.6	-1.3	-3.1	-0.4	-6.8	-2.8	-1.7	-1.5	-3.4	-2.5	-7.3	-3.6	-0.6	-2	-8.1	-4.2	-2.5	-2.5	0.6	0	-1.7
Proteins																														
Have	0.1	-0.5	11.7	2	0.3	0.9	1.3	2	0.8	0.2	0.5	0.2	1.3	5.7	0.7	0.8	1.6	2.9	-0.1	4.3	-0.6	0	0.9	2.1	-0.7	0.3	0.3	1.8	2.2	0.8
Unforced lack	-0.1	0.5	-11.7	-2	-0.3	-0.9	-1.3	-2	-0.8	-0.2	-0.5	-0.2	-1.3	-5.7	-0.7	-0.8	-1.6	-2.9	0.1	-4.3	0.6	0	-0.9	-2.1	0.7	-0.3	-0.3	-1.8	-2.2	-0.8
Unexpected expenses																														
Have	-0.7	0.2	14.4	-5.5	0.9	0.2	-0.9	2.8	-4.6	-0.6	0.3	0.4	1.4	-1.9	0.8	-0.3	1.6	2.2	0	2.1	-1.9	-0.3	-4.9	1.9	1	0.3	1.4	0	0.6	2.2
Unforced lack	0.7	-0.2	-14.4	5.5	-0.9	-0.2	0.9	-2.8	4.6	0.6	-0.3	-0.4	-1.4	1.9	-0.8	0.3	-1.6	-2.2	0	-2.1	1.9	0.3	4.9	-1.9	-1	-0.3	-1.4	0	-0.6	-2.2
Car																														
Have	-0.8	-0.4	-0.4	0.3	-0.2	0.6	1.8	1.5	-1.6	-0.4	-0.8	0.7	1.6	0.3	-1.4	0.8	-0.5	2.2	-1.1	2.1	0	0.2	1	0.2	0.9	1.6	0.1	-0.2	0.9	0.2
Unforced lack	0.1	-0.1	2	0	0.4	-0.5	-0.1	-0.2	1	-0.2	0.5	0	-1.1	-0.7	0.2	-1	0.5	-1.6	0.5	-3	0.5	0.5	-0.6	-0.1	-0.7	-2.1	-0.4	0.4	-0.8	-0.9
Other reasons	0.8	0.5	-1.6	-0.3	-0.2	0	-1.7	-1.3	0.7	0.6	0.2	-0.6	-0.5	0.3	1.1	0.2	0.1	-0.6	0.7	0.9	-0.6	-0.6	-0.3	-0.1	-0.1	0.5	0.3	-0.2	-0.1	0.7
Clothes																														
Have	-0.4	-7.9	2.3	4		6.3		7.6	-0.9	4.4	-1.4	-1	4.6	5.7	-1.1	1.5	1.8	1.2	1.2	5.8	0.4	-0.1	1.1	4.3	1.8	5			1.9	1.1
Unforced lack	0.9	6.3	-2.2	-4.3		-3.6		-3.8	0.3	-2.1	0.5	0.7	-4.8	-2.9	0.5	0	-1.5	-1.3	-0.9	-6.9	-1.1	0.4	-1.1	-1.9	-1.5	-5			-1.8	-1.3
Other reasons	-0.5	1.5	-0.1	0.3		-2.6		-3.8	0.6	-2.3	0.9	0.2	0.2	-2.9	0.5	-1.5	-0.4	0.2	-0.2	1.1	0.7	-0.2	0	-2.4	-0.2	0.1			-0.1	0.1
Shoes																														
Have	0.1	6.3	2.9	0.7		2.9		2.4	-0.2	-0.5	0.2	0.3	3.7	-0.3	-0.2	-0.4	2.1	1.3	0.9	5.9	-4	-0.1	0.3	0.3	-0.7	5			1.7	0.7
Unforced lack	0	-4.7	-2.9	-0.7		-1.0		-2	0	0.8	-0.2	-0.1	-2.7	0.3	0.2	0.3	-1.1	-0.8	-0.6	-5.9	2.7	0.1	-0.4	-0.3	0.8	-5			-1.2	-0.6
Other reasons	-0.1	-1.7	0	0		-2.0		-0.5	0.2	-0.2	0	-0.1	-1	0	0	0.1	-1	-0.5	-0.2	0.1	1.3	0	0	-0.1	-0.1	0.1			-0.6	-0.1

Table 3 (continued)

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK
Getting together with friends																														
Have	-1.1	-1.9	2.9	1.5		6.5		3.7	-2.2	-2.6	6.1	-2.4	4.2	4.5	3.9	-0.8	1	0.2	0.1	1.8	-1.3	1.6	1.6	1.7	0.3	2.2	1.5		-0.2	0.2
Unforced lack	0.9	1.9	-2.3	-0.9		-0.9		-1.1	0.6	3	-0.3	0.1	-3.6	-2.8	0.8	0.8	-0.2	1	-0.8	-1.1	0.6	-0.3	-1.6	-0.5	0.2	-2.1	-0.1		-0.1	-1
Other reasons	0.3	0	-0.5	-0.6		-5.6		-2.5	1.8	-0.4	-5.8	2.3	-0.6	-1.7	-4.7	0	-0.8	-1.1	0.7	-0.7	0.7	-1.4	0	-1.2	-0.5	-0.1	-1.3		0.3	0.9
Leisure																														
Have	3	0.3	2	-1.9		3.6		2.3	0.1	1.2	-0.7	-15.6	-0.6	1.4	-0.5	1.6	0.6	0	0	1.7	-1.5	-0.7	3.6	2.6	1.4	1.8	4.3		0.5	0.3
Unforced lack	0.2	1.8	-3.9	2.9		-2.3		-2.1	0.7	2.7	0	4.3	-1.9	-2.4	0.8	-1.6	-1.2	-0.9	-1.2	-0.6	1.7	1.4	-0.8	-2.3	-0.4	-0.4	-0.6		0.3	-0.9
Other reasons	-3.2	-2.1	1.9	-1		-1.2		-0.1	-0.8	-3.8	0.7	11.3	2.5	1	-0.4	0	0.6	0.9	1.3	-1	-0.2	-0.6	-2.9	-0.3	-1	-1.4	-3.6		-0.8	0.5
Pocket money																														
Have	-1.6	0.5	5.2	3		-1.6		9.2	-2.6	3.8	0.9	-4.1	3.8	8.9	23.8	1.2	2.5	4.3	-4	6.8	-2	-0.5	1.3	5.8	0.9	4.3			4.7	2.5
Unforced lack	-0.1	-0.5	-5.3	-0.8		1		-5.7	1.8	-0.5	-0.8	3.4	-4.9	-7.3	-7.6	-1.2	-2	-2.2	0	-5.7	1.1	0.2	-1.3	-3.2	-1	-3.8			-2.1	-2.2
Other reasons	1.8	0.2	0	-2.2		0.7		-3.5	0.7	-3.3	-0.2	0.7	1.2	-1.7	-16.2	0	-0.4	-2.1	4.1	-1.1	1	0.3	0	-2.6	0.1	-0.6			-2.6	-0.3
Internet																														
Have	1.3	1.1	1.6	2.1		4.9		4.1	6.4	2.5	-0.1	1.9	4.2	-1.3	1.4	2.1	2.7	4.3	1	2.5	0.7	1.8	2.2	5.8	2.9	4.6	1.4		0.9	2
Unforced lack	-0.6	0.2	-2.7	0.4		-1		-0.7	-2.2	0.7	0	-0.6	-1.9	-0.3	0.9	-2.1	-1	-1.6	-0.3	-1.5	0.3	-0.1	-0.2	-2.3	-1.2	-2.1	0.2		0	-1.9
Other reasons	-0.7	-1.3	1	-2.5		-3.9		-3.3	-4.4	-3.2	0.1	-1.4	-2.4	1.6	-2.3	0	-1.7	-2.7	-0.7	-1	-1	-1.7		-3.4	-1.7	-2.5	-1.6		-0.9	-0.2

Note: see Annex 1 for country abbreviations. In some countries, data were not collected in 2013 (gentleman agreement).

Source: EU-SILC 2014 cross-sectional data, authors' computation.

In Bulgaria, there is a large decrease in the proportion of people suffering from an enforced lack of a holiday, meat/chicken/fish or vegetarian equivalent each second day and those not able to face unexpected expenses. To a lesser extent, this improvement is visible for all adult items and for the capacity to keep the home adequately warm. There is a decrease across all age groups, but it is stronger for working age people and children (results not presented). The Bulgarian NSI explains these variations as due to improved interviewer training. These changes are flagged as a "break" in series on the Eurostat website.

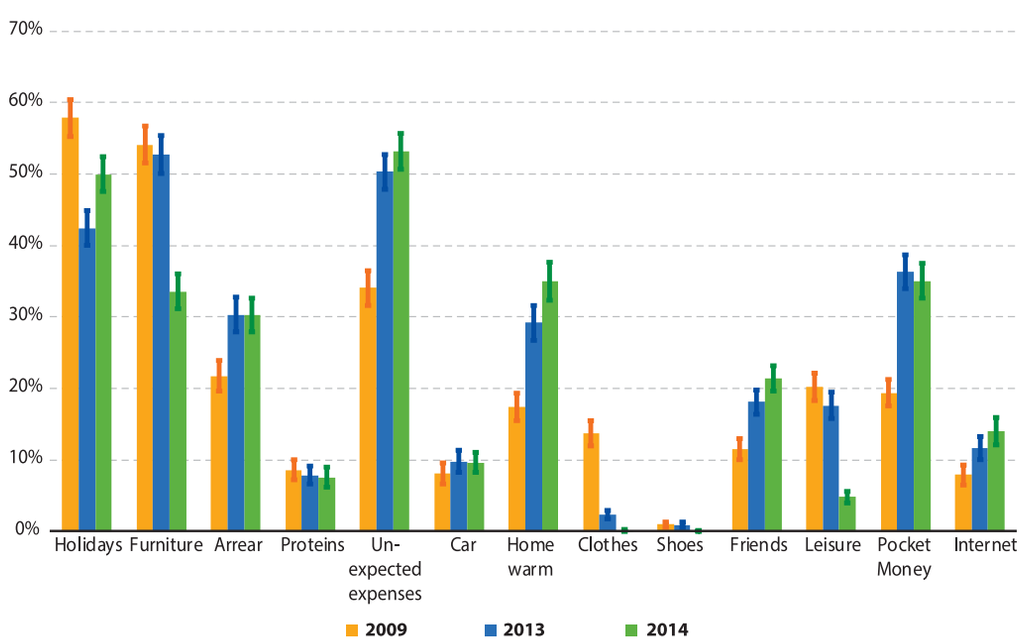
In countries like Germany, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland and Romania there is also a strong improvement (decrease in the proportion of enforced lack) for a non-negligible number of items. In these countries, this decrease in enforced lack is mainly due to an increase in the proportion of respondents who "have" the item, although the proportion of people not having the item for other reasons than affordability also decreased in some countries (Germany, Estonia, Poland).

For the item related to internet access, the proportion of other reasons decreased since 2009 (the first time data about this item was collected) in most countries, showing the growing importance of internet access.

The proportion of other reasons tends to increase for furniture (more than 1-pp in ten countries, more than 4-pp in Cyprus, Croatia, Lithuania and Slovakia). It however decreased in Estonia (-10.5-pp, from 24.8 in 2013 to 14.3 in 2014). The decrease of the "other reasons" category is also higher than 3-pp in Estonia for clothes, pocket money and internet, in Austria for leisure, in Germany for drink/meal out and internet, in Spain for leisure, pocket money and internet, in Greece for internet, in Ireland for pocket money and drink/meal out, in Poland for internet, in Sweden for leisure and in Finland for drink/meal out.

We also looked at the evolution by main characteristics of the persons/households. We identified the groups where the year-to-year variation was not concordant with the whole population variation. Our results show that in Greece, the proportion of the elderly lacking an item for other reasons than affordability increased by 21pp for "furniture", 18pp for leisure and 9pp for drink/meal out. The proportion of respondents who did not have the item because they could not afford it (enforced lack) varied substantially for these three items (Figure 1, vertical bars show the 95% confidence interval). These results were discussed with the Greek NSI, without being able to identify clearly the reasons for the large variations.

Figure 1 : Proportion of people deprived, Greece, people aged more than 65, 2009, 2013 and 2014
(%)



Source: EU-SILC 2014 cross-sectional data, authors' computation.

3.5. Evolution of MD items between 2013 and 2014, longitudinal data

Using the longitudinal data file, which links 2013 and 2014 data, it is possible to look at the changes between the two years at the individual level (for the subset of countries that agreed to give us access to the longitudinal file). Data for Hungary are not included due to problems with the longitudinal file.

Table 4 shows the proportion of people who gave the same reply to the question both years. This percentage varies between items and countries. It is the lowest for Furniture and Leisure and the highest for Internet, Shoes, Car, Home warm or Meal with proteins. It is lower in countries like Bulgaria (due to a break in series), Cyprus, Estonia, Italy, Latvia, Poland or Spain, and tends to be higher in Malta-(except for Furniture), Luxembourg or Finland. Countries where the proportion of people having the item is the highest have statistically more chance to reach a high degree of overlap between two data collections.

Table 4 : Percentage of the population who gave the same reply to each deprivation question in both 2013 and 2014 (%)

	Furniture	Internet	Pocket money	Leisure	Getting together with friends	Shoes	Clothes	Car	Home warm	Holidays	Meal with proteins	Unexpected expenses
Belgium	74.7	89.1	82.8	75.9	81.9	94.3	87.9	93.7	93.5	87.0	94.2	88.5
Bulgaria	87.3	81.2	79.9	76.5	82.5	81.0	81.9	94.6	90.7	80.1	81.0	79.2
Estonia	57.4	86.5	74.4	65.4	72.1	91.0	74.7	92.6	96.8	73.5	90.5	79.4
Spain	61.1	74.9	62.9	59.1	71.1	88.0	76.5	85.8	84.6	76.9	91.4	77.5
France	78.4	90.4	80.9	63.6	85.0	91.7	88.9	94.1	92.6	83.8	92.8	83.8
Italy	62.3	72.0	64.2	59.8	65.7	82.1	68.6	96.1	79.8	74.6	80.7	75.0
Cyprus	58.8	81.0	79.3	62.8	81.4	96.6	74.6	98.2	72.0	77.7	90.5	77.7
Latvia	64.8	80.0	71.7	62.3	73.3	69.4	65.0	92.5	77.3	69.7	79.3	80.3
Lithuania	70.9	85.5	75.6	67.7	77.5	94.7	76.8	84.4	89.2	87.9	87.9	86.4
Luxembourg	80.9	91.5	81.8	75.8	86.8	96.9	92.8	88.1	98.6	89.1	97.0	88.4
Malta	49.9	94.2	87.9	86.0	89.4	90.8	89.5	98.0	99.2	99.5	94.7	90.4
Austria	NC (2013)	91.9	77.9	69.4	85.1	97.0	86.2	93.3	96.3	86.2	90.3	87.1
Poland	69.3	85.5	74.2	66.8	76.1	92.6	78.9	80.6	91.6	81.3	89.5	85.9
Finland	86.0	93.8	96.2	77.3	73.0	97.5	92.8	89.8	98.0	88.8	97.1	86.6

Note: NC (2013): not collected in 2013.

Source: EU-SILC 2014 longitudinal data, authors' computation.

Table 5 shows the net changes for each answer modalities, for the items collected with three answer modalities. Table 6 provides similar information for items collected with two answer modalities. In Table 5, the net changes in the proportion of people suffering from enforced lack is the sum of four figures:

- the proportion of people having the item in 2013 who lacked it in 2014 for affordability reasons (first column)
- PLUS the proportion of people who declared not having the item in 2013 for other reasons who then answered in 2014 that the lack of the item was for affordability reasons (second column);
- LESS the proportion of those suffering from enforced lack in 2013 who have the item in 2014 (third column);
- LESS the proportion of those suffering from enforced lack in 2013 who declared not having the item in 2014 for "other reasons" (fourth column).

For example, in Malta, the decrease in enforced lack of furniture is due to both an increase of the share of people who declare being able to replace furniture if needed and an increase in those reporting not being able to do so for "other reasons". In Latvia, the decrease is mainly driven by an increase in the percentage of those who "Have" for most items (except Furniture and Internet). Table 5 also shows that there are substantial individual movements across the two waves between the enforced lack and the have answers, for items such as clothes.

The movements between the category "other reasons" and "lack for affordability reasons" are less prevalent than other movements, except for the Furniture and Leisure items. These changes may be due to the difficulty of subjectively explaining the lack of these items in terms of choice or financial strain and are problematic as they have an impact on the deprivation rate (as only the lack for affordability reasons is considered as a deprivation).

We ran logistic regressions to better understand the drivers of these changes from one year to the other (the results are available on demand).

The first set of logistic regressions look at the changes from non-deprivation to deprivation by item. The following variables have an impact:

- The income level in 2014 influence the odds of becoming deprived for all items: the poorest have a larger probability of becoming deprived than the richest;
- Income loss during one of the three previous years also increases the probability of becoming deprived;
- The number of years spent in poverty (low income) also increases the probability of lacking an item for affordability reasons;
- For items collected at the household level, change in the household respondent may lead to a significant difference in the answer given (for furniture for example).
- National differences are significant, once the impact of these variables is taken into account.
- A substantial amount of the variance is not explained by the model.

We also carried out a similar analysis for the exit rate from deprivation for each item, but found that only current income level had a statistically significant association with exiting deprivation. Income changes and other factors have no significant impact. National differences are significant, once the impact of these variables are taken into account.

These primary analyses based on two consecutive years show substantial unexplained variability of answer for some items for the same household/person. Additional analyses are required using a longer time series to better understand the drivers of these changes.

Table 5: Percentage change (2014-2013) in the proportion of people having the different deprivation items or lacking them for financial or other reasons) longitudinal data
(pp)

	Furniture					Internet					Pocket money					Leisure					Getting out with friends					Shoes					Clothes					Car				
		Increase			Decrease		Increase		Decrease			Increase		Decrease			Increase		Decrease			Increase		Decrease			Increase		Decrease			Increase		Decrease			Increase		Decrease	
		1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced→ have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons	Net change	Have → enforced	Other reasons→enforced	Enforced → have	Enforced→ other reasons
Belgium	0.5	4.7	1.3	-3.6	-1.9	0.0	1.2	0.9	-1.2	-0.9	-0.5	3.8	0.8	-4.5	-0.6	2.1	3.8	2.1	-2.2	-1.6	2.3	4.8	1.0	-2.7	-0.9	0.5	1.6	0.0	-1.1	0.0	0.7	3.7	0.3	-3.0	-0.2	-0.5	0.9	1.1	-0.9	-1.6
Bulgaria	-0.3	3.0	1.8	-2.2	-2.9	-4.1	1.5	3.0	-3.0	-5.6	-5.0	3.8	1.4	-8.2	-1.9	-4.1	1.4	5.0	-2.4	-8.1	-2.8	3.7	1.2	-6.3	-1.2	-3.7	3.5	2.0	-6.1	-3.1	-2.8	3.8	1.7	-6.1	-2.2	0.4	1.3	1.1	-0.9	-1.1
Estonia	0.6	6.8	6.8	-9.4	-3.6	-0.5	0.4	2.1	-1.1	-1.8	-5.7	3.5	0.8	-8.9	-1.0	-2.3	2.4	2.0	-3.5	-3.2	-0.7	4.1	1.7	-5.0	-1.6	-2.2	1.2	0.0	-3.5	0.0	-3.6	3.6	1.4	-6.8	-1.9	0.3	0.8	1.5	-0.8	-1.2
Spain	-3.1	8.1	3.5	-9.6	-5.1	0.4	2.0	3.0	-2.7	-2.0	-0.8	5.9	2.2	-7.0	-1.9	2.6	5.1	4.3	-3.6	-3.1	2.7	5.9	1.4	-3.5	-1.0	0.5	2.0	0.0	-1.5	0.0	-2.5	3.7	0.5	-6.3	-0.4	-0.7	1.3	3.6	-1.9	-3.7
France	-1.3	6.3	0.0	-7.6	0.0	-0.6	0.6	0.7	-0.7	-1.2	3.1	6.6	0.9	-3.7	-0.7	3.9	4.8	2.8	-1.4	-2.3	0.4	2.5	0.6	-2.2	-0.5	-0.2	2.3	0.1	-2.5	-0.2	0.9	3.8	0.3	-2.9	-0.3	-0.3	0.6	1.3	-0.8	-1.4
Italy	-0.9	6.4	4.0	-7.3	-4.1	-0.8	1.4	2.2	-1.7	-2.6	-2.2	4.1	2.7	-6.0	-3.0	-1.1	2.6	5.2	-3.0	-5.9	-0.4	3.9	2.1	-3.8	-2.7	-1.2	2.0	0.5	-3.1	-0.6	-1.3	4.0	2.0	-5.1	-2.2	0.1	0.3	1.0	-0.5	-0.7
Cyprus	-2.0	4.6	9.3	-5.6	-10.4	0.5	1.6	1.6	-1.5	-1.3	-0.3	5.2	0.5	-5.8	-0.2	2.3	4.7	6.0	-3.6	-4.9	-0.5	4.5	0.4	-4.8	-0.6	-0.7	0.4	0.0	-1.1	0.0	-3.6	6.5	0.9	-9.9	-1.3	-0.4	0.2	0.2	-0.7	-0.2
Latvia	-3.3	6.1	5.7	-7.9	-7.2	-1.1	0.9	3.2	-1.9	-3.4	-4.3	7.1	0.7	-11.3	-0.9	0.5	6.7	4.6	-6.3	-4.5	-1.8	4.5	1.2	-5.8	-1.7	-3.5	7.5	1.4	-10.4	-1.9	-6.6	6.8	2.3	-11.9	-3.8	-0.5	0.5	2.1	-1.2	-1.8
Lithuania	-3.6	3.8	4.8	-3.6	-8.6	-0.8	0.8	2.0	-1.3	-2.3	-2.7	5.3	1.9	-8.2	-1.7	1.5	4.6	6.8	-3.1	-6.7	0.5	5.9	1.6	-5.5	-1.5	-0.7	0.7	0.0	-1.3	-0.1	-0.7	6.5	1.4	-6.2	-2.3	-2.0	1.4	4.1	-2.3	-5.2
Luxembourg	-2.1	3.8	1.3	-5.7	-1.5	-0.1	0.3	0.5	-0.6	-0.4	0.4	2.7	0.5	-2.1	-0.6	-0.9	0.5	1.3	-0.8	-1.9	-0.3	1.8	0.3	-1.7	-0.7	-0.7	0.2	0.0	-0.8	0.0	-0.7	1.9	0.1	-2.7	-0.1	0.2	0.5	0.6	-0.4	-0.5
Malta	-9.2	2.9	5.6	-8.8	-8.9	0.8	0.4	0.6	-0.1	-0.1	4.3	3.8	1.9	-0.9	-0.4	3.4	2.6	2.2	-0.8	-0.5	2.7	2.7	0.9	-0.8	-0.1	3.7	4.1	0.1	-0.5	0.0	-0.1	2.6	0.0	-2.5	-0.2	-0.2	0.3	0.3	-0.1	-0.6
Austria						-0.8	0.4	0.4	-0.4	-1.1	-1.4	3.3	0.8	-4.0	-1.4	-0.5	3.2	2.2	-3.0	-2.8	0.4	2.3	0.7	-2.0	-0.6	0.1	0.5	0.0	-0.4	0.0	0.6	2.9	0.4	-2.4	-0.2	-0.4	0.8	1.3	-0.7	-1.8
Poland	-2.1	3.1	4.4	-4.8	-4.8	-2.3	0.3	1.1	-1.7	-1.9	-3.8	3.4	1.2	-6.8	-1.6	-3.1	2.4	4.1	-3.4	-6.2	-0.8	3.4	1.3	-4.0	-1.6	-0.4	0.7	0.0	-1.1	0.0	-2.1	2.9	1.2	-4.9	-1.3	-2.1	2.2	4.0	-3.3	-5.0
Finland	-0.9	2.8	0.5	-3.3	-0.9	0.1	0.2	0.6	-0.1	-0.6	-0.8	0.6	0.1	-1.4	-0.1	-0.2	0.9	0.9	-0.9	-1.1	-0.2	0.5	0.6	-0.6	-0.7	-0.1	0.3	0.0	-0.4	0.0	0.2	1.8	0.2	-1.6	-0.3	-0.1	1.2	0.9	-1.1	-1.1

Source: EU-SILC 2014 longitudinal data, authors' computation.

Table 6: Percentage change (2014-2013) in the proportion of people having the different deprivation items or lacking them for financial or other reasons, longitudinal data
(pp)

	Home warm			Holidays			Meal with proteins			Unexpected expenses		
	Net change	Have → enforced	Enforced → Have	Net change	Have → enforced	Enforced → Have	Net change	Have → enforced	Enforced → Have	Net change	Have → enforced	Enforced → Have
Austria	0.7	2.2	-1.5	-3.9	5.0	-8.8	-0.9	4.4	-5.3	-0.3	6.3	-6.6
Belgium	-1.0	2.8	-3.7	-1.1	5.9	-7.0	-0.1	2.9	-2.9	-0.9	5.3	-6.2
Bulgaria	-1.6	3.9	-5.5	-16.1	1.9	-18.0	-11.8	3.6	-15.4	-14.0	3.4	-17.4
Estonia	-0.8	1.2	-2.0	-11.4	7.6	-19.0	-1.1	4.2	-5.3	-2.1	9.2	-11.3
Spain	3.0	7.5	-4.5	-1.2	9.3	-10.5	-0.3	2.4	-2.7	0.4	9.8	-9.3
France	-1.6	2.8	-4.3	-3.3	6.2	-9.5	-0.2	3.4	-3.6	-1.0	7.4	-8.3
Italy	-0.6	6.6	-7.2	-2.3	8.4	-10.7	-1.9	5.5	-7.4	-1.8	8.4	-10.2
Cyprus	-2.1	13.0	-15.1	-3.7	9.3	-13.0	-1.9	3.8	-5.7	6.9	14.6	-7.7
Latvia	-6.7	7.4	-14.1	-7.7	10.7	-18.4	-4.1	7.8	-11.8	-0.4	9.1	-9.5
Lithuania	-3.3	3.6	-6.9	-0.6	5.6	-6.1	-2.0	4.9	-6.8	-0.3	6.4	-6.8
Luxembourg	-0.9	0.3	-1.2	-3.0	3.9	-7.0	-0.2	1.4	-1.6	0.1	5.8	-5.7
Finland	0.3	1.1	-0.8	-1.9	4.4	-6.3	-0.4	1.2	-1.6	-1.3	5.5	-6.8
Malta	-0.1	0.4	-0.4	0.1	0.3	-0.2	2.0	3.7	-1.6	2.8	6.2	-3.4
Poland	-2.4	2.6	-5.0	-8.1	4.9	-13.0	-2.6	3.5	-6.1	-3.5	4.9	-8.3

Source: EU-SILC 2014 longitudinal data, authors' computation.

4. Suitability

The analytical framework presented in Section 2.1 requires the identification of items necessary to have a decent life in the society where people live. In Townsend's relative deprivation definition of poverty (see above), people are deprived if they lack the items "which are customary, or at least widely encouraged or approved, in the societies to which they belong". This approach may be difficult to operationalise as the list of customary items is in theory largely undetermined. The issue was addressed by Mack and Lansley (1985) who proposed an innovative consensual approach to identify 'necessities' in Britain, by taking into account the judgment of individuals as to what constitutes an acceptable standard of living. They defined necessities as possessions and activities that at least 50% of interviewees regarded as necessities of life that everyone should be able to afford. This approach has since been used in many high-income countries (e.g. Van Den Bosch, 2001; Halleröd, 1995; 2006; Gazareth and Suter, 2010; Saunders et al, 2007; Abe and Pantazis, 2013; Lau et al, 2015) as well as middle-income and low-income countries (Ahmed, 2007; Davies and Smith, 1998; Nandy and Pomati, 2015; Kaijage and Tibaijuka, 1996; Mtapuri, 2011; Wright, 2008).

At the EU level, an EU wide Eurobarometer survey on the perception of poverty and social exclusion was carried out in 2007 (see TNS (2007) for a description of the survey; see Accardo and de Saint Pol (2009), Dickes et al (2010), Guio et al (2009) for an analysis of these data). This Eurobarometer was the first EU dataset that allowed a comparative analysis of the items that citizens in the different Member States consider to be necessary for people to have an 'acceptable' standard of living in the country where they live. The results led to the inclusion of additional items in the EU-SILC survey in 2009, including children's deprivation items.

In the absence of up to date opinion data, we examined the actual behaviour of people, using the EU-SILC data, to assess the degree of importance of each item.

In the EU-SILC survey, most of the deprivation questions([4]) allow us to distinguish between a "simple" lack of an item (people do not possess/ have not access to the item) and an "enforced" lack of item (people would like to possess/ have access to an item but cannot afford it). For all new items, three answer categories are proposed:

1. have the item;
2. do not have the item because cannot afford it;
3. do not have the item for any other reason.

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).

Durables in the core part of EU-SILC and the majority of new items have these three answer categories. Most deprivation items are wanted by a large majority of the population: at least 90% (less than 10% of people replied they do not have the item for other reasons). If we set the suitability threshold at 70% (maximum 30% of "other reasons"), almost all items pass the test except adult leisure activity (in fifteen countries).

Between 2009 and 2014, the proportion of "other reasons" decreased in the large majority of countries for internet access. This indicates an increased desirability of this item, which should not be dropped on the basis of the problems of suitability in four countries.

For household furniture, there are major problems in the way the question was collected in Greece and Slovenia. Therefore, these two countries should not be counted among problematic countries.

([4]) All items except Holidays, Unexpected expenses, Home Warm, Arrears, Meal with proteins.

Table 7: Suitability: proportion of wanting, 2014
(%)

	Belgium	Bulgaria	Czech Republic	Denmark	Germany	Estonia	Ireland	Greece	Spain	France	Croatia	Italy	Cyprus	Latvia	Lithuania	Luxembourg	Hungary	Malta	Netherlands	Austria	Poland	Portugal	Romania	Slovenia	Slovakia	Finland	Sweden	United Kingdom
Furniture	89	87	NA	92	84	85	83	53	88	NA	71	85	75	85	75	94	64	67	NA	91	75	91	73	36	71	96	93	85
Car	92	82	84	94	94	86	94	86	89	94	84	90	94	81	82	96	82	92	95	91	85	90	72	97	87	95	91	92
Clothes	98	89	92	95	97	92	97	99	98	98	85	87	94	88	91	99	90	96	99	96	92	98	96	98	88	98	98	99
Shoes	100	89	97	99	99	99	99	100	100	99	98	97	100	93	99	100	100	97	99	100	100	100	NA	100	99	100	99	100
Getting together with friends/ family	93	92	90	92	84	88	81	81	90	93	84	83	95	91	90	94	80	88	89	93	88	92	92	92	85	73	90	85
Leisure	84	57	64	79	76	73	86	51	74	64	45	61	64	77	66	75	57	75	85	78	62	54	75	58	66	70	63	89
Pocket money	96	92	82	98	93	95	98	77	87	95	79	84	96	96	92	89	90	85	84	90	90	87	91	98	84	99	99	99
Internet	89	65	79	95	88	86	85	70	80	85	57	67	63	75	69	89	73	81	95	85	81	70	68	77	80	89	91	98

Notes: the definition of the item does not comply with the Eurostat guidelines for Furniture in Slovenia and Greece; for Shoes in Bulgaria and Romania; for Clothes in Greece. The category "other reasons" is not available for the item related to Furniture in Czech Republic, France and Netherlands. Items such as Holidays, Unexpected expenses, Home Warm, Arrears, Meal with proteins could not be tested as the information about the reasons other than affordability is not collected.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Guio, Gordon and Marlier (2012) discussed why the failure for the item related to adult leisure activity to attain the 70 % threshold needs to be interpreted cautiously. With 'consumer durables' and other material possessions, people usually either 'want' them or 'don't want them'. However, with social activities, the 'No, for any other reason' category is likely to include people who want to do this activity but are prevented from doing so by other constraints beyond a lack of income, e.g. lack of time due to caring responsibilities or due to work, poor health, no vehicle/ public transport, problems of physical access, feeling unwelcome, etc. This is especially true for older people. The Family Resources Survey conducted in the UK records many different types of other reasons for pensioners (health problems, activity considered as not relevant, no desire, too much trouble, no one to do this with me, enforced lack and other reasons). The 2014/2015 results show for example, that among pensioners who do not undertake regular leisure activities, only 35% replied that they do not want leisure or that this activity is not relevant to them. One third of them report that this is due to health problems and another 10% because of affordability reasons. This clearly shows that the "other reasons" category does not necessarily refer to a lack of desirability of the item, for items covering social activities([5]).

In order to test the homogeneity of preferences within countries, we disaggregated the proportion of people 'wanting' the items, by a range of socio-demographic variables. For each item collected with three-modality response categories (all items except Holidays, Unexpected expenses, Home Warm, Arrears, Meal with proteins), we estimated a multinomial logistic model to predict the odds of the three possible responses (i.e. have, do not have for affordability reasons, do not have for other reasons) with a range of independent variables. These independent variables include the income quintile, the age of the person (metric variable), an interaction term between the income and a dummy indicating that the person is aged more than 65 years (allowing for different impacts of income on younger and older people), a set of dummies indicating the household type and the country.

Two models are tested simultaneously in this multinomial regression, one comparing membership to the "cannot afford" group versus the "have" group and one comparing membership to the "other reasons" group versus the "have" group.

Table 8 presents the exponential beta coefficient which represents the change in the odds of choosing one answer modality vis-à-vis the reference one ("have") associated with a one unit change of the corresponding independent variable.

([5]) We are grateful to Donncha Burke from the Department of Work and Pensions for having kindly provided these figures.

Table 8: Multinomial logistic models for each deprivation item, odds ratios, EU pooled dataset, 2014

Variable	Modality	Furniture	Internet	Clothes	Friends	Leisure	Pocket money	Shoes
Age (reference: 30-64)								
age 18-30	Cannot afford	1.1 *	0.7 *	0.7 *	0.6 *	0.5 *	0.8 *	0.9 *
	Other reasons	1.1 *	0.3 *	0.6 *	0.4 *	0.4 *	0.6 *	1.0
age 65+	Cannot afford	0.9 *	2.7 *	1.2 *	1.0	1.1	1.0	1.4 *
	Other reasons	1.4 *	6.1 *	3.7 *	2.3 *	2.2 *	2.4 *	3.2 *
Income quintile (reference: fifth quintile)								
Income quintile 1	Cannot afford	17.7 *	37.0 *	22.4 *	21.7 *	27.7 *	18.9 *	19.0 *
	Other reasons	3.2 *	7.1 *	4.4 *	2.8 *	4.0 *	3.4 *	3.8 *
Income quintile 2	Cannot afford	8.8 *	14.2 *	9.2 *	10.2 *	12.8 *	9.0 *	7.4 *
	Other reasons	2.3 *	4.9 *	3.0 *	2.2 *	3.1 *	2.9 *	2.5 *
Income quintile 3	Cannot afford	5.0 *	6.8 *	4.7 *	5.3 *	6.5 *	4.9 *	4.3 *
	Other reasons	1.8 *	3.5 *	2.3 *	1.9 *	2.4 *	2.2 *	1.9 *
Income quintile 4	Cannot afford	2.6 *	3.1 *	2.6 *	2.8 *	3.4 *	2.8 *	2.4 *
	Other reasons	1.4 *	2.3 *	1.6 *	1.5 *	1.8 *	1.6 *	1.6 *
Interaction term (aged 65+ * quintile)								
age 65+ *Q1	Cannot afford	0.8 *	0.7 *	0.5 *	0.7 *	0.6 *	0.6 *	0.4 *
	Other reasons	0.9	1.1 *	0.7 *	0.8 *	1.0	0.7 *	0.5 *
age 65+ *Q2	Cannot afford	0.9	1.0	0.7 *	0.8 *	0.7 *	0.7 *	0.6 *
	Other reasons	1.1	1.2 *	0.8 *	0.9 *	1.0	0.8 *	0.7 *
age 65+ *Q3	Cannot afford	0.9	1.0	0.8 *	0.9	0.8 *	0.8 *	0.7 *
	Other reasons	1.1	1.1	0.8 *	1.0	1.0	0.9	0.8 *
age 65+ *Q4	Cannot afford	1.0	0.9	0.8 *	0.9	0.8 *	0.8 *	0.8
	Other reasons	1.0	1.0	1.0	1.1	1.0	1.0	0.8
Sex (reference: man)								
Woman	Cannot afford	1.0 *	1.0	1.1 *	1.1 *	1.2 *	1.2 *	1.0
	Other reasons	1.0	1.1 *	1.0	1.1 *	1.1 *	1.1 *	0.9 *
Health problem (reference: no limitation in daily activities)								
Health limitations	Cannot afford	2.0 *	2.2 *	2.3 *	2.2 *	2.6 *	2.0 *	2.1 *
	Other reasons	1.3 *	2.0 *	2.1 *	2.1 *	2.3 *	1.9 *	2.0 *
Household type (reference: two adults with children)								
Single	Cannot afford	1.4 *	3.6 *	1.3 *	0.9 *	0.9 *	0.6 *	1.1 *
	Other reasons	2.0 *	4.3 *	1.4 *	0.9 *	0.8 *	0.6 *	1.0
Single parents	Cannot afford	1.8 *	1.0	1.4 *	1.2 *	1.0	1.2 *	1.3 *
	Other reasons	1.4 *	0.5 *	1.0	0.8 *	0.6 *	0.7 *	0.9
Two adults 3+	Cannot afford	0.9	1.0	1.0	1.0	0.9 *	1.1 *	1.1
	Other reasons	0.9	0.5 *	0.8 *	0.9	0.8 *	1.1 *	0.9
Complex hhd with children	Cannot afford	1.1	1.1	1.0	1.2 *	1.1 *	1.1 *	1.2 *
	Other reasons	0.9 *	1.0	1.1	1.1 *	1.1 *	1.1 *	1.1

Table 8 (continued)

Variable	Modality	Furniture	Internet	Clothes	Friends	Leisure	Pocket money	Shoes
Two adults no child	Cannot afford	1.0 *	2.2 *	1.0	1.0	1.0	0.9 *	1.0
	Other reasons	1.2 *	2.7 *	1.1 *	1.0 *	1.1 *	0.9 *	0.9
Complex hhd without children	Cannot afford	1.7 *	1.5 *	1.7 *	1.5 *	1.8 *	1.5 *	1.5 *
	Other reasons	1.5 *	0.9	1.4 *	1.2 *	1.2 *	1.2 *	1.4 *
Country (reference: Austria)								
Belgium	Cannot afford	1.6 *	2.3 *	1.7 *	2.8 *	1.1	1.2 *	3.7 *
	Other reasons	1.4 *	0.7 *	0.5 *	1.1	0.7 *	0.5 *	1.2
Bulgaria	Cannot afford	62.9 *	56.5 *	33.1 *	13.5 *	17.6 *	10.2 *	*
	Other reasons	9.8 *	8.9 *	6.9 *	1.6 *	7.5 *	1.2 *	*
Czech Republic	Cannot afford	11.4 *	3.1 *	1.6 *	0.8 *	0.8 *	1.2 *	2.9 *
	Other reasons	NA *	1.4 *	1.9 *	1.3 *	2.0 *	2.0 *	8.4 *
Denmark	Cannot afford	1.1	0.3 *	1.1	0.6 *	0.5 *	0.9	2.4 *
	Other reasons	0.9	0.2 *	1.5 *	1.2 *	1.0	0.2 *	3.8 *
Germany	Cannot afford	2.0 *	2.2 *	1.0	4.0 *	1.0	1.4 *	2.4 *
	Other reasons	2.2 *	0.6 *	0.6 *	2.5 *	1.0	0.6 *	2.0 *
Estonia	Cannot afford	5.7 *	2.3 *	2.1 *	2.0 *	0.6 *	0.8 *	3.1 *
	Other reasons	2.7 *	0.8 *	1.8 *	1.6 *	1.1	0.4 *	1.5
Ireland	Cannot afford	4.2 *	5.6 *	2.6 *	7.2 *	1.0	1.9 *	8.8 *
	Other reasons	3.0 *	1.2 *	1.2	4.4 *	0.6 *	0.2 *	2.8 *
Greece	Cannot afford	NA	16.5 *	0.2 *	7.8 *	7.2 *	17.8 *	1.0
	Other reasons	NA	3.9 *	0.1 *	3.3 *	5.5 *	5.7 *	0.5 *
Spain	Cannot afford	10.4 *	12.3 *	2.1 *	3.1 *	2.0 *	2.3 *	4.8 *
	Other reasons	2.9 *	2.3 *	0.7 *	1.6 *	1.4 *	1.4 *	1.3
France	Cannot afford	2.9 *	2.0 *	2.0 *	1.4 *	2.0 *	1.9 *	10.0 *
	Other reasons	NA *	1.2 *	0.4 *	1.1	2.5 *	0.5 *	2.5 *
Croatia	Cannot afford	9.8 *	6.9 *	4.9 *	2.2 *	1.7 *	3.8 *	5.7 *
	Other reasons	8.9 *	8.9 *	5.0 *	2.4 *	5.4 *	2.9 *	3.6 *
Italy	Cannot afford	7.6 *	13.2 *	4.9 *	4.3 *	3.7 *	2.7 *	9.6 *
	Other reasons	3.1 *	6.3 *	4.8 *	3.2 *	3.2 *	1.9 *	11.2 *
Cyprus	Cannot afford	45.4 *	9.6 *	5.2 *	1.7 *	3.7 *	0.9	1.1
	Other reasons	18.5 *	8.7 *	2.0 *	0.7 *	3.0 *	0.4 *	0.7
Latvia	Cannot afford	27.4 *	10.2 *	11.7 *	2.4 *	2.8 *	1.8 *	NA
	Other reasons	6.3 *	2.2 *	4.2 *	1.1	1.1	0.3 *	NA
Lithuania	Cannot afford	28.7 *	9.3 *	8.3 *	5.2 *	9.5 *	3.3 *	1.7 *
	Other reasons	12.3 *	3.2 *	3.0 *	1.4 *	3.7 *	0.7 *	1.9 *
Luxembourg	Cannot afford	1.7 *	1.0	0.8 *	0.9	0.3 *	0.6 *	0.7
	Other reasons	0.8 *	1.0	0.2 *	0.9	1.3 *	1.2 *	0.6
Hungary	Cannot afford	43.3 *	20.5 *	14.5 *	25.8 *	13.1 *	4.8 *	7.5 *
	Other reasons	32.0 *	4.9 *	5.2 *	7.1 *	7.9 *	1.3 *	1.1

Table 8 (continued)

Variable	Modality	Furniture	Internet	Clothes	Friends	Leisure	Pocket money	Shoes
Malta	Cannot afford	7.5 *	5.9 *	2.7 *	7.5 *	4.9 *	7.5 *	32.6 *
	Other reasons	9.6 *	2.2 *	1.2	2.5 *	2.0 *	2.5 *	10.1 *
Netherlands	Cannot afford	2.4 *	0.5 *	0.8	0.7 *	0.7 *	0.9	2.1 *
	Other reasons	NA *	0.2 *	0.3 *	1.7 *	0.7 *	1.7 *	2.8 *
Poland	Cannot afford	8.9 *	4.5 *	3.8 *	3.7 *	4.2 *	1.9 *	2.8 *
	Other reasons	6.9 *	1.7 *	2.6 *	2.0 *	3.3 *	1.0	0.9
Portugal	Cannot afford	21.1 *	13.1 *	5.1 *	3.9 *	4.1 *	2.4 *	5.1 *
	Other reasons	3.2 *	4.3 *	0.5 *	1.1	4.3 *	1.4 *	0.9
Romania	Cannot afford	98.8 *	112.5 *	NA	17.1 *	29.7 *	21.3 *	NA
	Other reasons	36.1 *	10.9 *	NA	1.6 *	4.6 *	2.1 *	NA
Slovenia	Cannot afford	NA	2.9 *	2.1 *	2.0 *	4.3 *	0.8 *	1.6 *
	Other reasons	NA	2.2 *	0.7 *	1.3 *	3.9 *	0.1 *	0.5
Slovakia	Cannot afford	16.9 *	8.1 *	3.3 *	2.7 *	1.6 *	2.4 *	3.9 *
	Other reasons	12.4 *	2.8 *	4.3 *	2.5 *	2.3 *	1.9 *	2.2 *
Finland	Cannot afford	0.9	0.6 *	0.6 *	0.4 *	0.2 *	0.1 *	0.5 *
	Other reasons	0.6 *	0.6 *	0.6 *	4.3 *	1.3 *	0.1 *	0.1 *
Sweden	Cannot afford	0.4 *	0.4 *	0.4 *	0.2 *	0.4 *	0.5 *	0.8
	Other reasons	0.8 *	0.4 *	0.6 *	1.4 *	2.2 *	0.1 *	2.8 *

NA: not available. ; * statistically significant at the 5% level

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 9: Nagelkerke pseudo R2, logistic regression, 2014

Other reasons versus have				
Item	**Age**	**Household income quintiles**	**National dummies**	**Full model**
Clothes	0.09	0.03	0.11	0.24
Shoes	0.03	0.01	0.16	0.21
Friends	0.07	0.02	0.06	0.16
Leisure	0.1	0.05	0.1	0.27
Pocket money	0.04	0.02	0.12	0.2
Internet	0.3	0.07	0.07	0.48
Furniture	0.01	0.02	0.41	0.41
Cannot afford versus have				
Item	**Age**	**Household income quintile**	**National dummies**	**Full model**
Clothes	0	0.15	0.13	0.32
Shoes	0.01	0.07	0.29	0.39
Friends	0.01	0.09	0.13	0.31
Leisure	0.01	0.21	0.19	0.44
Pocket money	0	0.14	0.16	0.33
Internet	0.05	0.15	0.14	0.38
Furniture	0	0.18	0.27	0.44

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Income has a significant impact on both the probability of replying "no for affordability reasons" (versus "have") and "no, for other reasons" (versus "have"). The change in odds are however (far) lower for the second option than for the first. This suggests that some of the "other reasons" why people declare not having the item may be correlated with their income/living standards (Guio et al, 2012). This may be explained by different priorities among the poorest (McKay, 2004); by the shame of having to reply that essential items are lacked for affordability reasons (people may therefore prefer to respond that they do not want these items) or due to the so-called "adaptive preferences". According to this theory, poor people may report that they do not want things, simply because they cannot afford them and have got "used" to living without them (see Sen 1985 and 2009). As discussed by Halleröd (2006, p. 372): "People's consumption preferences are shaped to a larger degree by their economic conditions: that is, people prefer what they can afford".

In order to assess the variance explained by low income variables, Table 9 compares the adjusted Nagelkerke pseudo R squared of the partial model which includes either the age of respondent, income quintiles or national dummies with the full model. The first part of Table 9 presents these figures for the "other reasons" modality versus "have" and the second part for the "cannot afford" modality (versus "have"). First, this shows that the fit of the full model for the "other reasons" modality is lower for most items, indicating that unobserved characteristics, such as individual preferences or data collection problems, are likely to explain much of the variation in the odds of selecting "other reasons" for not having an item. The fit is substantially higher for the model estimating the probability of the modality "cannot afford" versus "have", where the observed characteristics have a more substantial impact. Finally, we find that household income explains a much larger share of the variance in enforced lack than in simple lack. As we used household income as a validator, we therefore conclude that enforced lack items show greater validity than simple lack ones (see Section 5).

As shown in Table 8, older respondents also have higher odds of choosing "other reasons" as an answer and this relationship remains significant even after controlling for income. Older people are therefore less likely to want leisure activities or internet access or are prevented from doing so by health problems, skills constraints etc. Some authors argue that there are substantial (and problematic) differences between age groups in terms of whether the lack of an item is attributed to financial problems or to lack of personal relevance and importance of the item. The higher share of "other reasons" among those not having the item in the over 65 age group could also be interpreted as a sign of adaptive preference: older people with low economic resources have had the time to adapt their preferences to what is economically achievable. Figure 2, as well as Tables 8 and 9, show that the impact of the respondent's age on the probability of replying "other reasons" rather than "have" is particularly important for items such as internet access,

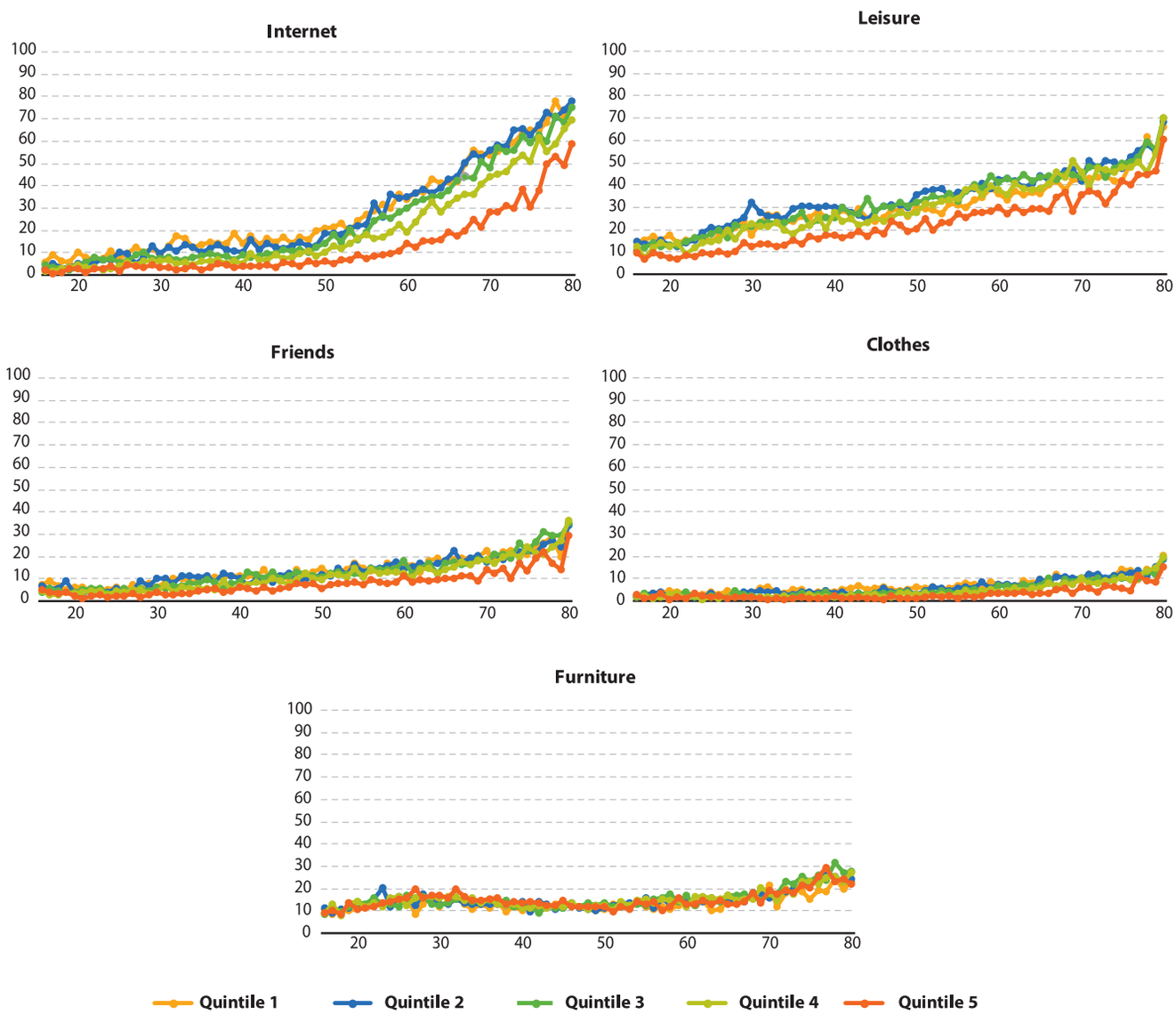
leisure or going out with friends. Older people from the last quintile(s) have a lower probability of answering that they do not have the item for "other reasons".

In Guio, Gordon and Marlier (2012), the differences between age groups were highlighted and discussed (p. 32 and 33) and the authors decided to keep the basket identical for all age groups. Indeed, as the EU-SILC question response categories do not differentiate precisely between respondents who "do not want" an item and those who "do not have" the item for other reasons (health reasons, problems of access, etc., see discussion above), it is difficult to assess differences in suitability between age groups for the items linked to social activities. Even if suitability differs for some items between age groups, we can argue that the importance of some items like internet access is likely to increase among older people in the near future (this is corroborated by the decrease of the proportion of "other reasons" among older people between 2009, 2013 and 2014).

Table 8 and 9 also show the importance of national differences to explain variations in "other reasons" at the EU level. This is particularly true for items like Furniture or Shoes, for which the proportion of variance explained by national dummies is very large, compared with the full model. Variables such as gender or household type have minor effect on the odds of other reasons, but larger impact on the odds of enforced lack. The results presented in Table 8 also show that health problem increase the probability of choosing the "other reasons" modality.

Figure 2: Proportion of persons not having the deprivation item because of "other reasons" by income quintile and age, 2014, EU

(%)



Source: EU-SILC 2014 cross-sectional data, authors' computation.

5. Validity

All items in a deprivation indicator need to be valid measures of deprivation. An individual MD item can be considered to be valid if it exhibits statistically significant relative risk ratios with a set of independent 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 a priori to be correlated with MD.

Four indicators of validity are used as validator:

1. At-risk-of-poverty. Even though the cross-sectional association between low income and deprivation is often lower than might be expected (Perry, 2002), there is a long tradition of using this association to validate deprivation indicators. Both Peter Townsend (1979) and Mack and Lansley (1985) used the size of the correlation between income and deprivation to help select their deprivation items.

2. Economic strain (making ends meet with "great difficulties" or "difficulties"), which is often used as a measure of financial stress, is closely related to MD. Thus, someone who is "deprived" should also be more likely to consider themselves to be subjectively poor.

3. Self-reported health status ("limitations" or "strong limitations" in activities because of health problems, after controlling for age and gender effects). Many scientific studies have shown that people suffering from deprivation have a higher probability of developing health problems (Commission on the Social Determinants of Health, 2008; Leon & Walt, 2001; Power et al, 1996; Shaw et al, 1999; Wilkinson, 1999) and that there is a strong association between living/growing up in poverty and deprivation and having worse health. The relationship can go in both directions, i.e. health problems can also cause poverty. However, while ill health may sometimes be a cause of poverty/ deprivation, the available evidence suggests that, in EU countries, "poor" people are much more likely to become "sick" than "sick" people are to become "poor". The direction of causality is strongly weighted towards deprivation/poverty causing ill health rather than ill health causing poverty/deprivation.

4. The deprivation level is measured by the current EU MD indicator (which defines as deprived people lacking at least three items out of the list of nine items) for the new items not included in the EU 9-item scale. We therefore look at the association between the EU 9-item MD indicator and the new items not used to calculate this MD scale.

We consider that a deprivation item has validity problems if the results of the logistic regressions are not significant in at least two out of our four validity tests. Only a few items([6]) did not pass the validity tests using the health variables (test 3 above), but these items are correlated with income poverty (test 1), difficulties in making ends meet (test 2) and the material deprivation indicator (test 4) as defined by the current EU 9-item deprivation index and therefore pass the validity tests.

([6]) These items are:
- Shoes: Greece, Finland;
- Leisure: Greece, Romania;
- Internet: Romania;
- Arrears: Croatia;
- Car: Greece, Croatia, Romania;
- Unexpected expenses: Croatia.
- Home warm: Finland, Croatia, Lithuania

6. Reliability — Classical Test Theory

Reliability was tested using Classical Test Theory (Nunally, 1978), Item Response Theory (Section 7) and Omega analysis (Section 8).

6.1 Cronbach's Alpha

In Classical Test Theory, the Cronbach's Alpha statistic is the most widely used coefficient of reliability. It 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 – which may or may not be unidimensional. An Alpha of 0.7 or higher is considered to be "satisfactory" in most social science research situations (Nunally, 1978).

We identified which items if omitted (one by one) would increase the reliability of the deprivation index (i.e. increase Cronbach's Alpha – this analysis was performed at both country and EU levels) when an item is dropped.

Examination of the detail Alpha statistics for each indicator shows that the 13 item deprivation index would increase slightly in reliability if certain items were dropped (See Table 10). However, the gain in the overall reliability of the deprivation index in each of these countries would be very small if these less reliable (but valid) items were dropped.

Table 10: Cronbach's Alpha when the items are dropped one by one, 2014

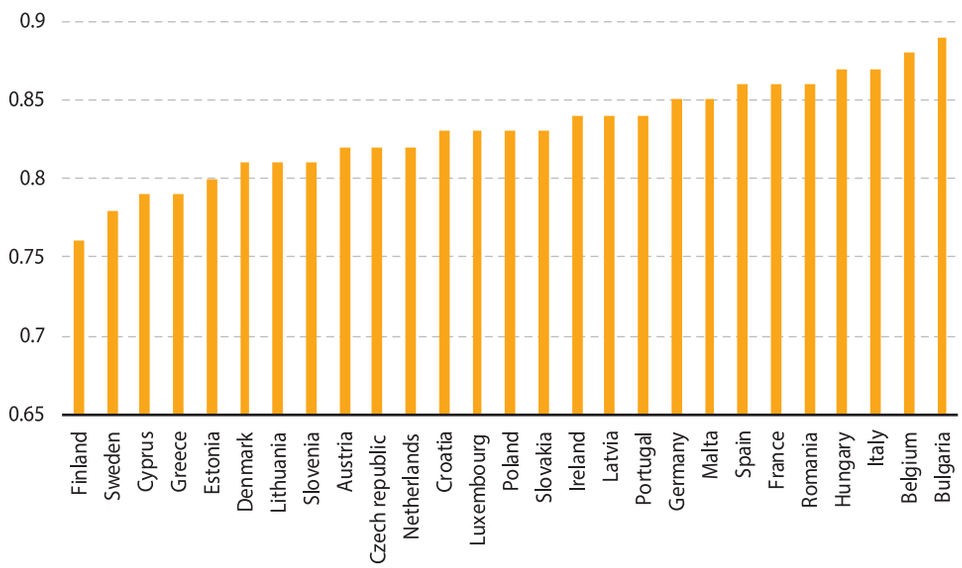
	Total Alpha (no item dropped)	Holidays	Furniture	Arrear	Proteins	Unexpected expenses	Car	Home warm	Clothes	Shoes	Friends	Leisure	Pocket money	Internet
Belgium	0.88	0.87	0.87	0.88	0.88	0.87	0.88	0.88	0.87	0.88	0.86	0.86	0.87	0.88
Bulgaria	0.89	0.88	0.88	0.89	0.88	0.88	0.88	0.88	0.87	0.87	0.87	0.88	0.87	0.88
Czech Republic	0.82	0.8	0.81	0.82	0.81	0.8	0.81	0.82	0.8	0.82	0.81	0.8	0.8	0.82
Denmark	0.81	0.8	0.79	0.8	0.81	0.8	0.81	0.81	0.79	0.81	0.8	0.79	0.79	0.82
Germany	0.85	0.83	0.83	0.85	0.84	0.83	0.85	0.84	0.84	0.85	0.83	0.83	0.83	0.85
Estonia	0.8	0.78	0.77	0.8	0.78	0.78	0.79	0.8	0.78	0.8	0.77	0.78	0.78	0.8
Ireland	0.84	0.82	0.82	0.82	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.82	0.82	0.83
Greece	0.79	0.77	0.78	0.78	0.78	0.77	0.79	0.78	0.79	0.79	0.78	0.77	0.78	0.79
Spain	0.86	0.84	0.84	0.85	0.86	0.84	0.86	0.85	0.84	0.85	0.84	0.84	0.84	0.85
France	0.86	0.85	0.84	0.86	0.85	0.85	0.86	0.86	0.84	0.85	0.85	0.84	0.84	0.86
Croatia	0.83	0.83	0.82	0.83	0.82	0.82	0.83	0.82	0.81	0.83	0.81	0.82	0.81	0.83
Italy	0.87	0.87	0.86	0.87	0.87	0.86	0.88	0.87	0.86	0.87	0.86	0.86	0.86	0.87
Cyprus	0.79	0.77	0.77	0.78	0.78	0.77	0.8	0.77	0.76	0.79	0.78	0.76	0.78	0.78
Latvia	0.84	0.82	0.82	0.83	0.83	0.82	0.83	0.83	0.81	0.82	0.82	0.82	0.83	0.83
Lithuania	0.81	0.8	0.79	0.81	0.8	0.79	0.8	0.82	0.79	0.82	0.79	0.79	0.8	0.81
Luxembourg	0.83	0.8	0.81	0.82	0.82	0.81	0.83	0.83	0.8	0.83	0.8	0.81	0.8	0.83
Hungary	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.87	0.86	0.87	0.86	0.86	0.86	0.87
Malta	0.85	0.84	0.84	0.85	0.84	0.84	0.85	0.85	0.83	0.84	0.83	0.83	0.83	0.85
Netherlands	0.82	0.79	0.79	0.82	0.81	0.8	0.82	0.82	0.81	0.82	0.81	0.8	0.8	0.83
Austria	0.82	0.8	0.8	0.82	0.81	0.8	0.81	0.82	0.8	0.82	0.81	0.79	0.8	0.82
Poland	0.83	0.82	0.81	0.82	0.82	0.81	0.83	0.82	0.81	0.83	0.81	0.81	0.81	0.83
Portugal	0.84	0.83	0.83	0.84	0.84	0.82	0.83	0.83	0.82	0.84	0.82	0.82	0.82	0.83
Romania	0.86	0.85	0.85	0.86	0.85	0.85	0.86	0.86	0.85	0.85	0.85	0.85	0.85	0.85
Slovenia	0.81	0.79	0.79	0.8	0.79	0.79	0.8	0.8	0.78	0.81	0.79	0.78	0.79	0.81
Slovakia	0.83	0.82	0.81	0.83	0.82	0.81	0.82	0.83	0.81	0.83	0.81	0.81	0.81	0.82
Finland	0.76	0.74	0.73	0.75	0.75	0.74	0.76	0.78	0.73	0.76	0.75	0.74	0.75	0.76
Sweden	0.78	0.76	0.75	0.77	0.78	0.76	0.78	0.79	0.76	0.78	0.77	0.75	0.75	0.79

Source: EU-SILC 2014 cross-sectional data, authors' computation.

The final Cronbach's alpha using the 13 items is higher than the 0.7 threshold in all countries (see Figure 3).

Figure 3: Cronbach's Alpha, 2014

(13-item MD measure)



Source: EU-SILC 2014 cross-sectional data, authors' computation.

6.2 Other measures of reliability

Alpha has been the most widely used reliability statistic in social sciences, however, its validity is based on a series of assumptions that are rarely met in practice (Sijtsma, 2008). Alpha assumes that all items have the same relationship with the true score and that all items have the same amount of variance. In practice, this is rarely the case and alpha is likely to offer an imprecise summary of the overall reliability of an index.

Guttman (1945) proposed six different reliability measures based on a range of assumptions. There are three parameters that matter in computing Guttman's six reliability statistics: the total variance of a scale, the variance of each of its components and the covariance between items. Basically, each statistic uses the three parameters in different ways, for example, it can use a sum of the variance, item by item variance, etc. with different types of adjustments such as the number of items. A good reliability coefficient therefore needs to be sensible enough to take into account the different manners in which the data affect these variances. The theoretical work of Guttman offers the possibility of detecting under which circumstances a reliability coefficient is better than other.

Among the six statistics, Lambda 4 is usually the best reliability statistic (Callender and Osburn, 1979). It computes reliability in such a way that it is often more accurate than the other statistics. This is done by splitting a given item into halves and computing the variances of each subset. This is done several times until the lower bound value of reliability is found. For many years, this iterative process which requires fast computers, was often too difficult to calculate and Lambda 2 offered the best possible alternative among the other five lambdas. Guttman showed that, Lambda 2 is often a more accurate lower bound reliability index than Lambda 3 (Cronbach's Alpha), in some cases Lambda 2 would be equal to Lambda 3 but never lower. It follows that Lambda 2 is never less accurate than Alpha and that Lambda 4 is better than Lambda 2([7]).

Revelle (1979) has argued that coefficient Beta can provide additional and complementary information about reliability. Beta provides information about the homogeneity of the deprivation index, e.g. if there are some items in the index which may be unreliable, causing the index to be "lumpy" (Revelle, 1979). Beta can be considered to be a conservative estimate of reliability and a lower bound of the percentage of the deprivation index that measures a single latent construct (e.g. Material Deprivation). Item cluster analysis is a technique that permits the analysis of reliability and exploration of the dimensional structure of an index using two statistics: Beta and Alpha. It is a helpful technique to examine in the way items are related according to their proximity (i.e. correlation) and how reliable the sub-groupings are. The resulting structure therefore enables judgments about the internal consistency of a measure and about the existence of possible sub-groups (dimensions).

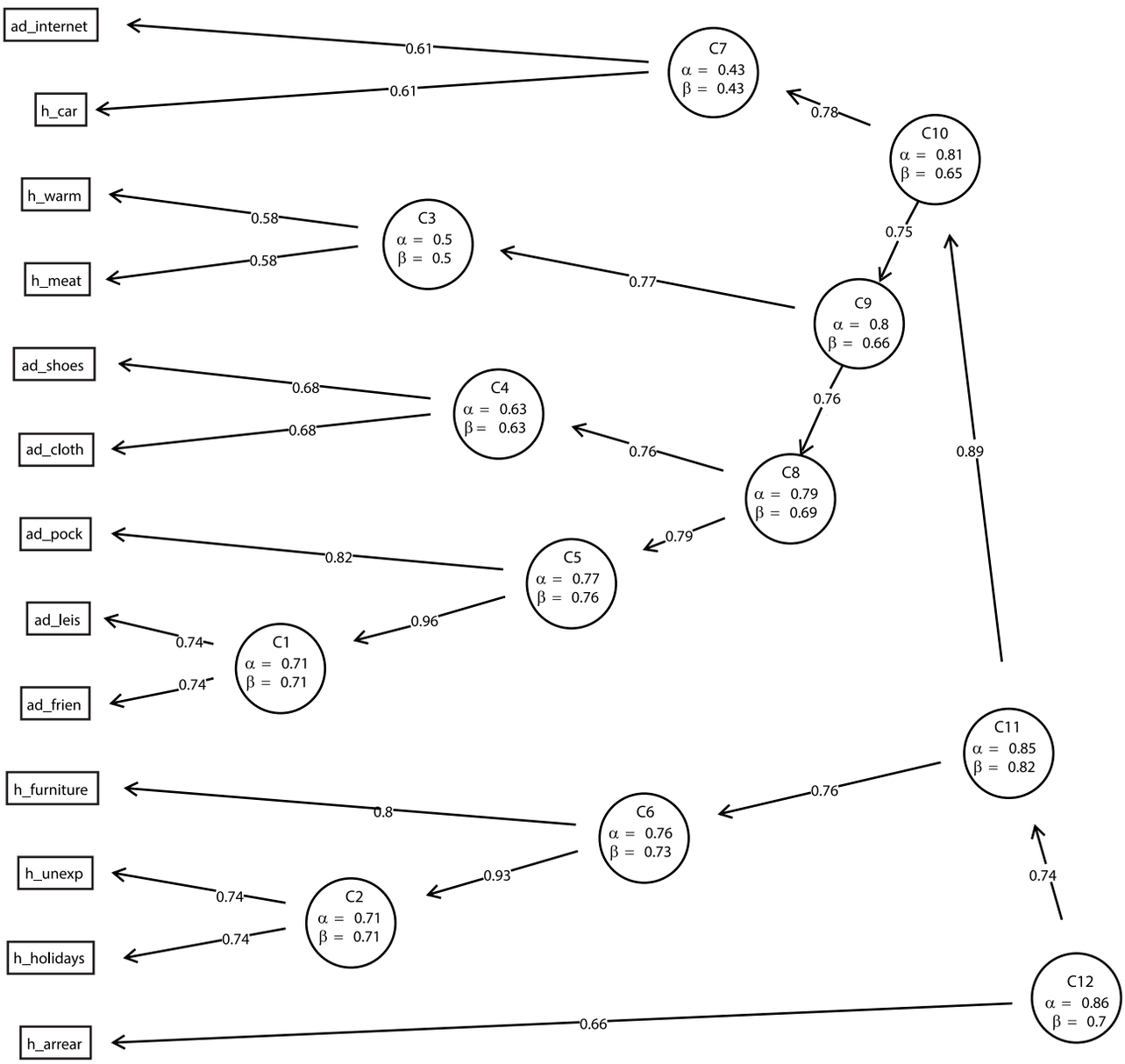
Figure 4 shows the results of the Item Cluster Analysis for all countries. The 13 deprivation items can be grouped into 12 reliable clusters. Although there are clusters of items with low reliability values (car and internet; warm and meat), when these clusters are merged with other deprivation items both beta and alpha increase to high levels. Cluster 11 has the highest reliability values and includes all the indicators but arrears, which is the only single-item cluster.

Table 11 shows the Beta, Lambda 2 and Lambda 4 statistics for the 13-item deprivation index in each EU Member State. In every EU Member State the Guttman's Lambda 2 and Lambda 4 coefficients are all greater than the threshold value of 0.7 and for most countries are above 0.8 – indicating a very reliable deprivation measure. However, ten countries have a low Beta value (ß <= 0.5) which may indicate some homogeneity problems with the deprivation index in these countries e.g. the 13 item index may include some individual unreliable (or multidimensional) components in these countries. These countries are Cyprus, Denmark, Estonia, Greece, Finland, Italy, Lithuania, Luxembourg, Netherlands and Sweden (Austria, France and Slovenia are borderline with a Beta of 0.49).

In most cases, Beta falls due to one or two items with a low correlation with the other deprivation items. If these indicators are removed, then the Beta value would be higher than 0.5. In Finland for example, the cluster regrouping 12 items (all but keeping the home warm) has a Beta of 0.57, which decreases to 0.24 once the last item is added. In Cyprus, the tenth cluster (which regroups 11 items) has a Beta of 0.65. The Beta decreases once shoes and car are clustered with the other items. In Greece, it is the addition of shoes and clothes (for which there are problems of data collection) which decreases the final Beta. In Estonia, arrears is poorly related to the other items and in Italy, the inclusion of car deprivation decreases the Beta from 0.76 to 0.36.

([7]) It should be noted that Guttman's Lambda 6 measure is similar to Macdonald's (1978,1999) Omega (see Section 8) – however Lambda 6 is calculated using linear regression analysis and Omega is based on Factor analysis – see Revelle and Zinbarg (2009) for discussion.

Figure 4: Item cluster analysis, pooled sample, 2014



Note: see Annex 1 for item abbreviations. The diagram shows the correlations of the items with the corresponding cluster, as well as the alpha and beta coefficients of each cluster.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 11: Reliability of the 13 item Deprivation Measure by country, 2014

	Beta	Lambda 2	Lambda 4
EU	**0.7**	**0.86**	**0.88**
Belgium	0.64	0.88	0.91
Bulgaria	0.84	0.88	0.92
Czech Republic	0.72	0.81	0.85
Denmark	0.41	0.8	0.84
Germany	0.54	0.85	0.88
Estonia	0.48	0.8	0.83
Ireland	0.7	0.83	0.87
Greece	0.45	0.79	0.84
Spain	0.55	0.86	0.89
France	0.49	0.86	0.88
Croatia	0.69	0.83	0.87
Italy	0.36	0.88	0.91
Cyprus	0.34	0.8	0.84
Latvia	0.72	0.84	0.87
Lithuania	0.38	0.81	0.85
Luxembourg	0.46	0.84	0.89
Hungary	0.56	0.87	0.9
Malta	0.55	0.85	0.89
Netherlands	0,32	0.81	0.84
Austria	0.49	0.82	0.85
Poland	0.54	0.83	0.86
Portugal	0.58	0.84	0.87
Romania	0.86	0.86	0.9
Slovenia	0.49	0.81	0.84
Slovakia	0.55	0.83	0.86
Finland	0.24	0.76	0.81
Sweden	0.31	0.79	0.84

Source: EU-SILC 2014 cross-sectional data, authors' computation.

7. Reliability — Item Response Theory

Classical Test Theory provides information on the reliability of a MD scale/index as a whole. The results can be further explored with Item Response Theory (IRT), which provides additional information on the reliability of each individual item in the scale/index. IRT, 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. IRT 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 (e.g., Capillary and Jenkins, 2007; Fusco and Dickes, 2008; Martini and Vanin, 2010; Raileanu Szeles and Fusco, 2011).

We have applied a two-parameter IRT test to each of the MD items. The first parameter can be interpreted as the likely severity of MD suffered by a person who lacks this item because he/she cannot afford it ("enforced lack"). The severity scores are measured in units of standard deviation from the average. As in Guio, Gordon and Marlier (2012), we set the severity criterion at 3 standard deviations from the mean, i.e., we flag all items with a severity greater than 3 standard deviations (borderline severity levels between 3 and 3.5 have a lighter flag).

The discrimination scores indicate how well each item discriminates between the deprived and non-deprived respondents, and can be expressed as IRT parameters or translated into factor loadings (ranging between -1 and +1). The criterion we use here is to flag all items whose loading (i.e. correlation with MD) is lower than 0.4.

As illustrated in Figure 5, the ability of each item to measure severity is shown by the position of an asymptotic (i.e. "S" shaped curve, called Item Characteristic Curves) along the X-axis – the further to the right the more severe the deprivation. The ability of each item to discriminate between deprived and non-deprived people/households is shown by how vertical each curve is with respect to the y-axis; the more upright the better the discriminating ability of the item and the higher its correlation with MD.

Ideally, a "good" MD index would be illustrated by a series of fairly vertical "S" shaped curves spread out along the X-axis. The inflection point of each curve, that is, half the distance between the upper and lower asymptotes, where the slope is steepest, should lie between 0 and +3 on the X-axis (i.e. have a severity of between 0 and +3 standard deviations).

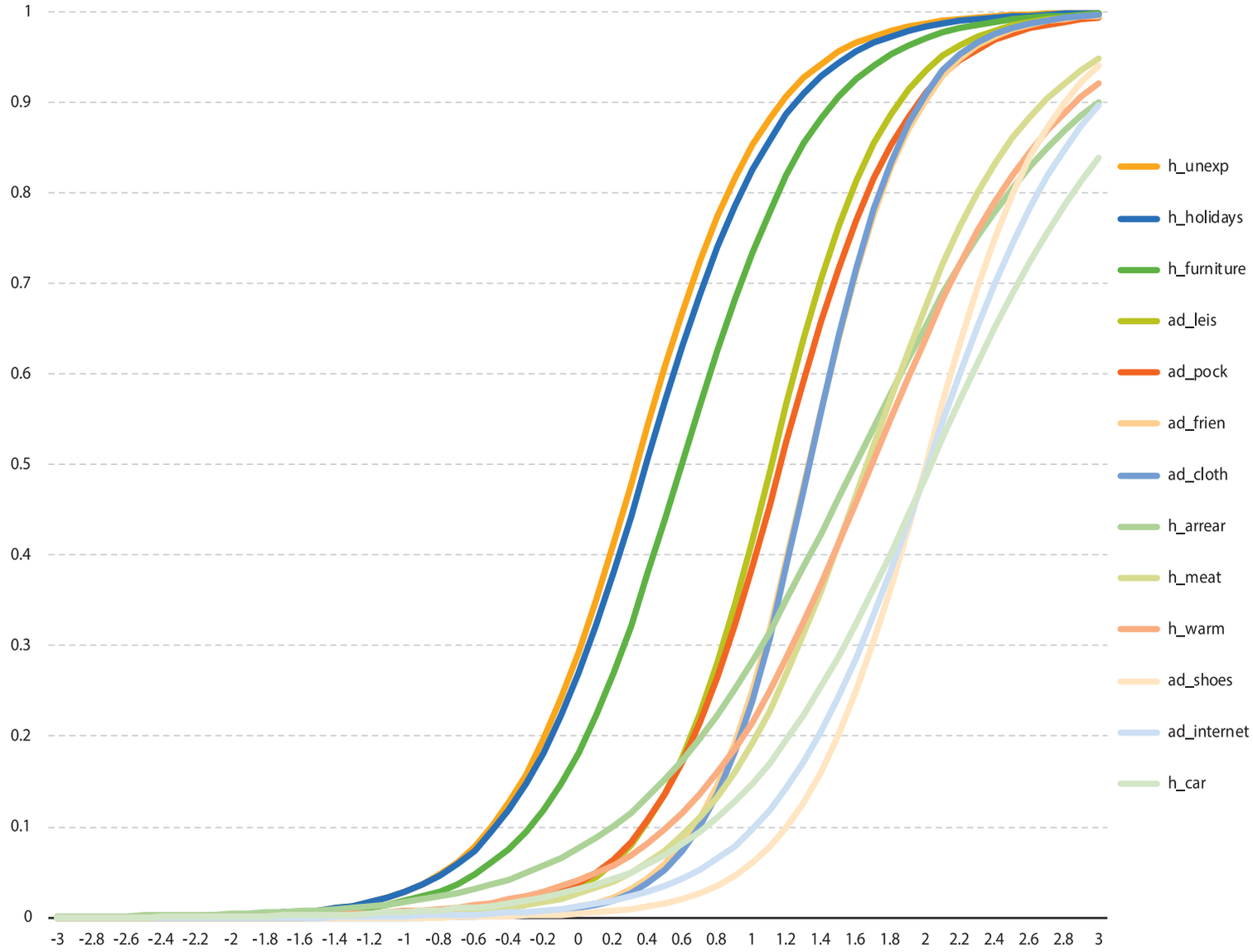
Deprivations such as holidays and unexpected expenses are generally associated with lower levels of deprivation, whereas access to internet, shoes and car deprivation are associated with much higher levels of deprivation (i.e. are more severe).

As highlighted in Table 12, the severity coefficients are borderline for internet in four EU Member States (Denmark, Finland, Netherlands, Sweden), for keeping adequately warm in Estonia and Sweden, for lacking access to a car in the household in Italy, and lacking a meal with proteins in Denmark. Not keeping the home warm is a very severe deprivation in Finland where it is a matter of survival due to climatic conditions, as well as lacking a car in Cyprus, where the number of cars per capita is amongst the highest in the EU (549 cars per 1000 inhabitants in 2012) – along with Italy (619 cars per 1000 inhabitants in 2012)([8]).

Only the deprivation item related to keeping the home adequately warm in Lithuania has a correlation with the overall 'trait' below 0.4 while the vast majority of all other items have a correlation of above 0.4 (our criterion value), see Table 13.

([8]) http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdpc340&plugin=1

Figure 5: Item Characteristic Curves (EU-28). Legend sorted by item severity (from least severe deprivation: unexpected expenses and holidays to most severe: shoes and car), 2014



Note: see Annex 1 for item abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation

Table 12: Severity coefficients by country, 2014

	Unexpected expenses	Holidays	Furniture	Leisure	Pocket money	Friends	Clothes	Arrears	Proteins	Home warm	Shoes	Internet	Car
EU-28	**0.3**	**0.4**	**0.6**	**1.1**	**1.2**	**1.3**	**1.3**	**1.6**	**1.7**	**1.7**	**2**	**2**	**2**
Belgium	0.8	0.7	1.2	1.1	1.3	1.3	1.5	2	2	2	2.2	2.1	1.9
Bulgaria	-0.1	-0.1	-0.7	0.4	0.2	0.5	0.1	0.8	0.4	0.4	-0.1	1	1.1
Czech Republic	0.3	0.4	0	1.7	1.6	2.1	1.8	2.5	1.6	2.3	2.6	2.4	1.9
Denmark	0.9	1.5	1.6	1.8	1.7	2.2	2	2.1	3.2	2.7	2.8	3.4	2.9
Germany	0.6	1.1	1.2	1.3	1.3	1.2	1.9	2.5	1.9	2.2	2.6	2.3	2.2
Estonia	0.3	0.4	0.5	1.9	1.7	1.6	1.7	2.6	1.8	3.1	2.5	2.6	1.7
Ireland	-0.1	0.1	0.9	1.4	1.2	1.1	1.6	1.2	2.1	1.7	2	2.3	2.3
Greece	0.1	0.1	0	0.9	0.2	1.1	2.3	0.3	1.5	0.7	2.4	2.3	2.5
Spain	0.3	0.1	0.3	1	1	1.3	1.5	1.7	2.4	1.7	2.1	1.6	2.5
France	0.5	0.8	0.7	1.1	1.1	1.7	1.4	1.8	1.8	2.2	1.7	2.7	2.7
Croatia	-0.4	-0.7	0.5	1.6	0.9	1.5	1.1	1.1	1.5	1.8	2	2.2	2
Italy	0.5	0.1	0.6	0.9	1.1	1.2	1.2	1.6	1.7	1.4	1.8	1.7	3.1
Cyprus	-0.2	-0.2	-0.2	1	1.7	1.8	1.1	0.8	2.2	1	3	2.1	4
Latvia	-0.6	0.1	-0.3	0.8	1.4	1.4	0.5	1.6	1.2	1.4	0.9	1.8	1
Lithuania	-0.1	0.1	-0.1	0.5	1	1.1	0.8	2.1	1.4	2	2.8	1.9	1.7
Luxembourg	0.8	1.3	1.1	1.8	1.6	1.7	1.8	2.2	2.2	3	2.6	2.9	2.5
Hungary	-1	-0.4	0	0.4	0.7	0.3	0.5	0.9	0.8	1.6	2.1	1.4	1
Malta	1	-0.1	1	0.6	0.5	0.9	1.4	2	1.5	1.4	1.3	2.3	2.6
Netherlands	1.2	1.3	1.1	1.7	1.9	2.5	2.2	2.3	2.7	2.8	2.6	3.5	2.4
Austria	1	1.2	1.5	1.4	1.5	1.9	1.9	2.3	2	2.4	2.7	2.7	2.2
Poland	0	-0.2	0.5	0.8	1.2	1.2	1.3	1.7	1.6	1.8	2.4	2.3	2.1
Portugal	0.2	-0.3	-0.3	0.9	1	1.1	0.9	1.9	2.2	0.9	2.2	1.8	1.8
Romania	-0.2	-1	-0.7	-0.3	-0.2	0.4	0.5	1.3	1.2	2	0.5	0.7	0.9
Slovenia	0.2	0.5	1	1	1.6	1.6	1.5	1.3	1.9	2.2	2.7	2.6	2.7
Slovakia	0.4	0	0.3	1.3	1.2	1.5	1.4	2.5	1.1	2.6	2.5	1.8	1.6
Finland	0.9	1.5	1.6	2.4	2.4	2.8	2.1	1.8	2.6	4.6	2.8	3.2	2.7
Sweden	1.2	1.7	2	2	1.9	2.6	2.3	2.2	3	3.3	2.7	3.5	2.8

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 13: Discrimination coefficients by country, 2014

	Unexpected expenses	Holidays	Furniture	Leisure	Pocket money	Friends	Clothes	Arrears	Proteins	Home warm	Shoes	Internet	Car
EU-28	**0.8**	**0.8**	**0.8**	**0.9**	**0.8**	**0.9**	**0.9**	**0.7**	**0.8**	**0.7**	**0.8**	**0.8**	**0.7**
Belgium	0.9	0.9	0.9	1	0.9	0.9	0.9	0.7	0.8	0.8	0.9	0.8	0.8
Bulgaria	0.8	0.8	0.7	0.8	0.9	0.9	0.9	0.5	0.7	0.6	0.9	0.8	0.6
Czech Republic	0.8	0.8	0.8	0.9	0.8	0.9	0.9	0.7	0.7	0.7	0.9	0.8	0.7
Denmark	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.7	0.7	0.8	0.9	0.8	0.6
Germany	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.7	0.7
Estonia	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.5	0.8	0.7	0.8	0.7	0.7
Ireland	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.9	0.8	0.8	0.7	0.6
Greece	0.8	0.8	0.5	0.8	0.7	0.7	0.9	0.6	0.8	0.6	1	0.6	0.5
Spain	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.7	0.8	0.7	0.9	0.8	0.6
France	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.7	0.8	0.7	0.9	0.7	0.7
Croatia	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.5	0.7	0.7	0.8	0.8	0.6
Italy	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.9	0.9	0.7
Cyprus	0.8	0.8	0.7	0.8	0.8	0.8	0.9	0.6	0.7	0.7	0.8	0.8	0.6
Latvia	0.8	0.6	0.8	0.8	0.6	0.8	0.9	0.5	0.7	0.6	0.8	0.7	0.6
Lithuania	0.8	0.7	0.8	0.7	0.7	0.9	0.9	0.6	0.7	0.3	0.8	0.7	0.6
Luxembourg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.8	0.9	0.8	0.8
Hungary	0.8	0.8	0.8	0.9	0.8	0.9	0.9	0.7	0.7	0.7	0.8	0.8	0.6
Malta	0.7	0.7	0.7	0.9	0.9	0.9	0.9	0.5	0.7	0.5	0.8	0.7	0.7
Netherlands	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.8	0.7
Austria	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.7	0.7	0.8	0.9	0.8	0.8
Poland	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.6	0.7	0.7	0.8	0.7	0.6
Portugal	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.6	0.8	0.6	0.8	0.7	0.7
Romania	0.6	0.7	0.6	0.7	0.7	0.7	1	0.4	0.6	0.5	1	0.6	0.4
Slovenia	0.8	0.8	0.7	0.8	0.8	0.8	0.9	0.6	0.7	0.7	0.9	0.7	0.7
Slovakia	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.5	0.7	0.6	0.8	0.8	0.6
Finland	0.9	0.8	0.9	0.9	0.8	0.8	0.9	0.7	0.8	0.5	0.9	0.8	0.6
Sweden	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.9	0.7	0.7

Source: EU-SILC 2014 cross-sectional data, authors' computation.

8. Reliability — Hierarchical Omega Analysis

Despite its popularity and widespread use in scale development, the Cronbach's alpha coefficient of reliability has some potential drawbacks and limitations (see discussion in Section 6). The alpha coefficient measures both the general factor saturation (i.e. the correlation/loading between each deprivation item and the latent variable/general factor we call "overall deprivation"), but also the group factor (i.e. factors/latent variables that are common to some but not all items and that are uncorrelated with the general factor) correlation/saturation. The group factor represents systematic information (e.g. social or material deprivation) over and above what is measured by the general factor (Overall Deprivation) and which some but not all sub-groups of the deprivation items measure. See Zinbarg, Revelle, Yovel and Li (2005) for a thorough comparison of the reliability coefficients. If the deprivation index is "lumpy" (not homogeneous) then Alpha will overestimate the general factor saturation (e.g. Overall Deprivation) and underestimate the common/group factor saturation (e.g. social deprivation). Beta does the opposite being strongly influenced by the size of the group factor correlations (see above).

The Omega statistics ω and ω_h can produce a more accurate estimate of the reliability of the deprivation index - the greatest lower bound of reliability (Revelle and Zinbarg, 2009). ω_h is a useful statistic to assess reliability, particularly when a measure is multidimensional (Zinbarg et al, 2005). Discrepancies between Alpha and Omega are due to multidimensionality and the relationship between each item and the latent construct. Alpha is higher than ω_h when there are strong group factors (dimensions such as social and material or housing deprivations) and there is low variability in the relationship between the individual deprivation items and the higher order factor (overall deprivation). This seems to be the case for the proposed 13-item deprivation index. The ratio between ω and ω_h equals the percentage of the explained variance accounted for by the higher order factor (Overall Deprivation).

However, in order to calculate ω_h (Omega Hierarchical) a multi-dimensional model needs to first be specified. Thus, to calculate ω and ω_h four structural models were estimated([9]) drawn from both the theoretical work of Townsend (1979) and from well-founded empirical results on previous survey data([10]).

- **Model 1:** Unidimensional Model. Null Model.
- **Model 2:** The Townsend model. A simplified version of Townsend's deprivation structural model where deprivation comprises two dimensions: Material and Social deprivation. In the 1968/69 Poverty in the United Kingdom study, Townsend divided 'deprivation' into these two major categories (Material and Social) and further sub-divided these two major categories into seven and four sub-groups respectively (see Townsend, 1979, pp.1173-1176). Townsend refined his deprivation model during his development work on the 1987 Booth Centenary Survey of Poverty and Labour in London (Townsend and Gordon, 1989).
- **Model 3:** The empirical model of deprivation. This model proposes grouping the items into three dimensions: Economic strain, Enforced lack of durables and Housing. Guio (2009) used confirmatory factor analysis (CFA) on 2007 EU-SILC data for the whole of the EU and showed the consistency of this dimensional structure previously identified using 2001 European Household Panel survey (ECHP) and EU-SILC-2003 data (Guio, 2005).
- **Model 4:** The Irish Model proposed by the Economic and Social Research Institute (ESRI). This has three dimensions: Basic, Secondary and Housing deprivation. The ESRI developed the Government of Ireland's measure of consistent poverty, which is a combined low income and deprivation measure. As part of this research Callan et al (1993) identified these three dimensions of deprivation. Whelan et al (2001) used a CFA model in their analyses of the 1994 ECHP with a similar dimensional structure.

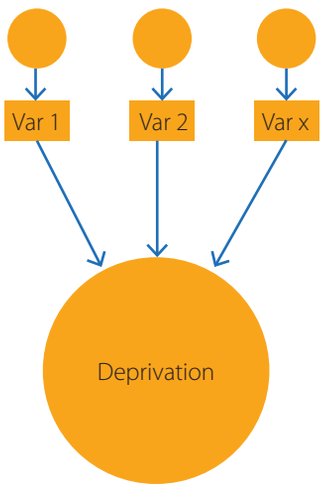
Figure 6 illustrates the structure of these four models of deprivation.

([9]) The models were fitted in MPLUS using both Maximum Likelihood (MLR estimator) and Weighted Least Squares (WLSMV estimator). MLR outperforms WLSMV but it has the drawback of being computationally intensive and it does not permit the calculation of relative statistics of fit such as RMSEA, TLI and CFI, which are useful for assessing the fit of the model when using large samples. However, all the more complex models (i.e. Models 2-4) had convergence problems using WLSMV. Therefore, the results shown are from the maximum likelihood estimates, and model comparisons can be undertaken using BIC, adjusted BIC by sample size and AIC (for models with the same variables).

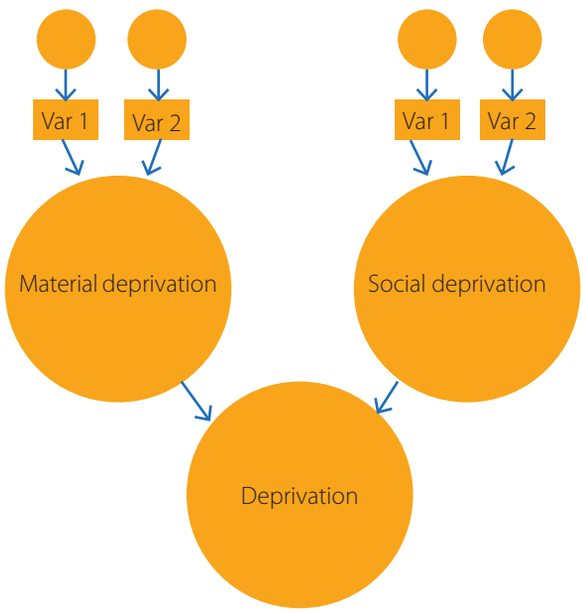
([10]) A series of sensitivity analyses were undertaken to assess the potential effects of missing data, collinearity and aggregation (i.e. individual-level data vs household-level data) upon: a) The global fit of the structural models; b) The standardised loadings of the main models (Model 1-4) and c) The estimation of ω and ωh. The result of these analyses is that the conclusions about model selection do not change after considering the missing data and collinearity, the standardised loadings barely differ across different models and the Omega statistics do not change.

Figure 6: Alternative Models used in the Omega analysis

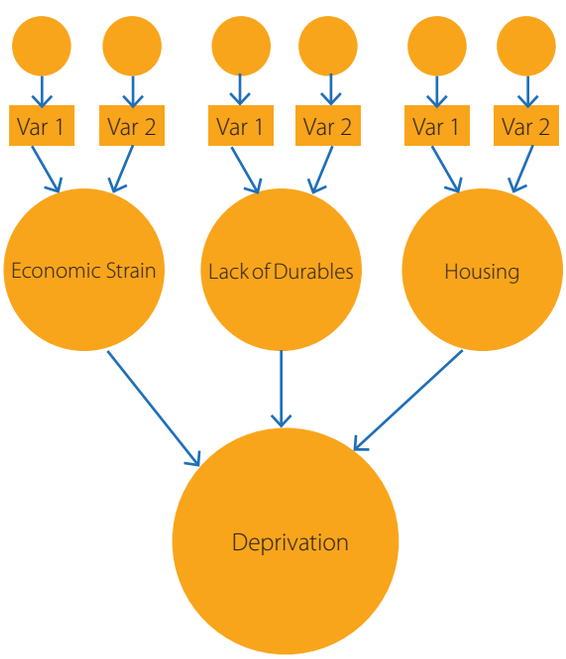
1. Null Model



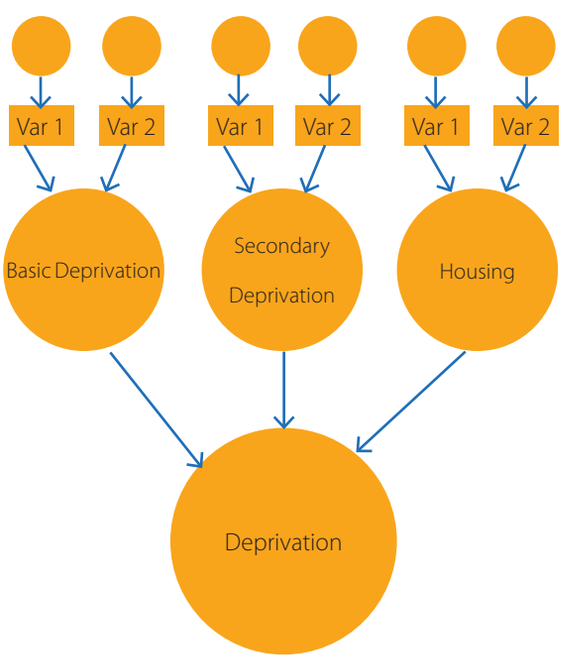
2. Townsend/PSE (simplified) Model



3. Empirical Model



4. ESRI Model



The purpose of the omega analysis is twofold. First, it examines the four structural models drawn from both theory and previous empirical analyses.

The second objective is to estimate both the Omega (ω) and the hierarchical Omega (ωh) statistics to assess reliability and the importance of the higher order factor (Overall Deprivation), Table 14 presents the Omega and the hierarchical Omega when wefocus on the 13 items proposed by Guio et al (2012), i.e. the 13 deprivation items have been grouped into domains as shown in Figures 6.1 to 6.4.

Table 14 contrasts the global statistic of fit (adjusted Bayesian Information Criteria (BIC)) of the four structural models. The unidimensional model has the best fit. This model therefore will be utilised for the Measurement Equivalence analysis (see Section 11) and the computation of the Omega statistics.

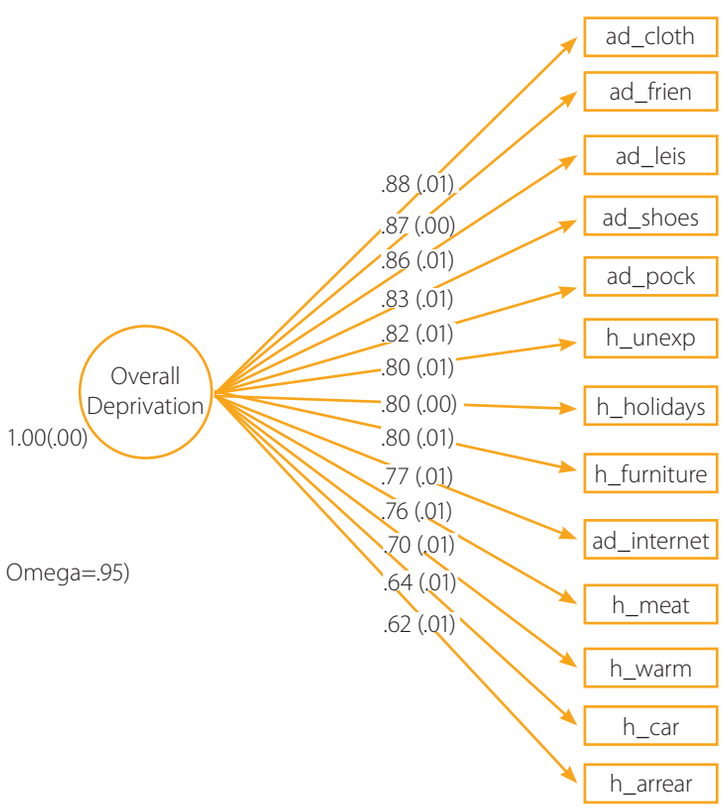
Table 14: Maximum Likelihood global statistics of fit. Model 1-4, 2014

Omega statistics using measurement models			
	Omega	**Omega_h**	**BIC**
Unidimensional	0.95	0.95	4613267
Townsend	0.94	0.64	4708170
Empirical	0.91	0.71	4717885
ESRI Model	0.87	0.74	4711749

Source: EU-SILC 2014 cross-sectional data, authors' computation.

The Path diagrams of Models 2 to 4 are presented in Annex 2. Figure 7 shows the path diagram of Model 1. As can be appreciated, all the loadings of the unidimensional model are high (>=.7) with the exception of the car and arrears which are slightly lower.

Figure 7: Path diagram. Unidimensional model, EU-28, 2014



Note: See Annex 1 for items abbreviations
Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 15 shows the model-based omega statistics (comparing the unidimensional and the Townsend models) per country. All the countries have very high Omega values (>0.9) indicating that the 13 item deprivation index is highly reliable in all EU member states and for the EU as a whole.

Table 15: Omega Analysis, national level, 2014

	Unidimensional		Townsend		
	Omega	BIC	Omega	Omega_h	BIC
Belgium	0.97	83593	0.95	0.65	86226
Bulgaria	0.94	155878	0.93	0.63	160109
Czech Republic	0.95	125497	0.95	0.64	127748
Denmark	0.94	73381	0.94	0.64	74320
Germany	0.94	188040	0.93	0.64	192065
Estonia	0.93	111990	0.93	0.65	113873
Ireland	0.94	124365	0.94	0.65	126486
Greece	0.92	226947	0.93	0.63	230458
Spain	0.96	245426	0.94	0.65	250931
France	0.95	182346	0.94	0.64	186617
Croatia	0.94	121422	0.94	0.64	123073
Italy	0.96	385840	0.94	0.65	397204
Cyprus	0.93	107605	0.93	0.64	109133
Latvia	0.92	157885	0.92	0.63	158775
Lithuania	0.92	123433	0.92	0.63	125872
Luxembourg	0.97	39261	0.95	0.65	40550
Hungary	0.95	242356	0.93	0.64	247061
Malta	0.94	109760	0.92	0.64	111200
Netherlands	0.95	127708	0.95	0.64	130432
Austria	0.96	70340	0.94	0.64	71973
Poland	0.94	310111	0.93	0.64	315812
Portugal	0.94	159328	0.94	0.65	162471
Slovenia	0.94	207387	0.94	0.64	211409
Slovakia	0.93	139511	0.93	0.64	141971
Finland	0.95	126804	0.94	0.64	128633
Sweden	0.93	53870	0.93	0.64	54715

Source: EU-SILC 2014 cross-sectional data, authors' computation.

9. Additivity

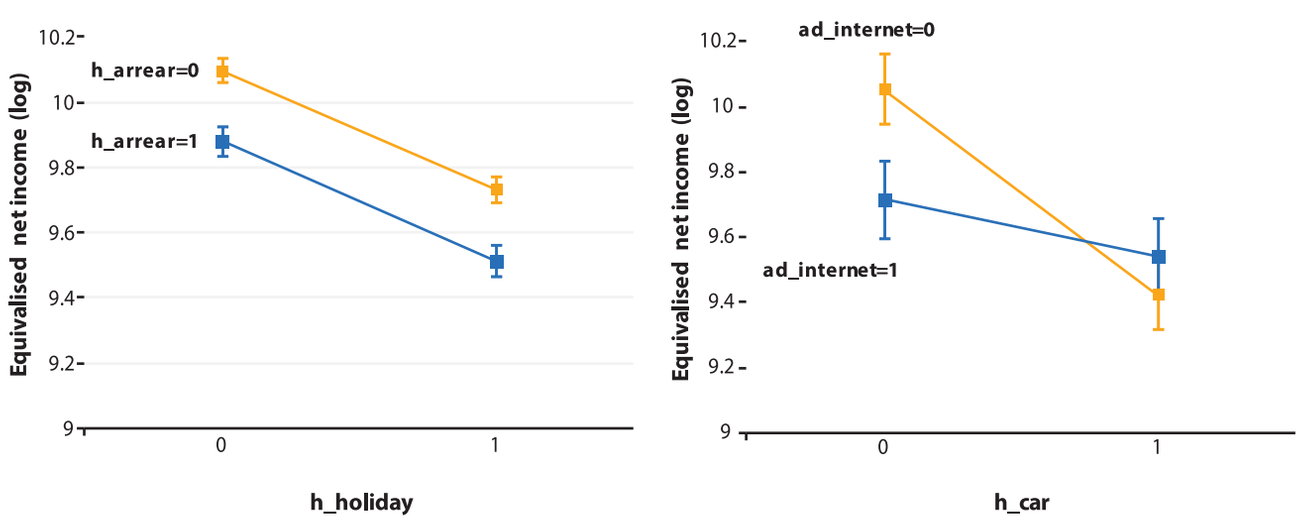
Additivity tests aim to ensure that the MD indicator's components add up, i.e. to check that, someone with a MD indicator score of "2" is in reality suffering from more severe MD than someone with a score of "1" or a score of "0". This was checked using an ANOVA model (second order interactions of MD items by (the log of) equivalised disposable household income). Negative incomes were adjusted according to the methodology proposed by Verma (2007). These models assume that people 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 (e.g. clothes or shoes deprivation only) or no deprivations. Similarly, those people suffering from one deprivation should have lower incomes than those with no deprivations. This should hold for all possible combinations of deprivation items.

Figure 8 compares two second order interaction effects for some items in Austria. Ideally, the two lines should move from top left to bottom right, as in the left-hand chart, which indicates that:

- households which have no deprivation (top-left of the chart) are estimated to have the highest income;
- households suffering from two deprivations (bottom-right) are estimated to have the lowest incomes; and
- households suffering from one deprivation are estimated to have intermediate levels of income.

The left-hand chart presents the desired outcome, while the right-hand chart below illustrates a problematic case, where the two lines intersect. This indicates that there may be additivity problems for these two MD items. These figures also show the 95% predicted value Confidence Intervals of the mean household income and illustrates the sensitivity of the results to the sample size. In this case it is difficult to establish whether there really are additivity problems because of the small number of cases which are not deprived of internet access but are deprived of access to a car and we therefore do not flag this as an additivity problem. Overall, all EU-level models meet the additivity assumption. At the country level, on the basis of thousands of possible interactions, no item fails the additivity tests in more than three countries.

Figure 8: ANOVA second order interaction plot of MD items by income, Austria, 2014



Note: See Annex 1 for items abbreviations

Source: EU-SILC 2014 cross-sectional data, authors' computation.

10. Final list of the items

Table 16 summarises the results of the various tests performed so far on the EU-SILC 2014 deprivation data.

Table 16: Outcomes of suitability, validity, reliability and additivity tests, total population, 2014

Adult items:	Problems
Some new clothes	√
Two pairs of shoes	√
Getting together with friends	√
Leisure activities	√
Pocket money	√
Internet	Severity, alpha and beta problems in DK, NL and SE (FI) Suitability borderline in HR, CY and IT (but rapid progress in recent years)
Household items	
Unexpected expenses	√
Holiday	√
Meat, chicken, fish each second day	Severity and beta problems in DK
Adequate warmth in home	Severity/discrimination, alpha and beta problems in FI, LT, SE, (EE)
Replace worn-out furniture	√
Avoid arrears	√
A car	Severity, alpha and beta problems in CY and IT

Note 1: √=successful on all criteria.

Note 2: We consider that an item has validity problems if the results of the logistic regressions are not significant in two of the three validity tests. And we consider an item "invalid" if it has validity problems in more than 2 out of 27 Member States (UK excluded to data quality). For reliability tests, the same logic is followed. The reliability tests are considered successful if reliability problems are observed for maximum two Member States. An item is kept in the proposed indicator if it does not violate any of the criteria we have retained in our analytical framework (suitability, validity, reliability (alpha), reliability (IRT) and additivity). See Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

In a few countries, a few items did not pass some of the tests. Some failure may be due to different wording in national questionnaires, some are "cultural" (for example "home warm" in Nordic countries) and some are due to the very high penetration rate in some countries (Internet in Netherlands, Denmark and Sweden; Car in Cyprus and Italy).

For Internet access, at the EU level, there is a large amount of heterogeneity. On one side there are countries where the penetration rate is relatively low (where the suitability criterion is barely met) and, on the other side, countries where the penetration rate is very high and where the lack of internet is associated with very severe deprivation. The recent increase in the suitability of internet shows that this item might become saturated in many countries in the future. There are therefore two options:

- Either dropping this item from the list (but continue to collect the information as it is crucial to measure digital divide);
- Or keeping this item in the list, as it has no impact on MD rates in countries with high proportion of "have" but it is a good measure of digital divide in some countries.

We estimated what would be the impact of using a subset of items in a few countries. As expected, the impact on the deprivation rate is negligible when the most severe items are dropped – as very few people suffer from these deprivations.

11. Measurement Invariance (MI) Analysis

11.1 Introduction

A desirable property of a deprivation index is that it should measure deprivation on the same basis across countries and/or population groups, so that a researcher or policy maker can conclude that the deprivation rate in country "a" is higher or lower than in country "b". Different data-collection modes, translation problems (see Section 3), cultural differences or unobserved factors affecting command of resources are likely to affect the way in which an indicator is measured in one country relative to another. A consequence of this is that the resulting deprivation rates reflect not only deprivation but are influenced by measurement errors and data collection biases. Measurement Invariance (MI) analysis can be used to test to what extent an index is comparable across population groups/countries (Meredith, 2006).

The EU-SILC is a multilingual survey that utilizes different data-collection modes. Therefore, the aim of this exercise is to analyse whether Measurement Invariance holds for the 13-item index. This will help to assess and detect any comparability problems in the measurement of deprivation at an international scale.

Full measurement invariance means that not only the scale is measured equivalently across groups (same indicators, same dimensional structure, same relationships between the indicators and the latent constructs) but also that the error structure is the same between groups. This kind of invariance is rarely found in the empirical literature. Measurement invariance can be more sensibly framed and tested according to the following criteria (Meredith, 2006; Gregorich, 2006):

a) Scalar or strong Invariance: This can be seen as the ideal type when using real large-scale survey data and is fulfilled when the dimensional structure across countries is equivalent but also the loadings (the correlation between each item and the latent deprivation) and thresholds (mean differences in deprivation) are the same, i.e. a deprivation index score of 4 in all countries measures exactly the same amount of deprivation – deprivation has been measured identically in each country. Scalar invariance is of course the ideal to aim for, but it is rarely (if ever?) satisfied with social survey based measures, which are subject to many different sources of collection bias and measurement error.

b) Metric Invariance: The dimensional structure and the loadings are equivalent. This measures if respondents in different countries/groups attributed the same meaning to the concept of deprivation (conceptualised as a latent variable) i.e. in each country the deprivation index measures the same phenomena and the strength of the relationship between each deprivation item and the concept of deprivation is similar across countries/population groups. If metric invariance is satisfied then the deprivation index scores can be compared across countries/population groups and different deprivation scores will measure differences in the latent variable deprivation i.e. countries/groups with a higher deprivation index score will be suffering from more deprivation than countries/groups with a lower deprivation index score (Milfont and Fischer, 2010).

c) Configural or pattern invariance: The dimensional structure is equivalent (i.e. the number and type of indicators are the same across groups). This means that respondents in different countries/population groups attributed the same meaning to the concept of deprivation (conceptualised as a latent variable) and that the indicators measure deprivation in a similar but possibly not in an identical manner

Given the characteristics of the data, it is sensible to aim for metric invariance as the minimum acceptable standard of MI for the 13-item deprivation index, but ideally scalar invariance should hold – at least partially. This form of invariance guarantees a high degree of comparability across countries with observed differences in material deprivation mostly attributable to data-collection problems and not necessarily to the scale itself. Partial scalar invariance requires the assessment of which deprivation items show non-invariant thresholds in order to inform the interpretation of differences in deprivation across countries.

11.2 Methods and strategy for analysing MI

Multi-group factor analysis and the Alignment Method are two main approaches to analyse Measurement Invariance (Asparouhov and Muthén, 2014). Both methods aim to find if a measurement model and its parameters (factor loadings, thresholds, residual variances, pattern loading, etc.) are the same across populations. However, they use different strategies to achieve this purpose. Multiple-group factor analysis fits the same measurement model to different populations and then compares the value of the different parameters across populations([11]). When dissimilar values in these parameters are found across groups, there is evidence that MI does not hold. Multiple-group factor analysis has been the most common approach to assess MI. However, it is rather inflexible and cumbersome as it requires several modifications to identify the model that meets MI (starting by fitting a Configural Model and then adding more restrictions). The Alignment method starts by fitting a Configural model and then finds the model that minimizes MI. This method is more straightforward and adequate when using large samples and many groups, however, there are currently few applications of this method using large-scale survey data and there are few simulations showing how stable and reliable this method is under different conditions (Asparouhov and Muthén, 2014). Thus, both methods are utilised to analyse whether MI holds for the 13-item deprivation index. Unfortunately, the relevant literature provides no clear way to calculate the effect of the data-collection mode upon MI (Hox et al, 2015). It assumes that identical questions were asked in identical ways in each country so we therefore opted to use a sub-sample of countries with the same data-collection mode (i.e. CAPI interviews). This exercise aims to assess whether the degree of non-invariance is reduced when we take into account the method used to collect the EU-SILC survey data.

11.3 Multiple group factor analysis. Full set of countries

Table 17 shows the relative statistics of fit for the different models. These statistics suggest that configural invariance holds for the 13-item index. In order to accept the hypothesis that scalar invariance holds, the fit of the scalar model should be very similar to the fit of the configural model. The results indicate that full scalar invariance does not hold. However, after making a series of modifications to the model, i.e. allowing some parameters in the model to be free (Thresholds), a partial version of scalar invariance holds. This conclusion is based on differences in the statistics of fit suggested by computer simulations.

Table 17: Whole EU MI analysis. Adjusted by population age structure, 2014([12])

Model	RMSEA	CFI	TLI
Configural	0.036	0.99	0.987
Scalar	0.063	0.965	0.962
Partial scalar	0.047	0.981	0.979

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 18 displays the items of the deprivation index with non-invariant thresholds. This corresponds to free parameters in the model of the partial scalar invariance model. A free parameter denotes a situation in which mean differences in deprivation of item "x" are due to unobserved factors that are not accounted for by the main latent construct in the model, i.e. deprivation. These differences can be the result of translation problems, data-collection problems, cultural differences and other issues that produce measurement error (coding errors) or other factors that explain mean differences in deprivation that are not linked with poverty.

For this data set, 351 thresholds needed to remain fixed in order to guarantee full scalar invariance. The partial scalar model suggests that 16% of the thresholds needed to be allowed to vary across countries in order to achieve the same fit as the configural model. The deprivation items which have the most measurement equivalence problems are furniture, holidays, arrears, keeping the home warm and money to spend on self (pocket money). This suggests that comparisons of deprivation rates need to consider the potential biasing effect that these items could have on the mean estimated value of deprivation. The question wording problems resulting from non-compliance with the EU-SILC guidelines for these deprivation items in different EU countries have been discussed above (see section 3).

([11]) It is not possible to test metric invariance when using categorical variables as this leads to a non-identified model. Therefore, it is only possible to analyse configural and scalar invariance. Metric invariance was analysed indirectly, i.e. if partial scalar invariance was found, by extension it can be assumed that metric invariance also holds. It might be possible, to find that some loadings are non-invariant when looking at the modification indices, however, metric invariance can be assumed to hold. In this report we tested scalar invariance, i.e. whether a model exists in which all loadings are fixed and some thresholds are free.

([12]) Using weights reflecting the age distribution according to the 2010 European Standard Population (Pace et al., 2013).

Table 18: Non-Invariant threshold. Partial scalar invariance, 2014

	Furniture	Arrear	Pocket money	Holidays	Home warm	Car	Shoes	Internet	Clothes	Unexpected expenses	Proteins	Friends	Leisure
Spain	*			*		*		*	*	*	*		
Greece	*	*	*		*	*			*				
Bulgaria	*				*		*	*	*				
Ireland				*	*	*		*		*			
France			*	*			*			*			*
Hungary					*	*	*					*	
Cyprus	*	*			*								
Germany			*	*								*	
Croatia		*		*									*
United Kingdom	*		*					*					
Czech republic	*										*		
Finland		*		*									
Italy			*				*						
Portugal	*				*								
Sweden	*	*											
Denmark						*							
Malta			*										
Slovenia		*											
Austria													
Belgium													
Estonia													
Lithuania													
Luxembourg													
Latvia													
Netherlands													
Poland													
Slovakia													
Total	8	6	6	6	6	5	4	4	3	3	2	2	2

Note: Countries are ranked according to the number of items with non-invariant thresholds.
Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 19 shows a model-based ranking produced after applying the alignment method. This table can be utilised as a reference to check if violations of MI might affect conclusion about between-countries differences in severity of deprivation in Europe. Bulgaria has the highest mean deprivation rate among the 27 countries while Sweden has the lowest. The alignment method and multiple-group factor analysis (see 11.4 below) produce different results. The results of the alignment method are shown in Annex 4.

Table 19: Model-based ranking of countries after adjusting by non-invariance, 2014

Ranking (More to less deprived)	Country	Factor	Groups With Significantly Smaller Factor Mean
		Mean (The higher the more deprived)	
1	Bulgaria	0.352	LV HU LT EL CY MT PT PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NLFI LU SE
2	Latvia	0	LT EL CY MT PT PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
3	Hungary	-0.025	LT EL CY MT PT PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
4	Lithuania	-0.335	CY MT PT PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
5	Greece	-0.342	CY MT PT PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
6	Cyprus	-0.479	PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
7	Malta	-0.507	PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
8	Portugal	-0.534	PL SK HR IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
9	Poland	-0.632	IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
10	Slovakia	-0.638	IE IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
11	Croatia	-0.657	IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
12	Ireland	-0.73	IT UK EE ES SI CZ FR DE BE AT DK NL FI LU SE
13	Italy	-0.821	ES SI CZ FR DE BE AT DK NL FI LU SE
14	United Kingdom	-0.841	ES SI CZ FR DE BE AT DK NL FI LU SE
15	Estonia	-0.872	SI CZ FR DE BE AT DK NL FI LU SE
16	Spain	-0.927	SI CZ FR DE BE AT DK NL FI LU SE
17	Slovenia	-1.013	CZ FR DE BE AT DK NL FI LU SE
18	Czech republic	-1.209	DE BE AT DK NL FI LU SE
19	France	-1.252	DE BE AT DK NL FI LU SE
20	Germany	-1.322	BE AT DK NL FI LU SE
21	Belgium	-1.558	DK NL FI LU SE
22	Austria	-1.584	DK NL FI LU SE
23	Denmark	-1.708	FI LU SE
24	Netherlands	-1.824	FI LU SE
25	Finland	-2.082	LU SE
26	Luxembourg	-2.355	SE
27	Sweden	-2.541	

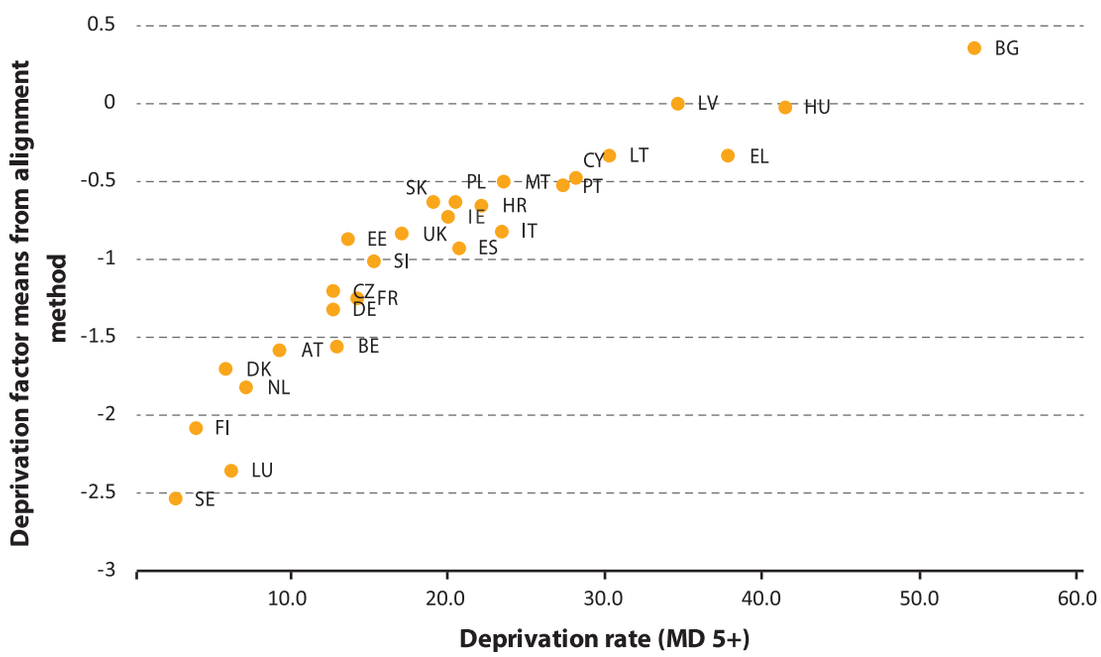
Note: See Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Overall, there is a high correlation of (Pearson's r) 0.94 between the raw mean deprivation scores and the factor means adjusted for non-invariance using the alignment method. Figure 9 below shows the relationship between adjusted and unadjusted scores. Overall, there are no dramatic changes in the order/position of most countries. However, there is evidence that violations of MI affect inference about the precise level of severity of material deprivation of some countries relative to others. For example, Spain showed a high number of parameters violating MI. The raw deprivation rate suggests that Spain (ES) and Ireland (IE) have a similar level of deprivation. However, the model-based estimate of severity indicates that Ireland has a higher level of deprivation. This suggests that after adjusting for non-invariance, the level of deprivation in Spain decreases, i.e. there are some unobserved factors inflating the level of deprivation in this country. Ireland also has a number of non-invariant parameters and this can also affect its relative position in the ranking. Moreover, Latvia (LV) and Greece (EL) show similar levels of deprivation rate, yet Greece has lower average levels of deprivation in comparison with Latvia. In this case, non-invariance is inflating the levels of deprivation.

Overall, the analysis suggests that both model-based and simpler estimates of deprivation rate provide a similar general picture of differences in deprivation across the countries of the EU. However, in order to make specific pairwise comparisons across countries researchers should ideally check their results by comparing the raw estimates with the model-based ones and also calculate the likely error of any rank order statistics. Annex 4 presents similar correlation between the adjusted and raw mean deprivation scores.

Figure 9: Relationship between adjusted deprivation scores and the deprivation rate (proportion of people lacking at least 5 items out of 13), 2014



Note: see Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

11.4 Multiple-group analysis. Same data-collection mode. CAPI Countries. 2014

Table 20 shows the results of the MI analysis for the sub-set of eight countries that utilize CAPI to collect the EU-SILC survey data (Belgium, Cyprus, Estonia, France, Hungary, Italy, Luxembourg and Portugal). Configural scalar invariance holds for the 13-item index when using this subset of countries. However, the scalar model is not as good as the configural model. After a series of modifications to the scalar model, partial scalar invariance holds for the 13-item deprivation index. This suggests that, for some indicators, mean differences in deprivation are due to factors that are not related to deprivation or data-collection mode, but totranslation errors, measurement error (coding), other factor explaining mean differences, etc.

Table 20: CAPI Countries MI analysis. Adjusted by population structure, 2014

Model	RMSEA	CFI	TLI
Configural	0.032	0.99	0.987
Scalar	0.051	0.971	0.969
Partial scalar	0.044	0.98	0.98

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Table 21 shows the non-invariant thresholds for the model with partial scalar invariance. The six most problematic items are shown in Table 21 - only keeping the home warm seems to be causing problems in several countries, and Holiday and Car are also problematic in Italy. Given that this table utilises a subset of countries with the same data-collection mode, these non-invariant parameters are due to other reasons such as translation, measurement error or other factors. Although it is not possible to estimate the effect of mixed data-collection mode upon the comparability of the 13-item index, these results suggests that a great deal of non-invariance could be reduced if all EU countries adopted the same method for collecting the EU-SILC survey or if the results of the survey were adjusted to allow for the systematic biases resulting from different data collection methods.

Table 21: Non-invariant thresholds for the model with partial scalar invariance, 2014

	Belgium	Cyprus	Estonia	France	Hungary	Italy	Luxembourg	Portugal
Unexpected expenses								
Holidays						*		
Clothes								
Furniture								
Arrears								
Shoes								
Internet								
Proteins								
Friends								
Home warm			*		*	*		*
Leisure								
Car						*		
Pocket money								

Note: see Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

12. General conclusions

The primary objective of this report was to update the analyses of Guio et al (2012) (which used the 2009 EU-SILC data) with the most recent data on MD collected in the 2014 EU-SILC ad hoc deprivation module. The systematic item by item analysis at both EU and country levels confirmed that the 13 items proposed by Guio et al (2012) satisfactorily meet our suitability, validity, reliability and additivity criteria across the EU, when 2014 data are used.

Our analysis also shows that harmonising data collection and item definitions is crucial to enhance the quality and the robustness of the MD indicator at the EU level.

Measurement invariance tests show that the 13 deprivation items all measure the same concept (latent construct) of deprivation in all EU countries and that configural, metric and partial scalar invariance holds, i.e. the deprivation index results are comparable. When carrying out pairwise comparisons between countries it would be ideal to consider both the raw mean score and the model-based (adjusted) level of deprivation, particularly when comparing countries which have collected the EU-SILC survey data using different methods (mode of collection). Overall, our measurement invariance analysis and data quality exploration suggests that comparing deprivation rates for individual items (e.g. ability to replace furniture) across countries is less reliable than comparisons using the aggregate index of deprivation. Hence, constructing an MD index out of the 13 proposed items provides a much more reliable comparative tool. Although there are some measurement invariance issues, we found that the national average MD rates produced by using the 13 item deprivation index provide a suitable, reliable, valid and additive tool for the comparative analysis of deprivation in the EU.

The 13 retained items will now be used by Member States and the Commission for the monitoring of MD among the population as a whole (0+), as a revised deprivation indicator based on these items was endorsed by the Indicators Sub-Group of the Social Protection Committee in April 2017.

As for the previous 9-item indicator, the revised indicator is based on the unweighted sum of the 13 items for each person. The scale ranges from 0 (no deprivation) to 13 (enforced lack of all items). The reliability of the scale is very high both at the EU level and in each Member State: the Cronbach's alpha statistic is 0.85 for the pooled EU dataset and ranges from 0.76 in Finland to 0.89 in Bulgaria (the usual minimal threshold is 0.70). The alpha is (much) higher than for the 9-item indicator in all countries. The reason why the indicator uses a simple sum of deprivations rather than a weighted sum is as follows (Guio et al 2012, p. 110): "*Classical Test Theory assumes that there are an infinite (or very large) number of material deprivation measures. If we could have answers to this infinite number of deprivation questions then we would have 'perfect knowledge' (we would know everything) about each person's deprivation. No set of weights could add any additional information as we would already know everything i.e. the infinite deprivation index is self-weighting. The square root of the Cronbach's alpha statistic can be considered to be the correlation between the indicator and the 'perfect' index made from the answers to the infinite set of deprivation questions. The Cronbach's alpha for the new indicator is 0.85. The correlation with the perfect infinite set of deprivation indicators is therefore impressive (0.92), so there is little additional information that any differential weights could add. Even if perfect error free differential weights could be developed the results from the current deprivation indicator and the weighted indicator would be essentially identical. In view of these results and because of the advantages of the unweighted approach (in particular, its simplicity and transparency), an equal weighting approach seems to be well suited for the construction of EU material deprivation indicators.*"

On the basis of the deprivations count (ranging from 0 to 13), the MD indicator adopted in April 2017 is defined as the proportion of people lacking at least five items in the whole population.

Seven out of the 13 deprivation items included in the new indicator are collected at the household level and are thus assumed to apply equally to all household members. The remaining six items are collected at the individual level: they are collected only for people aged 16 or over and allow measuring the intra-household sharing of deprivation (except in selected respondent countries). As, by definition, these adult items are not collected for people aged less than 16, they have therefore to be "distributed" to children. The rule applied in the agreed indicator for this distribution is the following: "if at least half the number of adults for which the information is available in the household lack an item, then the children living in that household are considered as deprived from that item". The same set of 13 items and the same threshold (5+) is used for both children and adults. However, when the deprivation rate is computed for children, the calculation is slightly different, in order to avoid making the indicator too sensitive to adult deprivations. Among the 5+ deprivations required for a child to be considered deprived, there needs to be at least three household deprivations (out of the seven household deprivations included in the list). This MD rate for children provides information on the proportion of children living in a "deprivation context". In parallel, a child-specific MD indicator is currently being developed at the EU level. It will be based on items addressing the specific living conditions of children (items collected in the EU-SILC ad hoc module), which may differ from those of their parents/ households.

References

Abe, A. and Pantazis, C. (2013), 'Comparing public perceptions of the necessities of life across two societies', ***Social Policy and Society***, Vol. 13, No 1, pp. 69-88.

Accardo J. and de Saint Pol T. (2009), 'Qu'est-ce qu'être pauvre aujourd'hui en Europe ? L'analyse du consensus sur les privations', ***Economie et statistique***, No 421, pp. 3-27.

Ahmed, A.I.M.U. (2007), 'Consensual poverty in Britain, Sweden and Bangladesh: A comparative study', ***Bangladesh e-Journal of Sociology***, No 4, pp. 56-77.

Asparouhov, T. and Muthén, B. (2014), 'Multiple-Group Factor Analysis Alignment', ***Structural Equation Modeling: A Multidisciplinary Journal***, Vol. 21, No 4, pp. 495-508.

Callan, T., Nolan, B. and Whelan, C.T. (1993), 'Resources, Deprivation and the Measurement of Poverty', ***Journal of Social Policy***, Vol. 22, No 2, pp.141-172.

Callender, J.C. and Osburn, H.G. (1979), 'An Empirical Comparison of Coefficient Alpha, Guttman's Lambda - 2, and MSPLIT Maximized Split-Half Reliability Estimates', ***Journal of Educational Measurement***, Vol. 16, No 2, pp. 89-99.

Cappellari, L. and Jenkins, S.P. (2007), 'Summarizing Multiple Deprivation Indicators', in S.P. Jenkins and J. Micklewright (eds.), ***Inequality and Poverty: Re-examined***, Oxford: Oxford University Press, pp. 166-184.

Chen, F.F. (2007), 'Sensitivity of Goodness of Fit Indexes to Lack of Measurement Invariance', ***Structural Equation Modeling: A Multidisciplinary Journal***, Vol. 14, No 3, pp. 464-504.

Commission on Social Determinants of Health (2008), 'Final Report: Closing the gap in a generation: Health equity through action on the social determinants of health', Geneva: WHO.

Council of the European Union (1975), 'Council Decision of 22 July 1975 Concerning a Programme of Pilot Schemes and Studies to Combat Poverty', 75/458/EEC, OJEC, L 199, Brussels.

Council of the European Union (1985), 'Council Decision of 19 December 1984 on Specific Community Action to Combat Poverty', 85/8/EEC, OJEC, L 2, Brussels.

Crettaz, E. and Suter C. (2013) 'The impact of adaptive preferences on subjective indicators: An analysis of poverty indicators', ***Social Indicators Research***, Vol. 114, No 1, pp.139-152.

Davies, R. and Smith, W. (1998), 'The basic necessities survey: The experience of action aid in Vietnam'. London: Action Aid.

Deutsch J., Guio A-C., Pomati M. and Silber J. (2015), 'Material Deprivation in Europe: Which expenditures are curtailed first?', ***Social Indicators Research***, Vol. 120, No 3, pp. 723-740.

Dickes P., Fusco, A. and Marlier, E. (2010). 'Structure of national perceptions of social needs across EU countries', ***Social Indicators Research***, Vol. 95, No. 1, pp.143-67.

Fahmy, E. and Gordon, D. (2005), 'La pauvreté et l'exclusion sociale en Grande-Bretagne', ***Economie et Statistique***, No 383-385, pp. 109-130.

Fahmy, E., Gordon, D., Dorling, D., Rigby, J. and Wheeler, B. (2011), 'Poverty and place in Britain, 1968-99', ***Environment and Planning A***, Vol. 43, No 3, pp. 594-617.

Fusco, A. and Dickes, P. (2008), 'The Rasch model and multidimensional poverty measurement', in N. Kakwani, J. Silber (eds.), ***Quantitative Approaches To Multidimensional Poverty Measurement***, Houndmills: Palgrave Macmillan, Chapter 3, pp.49-62.

Fusco, A., Guio, A-C. and Marlier, E (2010), 'Characterising the income poor and the materially deprived in European countries', in A.B. Atkinson and E. Marlier (eds.), ***Income and living conditions in Europe***, Luxembourg: Publications office of the European Union, pp. 133-153.

Gazareth, P. and Suter, C. (2010), 'Privation et risque d'appauvrissement en Suisse, 1999-2007', ***Swiss Journal of Sociology***, Vol. 36, No 2, pp. 213-234.

Gordon, D. (2006). 'The concept and measurement of poverty', in C. Pantazis, D. Gordon and R. Levitas (eds.), ***Poverty and Social Exclusion in Britain: The Millennium Survey***, Bristol: The Policy Press, pp. 29-69.

Gordon, D., Adelman, A., Ashworth, K., Bradshaw, J., Levitas, R., Middleton, S., Pantazis, C., Patsios, D., Payne, S., Townsend, P. and Williams, J. (2000), '***Poverty and social exclusion in Britain***', York: Joseph Rowntree Foundation, 102 p.

Gordon, D., Nandy, S., Pantazis, C., Pemberton, S. and Townsend, P. (2003), '***Child Poverty in the Developing World***', Bristol: The Policy Press, 44 p.

Gordon, D. and Pantazis, C. (eds.) (1997), ***'Breadline Britain in the 1990s'***, Bristol: Summerleaze House Books, 309 p.

Gordon, D. (2000),'The Scientific Measurement of Poverty: Recent Theoretical Advances', in J. Bradshaw and R. Sainsbury (eds.), ***Researching Poverty***, Aldershot: Ashgate. pp. 37-58.

Gregorich, S.E. (2006), 'Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework', ***Medical care***, Vol. 44, No 11, Suppl. 3, S78.

Guio, A-C. (2009), 'What can be Learned from Deprivation Indictors in Europe?', ***Eurostat Methodologies and Working Papers***, Luxembourg: Office for Official Publications of the European Communities (OPOCE), 40 p.

Guio, A-C. and Marlier, E. (2013), 'Alternative versus Current Measures of Material Deprivation at EU Level: What Difference Does it Make?', ***Improve Working Papers*** No. 13/07, August 2013, Antwerp: Herman Deleeck Centre for Social Policy, 40 p.

Guio, A-C., Fusco, A. and Marlier, E. (2009), 'A European Union Approach to Material Deprivation using EU-SILC and Euro-barometer data', ***IRIS Working Paper*** No 2009-19, Luxembourg: CEPS/INSTEAD, 29 p.

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***, Luxembourg: Publications Office of the European Union, 178 p.

Guio, A-C., Marlier, E., Gordon, D., Fahmy, E., Nandy, S. and Pomati, M. (2016), 'Improving the measurement of material deprivation at the European Union level', ***Journal of European Social Policy***, Vol. 26, No 3, pp. 219-333.

Guio, A-C. and Pomati, M. (2017), 'How do European citizens cope with economic shocks? the longitudinal order of deprivation', in A.B. Atkinson, A-C. Guio and E. Marlier (eds.), ***Monitoring Social Europe***, Luxembourg: Publications office of the European Union (OPOCE), pp. 385-399.

Guttman, L. (1945), 'A basis for analyzing test-retest reliability', ***Psychometrika***, Vol. 10, No 4, pp. 255-282.

Hallerod, B. (1995), 'The truly poor: Indirect and direct measurement of consensual poverty in Sweden', ***Journal of European Social Policy***, Vol. 5, No 2, pp. 111-129.

Halleröd, B. (2006), 'Sour Grapes: Relative Deprivation, Adaptive Preferences and the Measurement of Poverty', ***Journal of Social Policy***, Vol. 35, No 3, pp. 371-390.

Hillyard, P., Kelly, G.P., McLaughlin, E., Patsios, D. and Tomlinson, M. (2003), 'Bare Necessities: Poverty and Social Exclusion in Northern Ireland', Belfast: Democratic Dialogue.

Hox, J.J., De Leeuw, E.D. and Zijlmans, E.A.O. (2015), 'Measurement equivalence in mixed mode surveys', in R. van de Schoot, P. Schmidt and A. de beuckelaer, ***Measurement Invariance***, Frontiers in Psychology, pp. 115-123.

Jackson, P.H. and Agunwamba, C.C., 1977, 'Lower bounds for the reliability of the total score on a test composed of non-homogeneous items: I: Algebraic lower bounds', ***Psychometrika***, Vol. 42, No 4, pp.567-578.

Kaijage, F. and Tibaijuka, A. (1996), Poverty and social exclusion in Tanzania. ***Research Series*** No.109. Geneva: IILS.

Lau, M., Pantazis, C., Gordon, D., Lai, L. and Sutton, E. (2015), 'Poverty in Hong Kong', ***China Review***, Vol. 15, pp. 23-59. (Special Issue: Poverty in a Rich Society).

Leon, D. and Walt, G. (2001), 'Poverty, Inequality and Health: an international perspective.' Oxford: Oxford University Press, 358 p.

Mack, J. and Lansley, S. (1985), 'Poor Britain', London: George Allen & Unwin.

McDonald, R.P. (1978), 'Generalizability in factorable domains: domain validity and generalizability 1', ***Educational and Psychological Measurement***, Vol. ***38***, No 1, pp. 75-79.

McDonald, R. P. (1999), 'Test theory: A unified treatment', Lawrence Erlbaum Associates, 498 p.

Martini, M.C. and Vanin, C. (2010), 'A Measure of Poverty Based on the Rasch Model', in N. Torelli, F. Pesarin and A. Bar-Hen, ***Advances in Theoretical and Applied Statistics***, Springer, pp. 327-337.

McKay, S. (2004), 'Poverty or preference: What do "consensual deprivation indicators" really measure?', ***Fiscal Studies***, Vol. 25, No 2, pp. 201-223.

Meredith, W. and Teresi, J.A. (2006), 'An Essay on Measurement and Factorial Invariance', ***Medical Care***, Vol. 44, No 11, pp. S69-S77.

Milfont, T.L. and Fischer, R. (2010), 'Testing measurement invariance across groups: Applications in cross-cultural research', ***International Journal of Psychological Research***, Vol. 3, No 1, pp. 111-121.

Mtapuri, O. (2011), 'Developing and asset threshold using the consensual approach: Results from Mashonaland West, Zimbabwe', ***Journal of International Development***, Vol. 23, pp. 29-41.

Nandy, S. and Pomati, M. (2015), 'Applying the consensual method of estimating poverty in a low income African setting', ***Social Indicators Research***, Vol. 124, No 3, pp. 693-726.

Nunally, J. C. (1978), 'Psychometric theory (2nd ed.)', New York: McGraw-Hill.

Pace, M., Lanzieri, G., Glickman, M. and Zupanič, T., (2013), 'Revision of the European Standard Population: report of Eurostat's task force'. Luxembourg: Publications office of the European Union (OPOCE).

Pantazis, C., Townsend, P. and Gordon, D. (2006), 'The necessities of life', in C. Pantazis, D. Gordon and R. Levitas (eds.), ***Poverty and Social Exclusion in Britain. The Millennium Survey***, Bristol: The Policy Press, Chapter 4, pp. 89-122.

Perry, B. (2002), 'The mismatch between income measures and direct outcome measures of poverty', Centre for Social Research and Evaluation, Ministry of Social Development, New Zealand.

Power, C., Matthews, S. and Manor, O. (1996), 'Inequalities in self-rated health in the 1958 birth cohort: life time social circumstances or social mobility?', ***British Medical Journal***, No 313, pp. 449-53.

Raileanu Szeles, M., Fusco, A. (2011), 'Item Response Theory and the measurement of deprivation: evidence from Luxembourg data', ***Quality & Quantity***, first online 04 October 2011.

Revelle W. (1979), 'Hierarchical cluster analysis and the internal structure of tests', ***Multivariate Behavioural Research***, 1979, Vol. 14, pp. 57-74.

Revelle, W. and Zinbarg, R. (2009), 'Coefficients Alpha, Beta, Omega, and the glb: Comments on Sijtsma', ***Psychometrika***, Vol. 74, No 1, pp. 145-154.

Saunders, P., Naidoo, Y. and Griffiths, M. (2007), 'Towards new indicators of disadvantage: Deprivation and social exclusion in Australia', University of New South Wales: Social Policy Research Centre.

Sen, A.K. (1985), 'The standard of living: The Tanner lectures', Cambridge: Cambridge University Press.

Sen, A. (2009), 'The idea of Justice', Cambridge, Mass: Belknap Press of Harvard University Press.

Shaw, M., Dorling, D., Gordon, D. and Davey Smith, G. (1999), 'The Widening Gap: health Inequalities and Policy in Britain', Bristol: The Policy Press.

Sijtsma, K. (2008), 'On the use, the misuse, and the very limited usefulness of Cronbach's alpha', ***Psychometrika***, Vol. 74, No 1, pp. 107-120.

TNS (2007), 'Poverty and Social Exclusion', Report on the Special Eurobarometer 279/ Wave 67.1, Brussels.

Townsend, P. (1979), 'Poverty in the United Kingdom', Harmondsworth: Penguin Books.

Townsend, P. (1987), 'Deprivation', ***Journal of Social Policy***, Vol. 16, No 2, pp. 125-146.

Van Den Bosch, K. (2001), 'Identifying the poor: Using subjective and consensual measures', Aldershot: Ashgate.

Van De Schoot, R., Kluytmans, A., Tummers, L., Lugtig, P., Hox, J. and Muthen, B. (2013), 'Facing off with Choosing between Scylla and Charybdis: A comparison of scalar, partial, and the novel possibility of approximate measurement invariance', ***Frontiers in Psychology***, Vol. 4, No 770.

Verma, V. (2007), 'Proposals on the treatment of negative, zero, and extreme values of income', Siena.

Whelan, C.T., Layte, R., Maître, B. and Nolan, B. (2001), 'Income, deprivation and economic strain. An analysis of the ECHP', ***European sociological review***, Vol. 17, No. 4, pp. 357-372.

Wilkinson, R.G. (1999), 'Health, hierarchy, and social anxiety', in N.E. Adler, M. Marmot, B.S. McEwen and J. Stewart (eds.), ***Socioeconomic Status and Health in Industrial Nations***, Annals of the New York Academy of Sciences, New York: The New York Academy of Sciences, Vol. 896, pp. 48-63.

Wright, G. (2008), 'Findings from the indicators of poverty and social exclusion project: A profile of poverty using the socially perceived necessities approach: Key report 7', Pretoria: Department of Social Development, Republic of South Africa.

Zinbarg, R.E., Revelle, W., Yovel, I. and Li, W. (2005), 'Cronbach's α, Revelle's β, and McDonald's ω H: Their relations with each other and two alternative conceptualizations of reliability', *Psychometrika*, Vol. 70, No 1, pp. 123-133.

ANNEX 1

List of items abbreviations

1. H_unexp: the household cannot face unexpected expenses;

2. H_holiday: the household cannot afford a one week annual holiday away from home;

3. H_arrear: the household do not avoid arrears (in mortgage or rent, utility bills or hire purchase instalments);

4. H_meat: the household cannot afford a meal with meat, chicken or fish every second day;

5. H_warm: the household cannot afford keeping the home adequately warm;

6. H_car: the household cannot afford having a car/van for personal use;

7. Ad_cloth: the adult do not replace worn-out clothes with some new ones;

8. Ad_shoes: the adult has not two pairs of properly fitting shoes ;

9. Ad_pock: the adult do not spend a small amount of money each week on him/herself (pocket money);

10. Ad_leis: the adult do not have regular leisure activities;

11. Ad_frien: the adult do not get together with friends/family for a drink/meal at least monthly;

12. Ad_internet: the adult has no internet connection at home;

13. H_furniture: the household do not replace worn-out furniture.

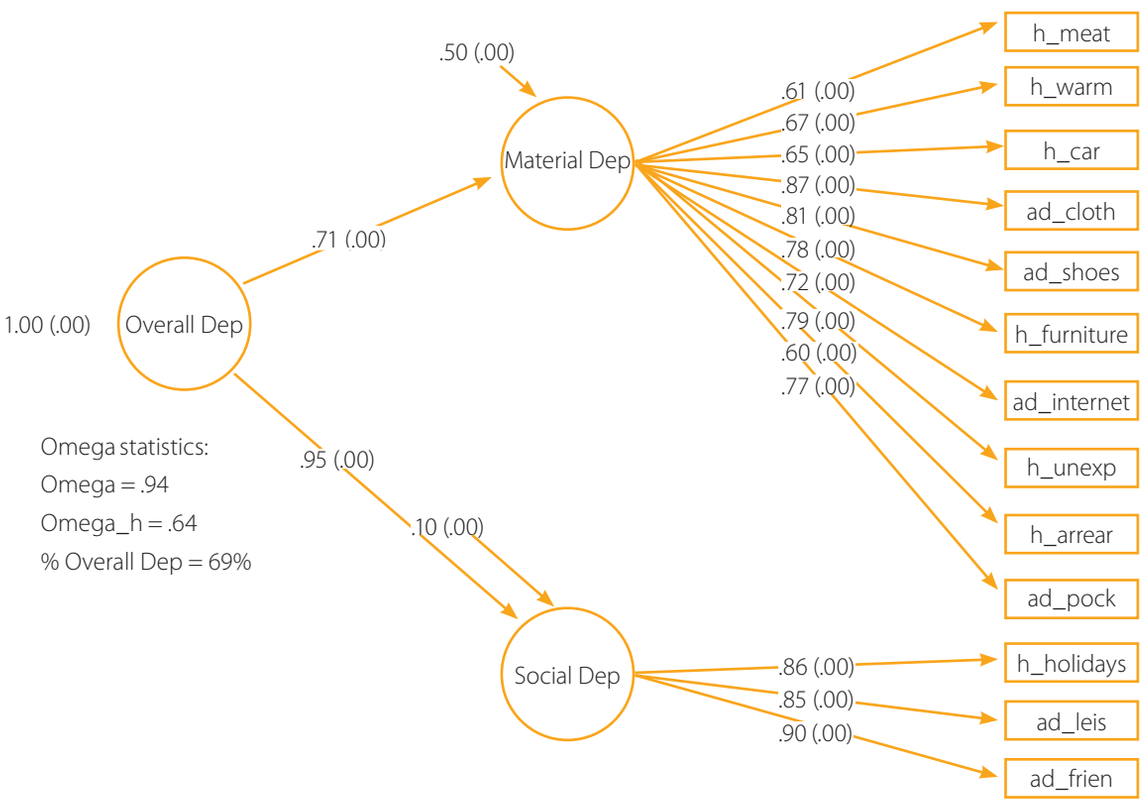
Countries' official abbreviations

BE Belgium
BG Bulgaria
CZ Czech Republic
DK Denmark
DE Germany
EE Estonia
IE Ireland
EL Greece
ES Spain
FR France
HR Croatia
IT Italy
CY Cyprus
LV Latvia
LT Lithuania
LU Luxembourg
HU Hungary
MT Malta
NL The Netherlands
AT Austria
PL Poland
PT Portugal
RO Romania
SI Slovenia
SK Slovakia
FI Finland
SE Sweden
UK United Kingdom

ANNEX 2

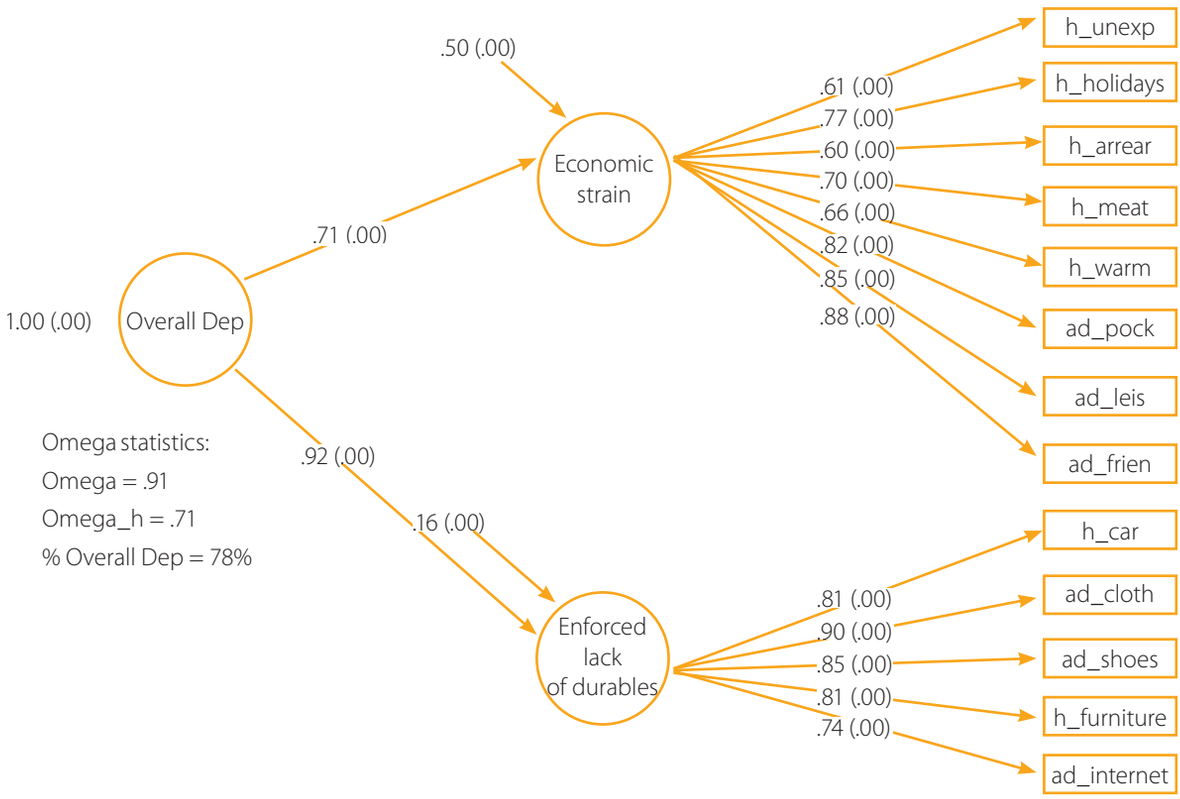
Path diagrams of the models 2 to 4 tested in the Omega analysis, 2014

Townsend/PSE (simplified) Model



Note: see Annex 1 for item abbreviatons.
Source: EU-SILC 2014 cross-sectional data, authors' computation.

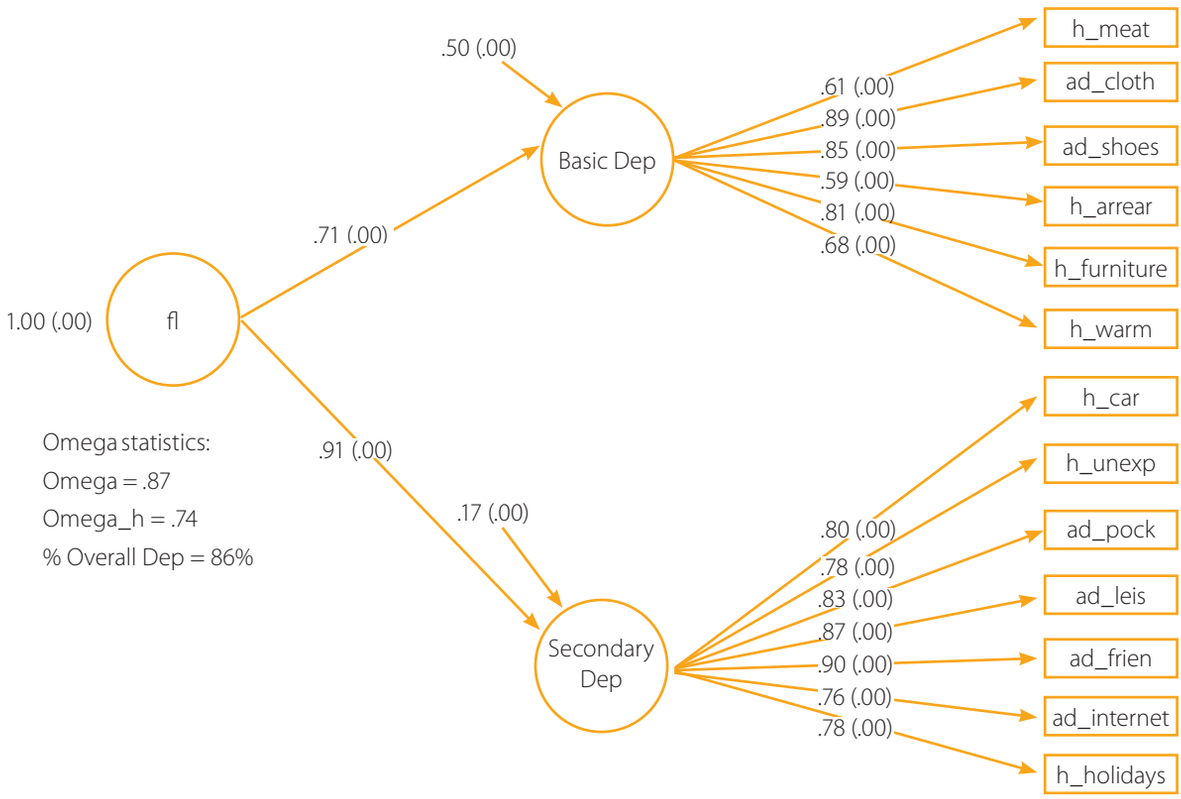
Empirical Model



Note: see Annex 1 for item abbreviatons.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

ESRI (simplified) Model



Note: see Annex 1 for item abbreviatons.
Source: EU-SILC 2014 cross-sectional data, authors' computation.

ANNEX 3

Non-invariant parameters (Between parenthesis). Alignment method, 2014

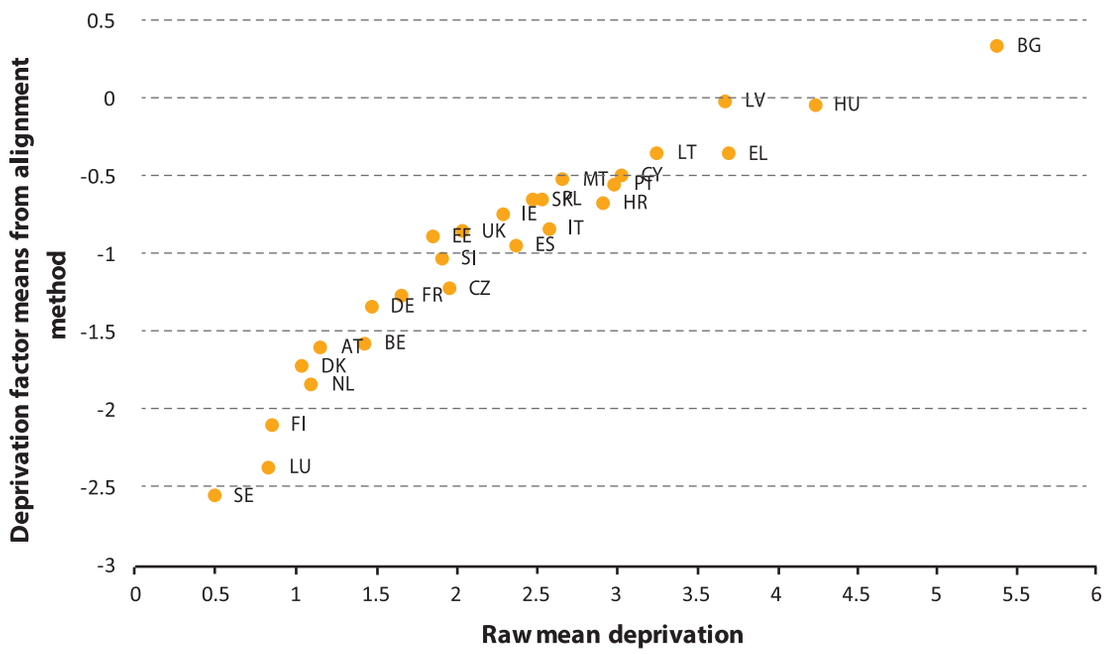
Items	Thresholds	Loadings
H_UNEXP	(AT) (BE) (BG) CY CZ (DE) (DK) (EE) (EL) (ES) (FI) (FR) (HR) HU (IE) (IT) (LT)	AT BE (BG) (CY) CZ DE DK EE 9 (ES) FI FR (HR) (HU) (IE) (IT) LT LU LV (MT) NL
	LU (LV) (MT) (NL) (PL) (PT) SE (SI) (SK) (UK)	PL PT SE (SI) (SK) (UK)
H_HOLIDAY	(AT) BE (BG) (CY) (CZ) (DE) (DK) EE 9 (ES) (FI) (FR) (HR) HU (IE) (IT) (LT) (LU)	AT BE BG CY CZ DE (DK) EE 9 ES (FI) (FR) HR (HU) (IE) IT (LT) LU (LV) (MT) (NL)
	(LV) (MT) NL (PL) (PT) (SE) SI (SK) (UK)	PL PT SE SI SK UK
H_ARREAR	AT (BE) (BG) (CY) (CZ) (DE) (DK) EE (EL) ES (FI) FR (HR) HU (IE) IT (LT) LU LV	AT BE (BG) CY CZ DE (DK) (EE) 9 ES FI FR (HR) (HU) (IE) IT LT LU (LV) (MT) NL
	MT NL (PL) (PT) (SE) (SI) (SK) (UK)	(PL) PT SE (SI) (SK) (UK)
H_MEAT	(AT) BE (BG) (CY) (CZ) (DE) (DK) (EE) 9 (ES) (FI) (FR) (HR) (HU) (IE) (IT) (LT)	(AT) BE (BG) CY (CZ) DE DK (EE) (EL) ES FI FR HR HU (IE) (IT) LT LU LV (MT) NL
	LU (LV) (MT) NL (PL) (PT) SE (SI) (SK) (UK)	PL PT SE SI SK (UK)
H_WARM	AT BE (BG) (CY) (CZ) DE DK (EE) (EL) (ES) (FI) (FR) (HR) (HU) IE (IT) (LT) (LU)	AT BE (BG) CY CZ (DE) DK EE 9 (ES) (FI) FR HR HU (IE) IT (LT) LU LV (MT) NL PL
	(LV) (MT) NL (PL) (PT) (SE) SI SK (UK)	(PT) SE (SI) SK (UK)
H_CAR	(AT) BE BG (CY) (CZ) DE (DK) (EE) 9 (ES) (FI) (FR) (HR) (HU) (IE) (IT) LT (LU)	AT BE BG CY CZ DE (DK) EE (EL) (ES) (FI) FR HR (HU) (IE) (IT) LT LU LV MT NL (PL)
	(LV) (MT) (NL) PL (PT) SE (SI) (SK) UK	PT SE SI SK UK
AD_CLOTH	AT (BE) BG CY (CZ) (DE) DK EE (EL) (ES) FI (FR) (HR) HU (IE) IT LT LU LV (MT) (NL)	(AT) BE BG (CY) CZ (DE) DK (EE) 9 (ES) FI FR HR HU (IE) (IT) LT LU LV MT (NL)
	(PL) PT SE SI (SK) (UK)	(PL) PT SE (SI) SK (UK)
AD_SHOES	AT BE (BG) CY CZ DE DK EE 9 ES FI (FR) HR HU IE IT LT LU (LV) (MT) NL PL PT SE	AT BE (BG) CY CZ (DE) DK EE (EL) ES (FI) (FR) HR (HU) (IE) (IT) LT LU (LV) MT NL
	SI SK (UK)	PL PT SE SI SK UK
AD_FRIEN	AT (BE) (BG) (CY) (CZ) (DE) (DK) (EE) (EL) (ES) (FI) (FR) (HR) (HU) (IE) (IT) (LT)	(AT) BE BG (CY) CZ (DE) (DK) EE (EL) ES (FI) (FR) HR HU (IE) IT LT LU (LV) MT (NL)
	LU (LV) MT (NL) (PL) (PT) (SE) SI (SK) UK	PL PT SE (SI) SK (UK)
AD_LEIS	(AT) BE (BG) (CY) (CZ) (DE) (DK) (EE) 9 (ES) (FI) FR (HR) (HU) (IE) (IT) (LT)	AT (BE) (BG) (CY) CZ DE DK (EE) (EL) ES (FI) (FR) (HR) HU (IE) IT (LT) LU (LV)
	(LU) (LV) (MT) NL PL (PT) SE (SI) (SK) (UK)	(MT) (NL) (PL) (PT) SE (SI) SK (UK)
AD_POCK	(AT) BE (BG) (CY) (CZ) (DE) (DK) (EE) (EL) ES (FI) (FR) (HR) (HU) (IE) (IT) LT	AT BE (BG) CY CZ (DE) DK (EE) (EL) (ES) (FI) FR (HR) HU (IE) (IT) (LT) LU (LV)
	LU (LV) (MT) NL (PL) (PT) (SE) (SI) SK (UK)	(MT) NL PL PT SE SI SK UK
H_FURNITURE	(AT) (BE) BG (CY) (CZ) (DE) (DK) EE (EL) (ES) FI FR (HR) (HU) (IE) (IT) LT (LU)	(AT) (BE) (BG) (CY) (CZ) (DE) DK EE (EL) (ES) FI FR (HR) (HU) (IE) (IT) (LT) (LU)
	LV (MT) (NL) (PL) (PT) (SE) (SI) SK (UK)	(LV) (MT) NL (PL) (PT) SE (SI) (SK) (UK)
AD_INTERNET	AT (BE) (BG) CY (CZ) (DE) (DK) (EE) (EL) (ES) FI FR (HR) HU (IE) IT LT LU (LV)	AT BE (BG) (CY) CZ DE DK EE (EL) ES FI FR (HR) (HU) IE (IT) (LT) (LU) LV MT NL
	(MT) (NL) PL (PT) SE SI (SK) (UK)	PL PT SE SI (SK) (UK)

Note: see Annex 1 for country and item abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

ANNEX 4

Relationship between adjusted and unadjusted mean deprivation scores, 2014



Note: see Annex 1 for country abbreviations.

Source: EU-SILC 2014 cross-sectional data, authors' computation.

Getting in touch with the EU

In person
All over the European Union there are hundreds of Europe Direct Information Centres. You can find the address of the centre nearest you at: http://europa.eu/contact

On the phone or by e-mail
Europe Direct is a service that answers your questions about the European Union. You can contact this service
– by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
– at the following standard number: +32 22999696 or
– by electronic mail via: http://europa.eu/contact

Finding information about the EU

Online
Information about the European Union in all the official languages of the EU is available on the Europa website at: http://europa.eu

EU publications
You can download or order free and priced EU publications from EU Bookshop at: http://bookshop.europa.eu. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see http://europa.eu/contact)

EU law and related documents
For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU
The EU Open Data Portal (http://data.europa.eu/euodp/en/data) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

KS-TC-17-002-EN-N

Revising the EU material deprivation variables

In March 2017, the European Union (EU) adopted a new indicator of 'material and social deprivation'. This measure was developed by Guio et al (2012) and covers the entire population of the 28 EU Member States. It includes 13 deprivation items and replaces the 9-item 'standard' material deprivation index adopted in 2009, by the then 27 EU countries and the European Commission, to monitor progress in the fight against poverty and social exclusion at national and EU level. Drawing on the methodology developed in the context of the 1999 'Poverty and Social Exclusion in the UK Survey', Guio, Gordon and Marlier (2012) proposed an analytical framework for producing a suitable, valid, reliable and additive deprivation measure for the EU. Their recommendations were based on analyses of the 2009 EU-SILC material deprivation module. This report extends these analyses using the 2014 EU-SILC data and demonstrates that the composition of the new material and social deprivation indicator remains optimal over a five year period of considerable socio-economic change.

For more information

http://ec.europa.eu/eurostat/

Publications Office

ISBN 978-92-79-70167-2