



The EU-wide income distribution: inequality levels and decompositions

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ABSTRACT

This study analyses EU-28 and euro area-level income distribution with the latest European Union Statistics on Income and Living Conditions (EU-SILC) data. More specifically it shows the development of inequality in net disposable incomes over the pre- and post-crisis period (2006–2014).

The analysis shows that income inequality in the EU-28 as a whole was falling up until the crisis and then stabilised afterwards. In the euro area it has increased slightly over the same period.

After estimating EU-28 and euro area-wide income inequality, an assessment of how large a share of it depends on between-country inequality, as opposed to within-country inequality, is carried out. The results highlight that the trend of between-country inequality, albeit starting from very different levels, has been declining in the EU-28 while slightly increasing in the euro area. The same analysis, conducted in terms of between-region versus within-region inequality, shows similar trends.

Finally, the study examines the extent to which individual incomes on the European scale can be predicted by country of residence and finds evidence in line with the inequality decomposition by country, that is, country of residence by itself predicts around 1/3 of individual incomes at EU level, and its role to explain individual variability has diminished until the crisis to then stagnate in its aftermath.

JEL codes: D3, D63, O52.

Keywords: distribution; income inequality; decomposition by country; European Union; equality of opportunity.

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1. INTRODUCTION

Income inequality studies have become crucial for policy making. In the wake of the strand of research recently popularised, among others, by Atkinson (2015) and Piketty (2014), inequality issues that were not explicitly addressed in the 1990s and 2000s have spurred debate both in the economic profession and in policy circles.

Indeed, many dimensions of inequality have been studied thoroughly, mostly at country or subnational level. A recent research strand has even focused on estimating global inequality. But continental-level inequality, such as at EU level, has only rarely been examined. However, EU-28 or euro area-wide inequality analysis poses interesting challenges both from a policy perspective and from a theoretical standpoint.

Monitoring inequality at the EU level provides information about the income convergence of EU countries. This convergence has always been a goal of the EU, and is enshrined in the Treaty on the Functioning of the European Union. Article 151 explicitly states that: '[T]he Union and the Member States ... shall have as their objectives ... improved living and working conditions, so as to make possible their harmonisation while the improvement is being maintained' (EU, 2007, Article 151 TFEU (ex Article 136 TEC)).

In addition to these considerations,¹ the policy context is increasingly attentive to inequality-related issues that affect the EU as a whole, especially from the Commission and other EU institutions.

More recently, the entire second chapter of *The Five Presidents' Report: Completing Europe's Economic and Monetary Union* is devoted to convergence, prosperity and social cohesion, with an explicit reference to convergence 'between Member States towards the highest levels of prosperity; and convergence within European societies, to nurture our unique European model' (Juncker et al. 2015, 2).

The recently proclaimed European Pillar of Social Rights (European Commission 2017c), explicitly addresses income inequality. The third principle, which sets out the right to equal opportunities for all, is accompanied by a Social Scoreboard to monitor this process that includes one headline indicator directly relating to within-country income inequality.²

Moreover, inequality has been stressed in the Sustainable Development Goals set by the UN. Indeed, the tenth goal explicitly identifies inequality-reducing targets (10.1-4) to be achieved by 2030, including the famous 'income growth of the bottom 40 per cent of the population at a rate higher than the national average' (UN 2015). In doing so, it mostly focuses on national-level inequality and implicitly delegates the mission of reducing between-country inequality to the eighth SD goal, devoted to 'promote sustained, inclusive, and sustainable economic growth.' However, the objective of reducing inequalities, especially in a highly integrated economic area such as the EU, may well be addressed at the supranational level.

From a theoretical viewpoint, enlarging the unit of analysis from the country level to the EU level may be relevant for many reasons.

Firstly, monitoring how unequal the EU is and how its territorial disparities have evolved should be an issue of public relevance, as Atkinson (1995) recognised more than 20 years ago, albeit for the case of poverty.

Secondly, studying how much inequality in the EU is attributable to inequality between the different countries that constitute it may shed light on highly topical issues such as social cohesion and cross-country migration.

¹ These considerations are also applicable to the case of the subset of EU-28 countries that make up the euro area.

² Other indicators also address policy areas closely related to combatting rising income inequality and providing more equal chances.

As pointed out by Milanovic (2010), when inequality between states in a federation or union of states grows, it is likely to affect social cohesion among the citizens of the area as well as popular support for the Union's institutions.

If the income differentials between geographically close countries increase, they are likely to trigger migration from country to country, as standard migration models recognise. Conversely, as the Reflection Paper on the Social Dimension of Europe (2017, p. 8) states: '[w]hen living and working conditions converge, it can make the difference between a person moving to another country as a result of a positive choice and being driven to move by economic necessity. Where convergence in economic performance over time is accompanied by convergence of social conditions, fears of 'social dumping' diminish and support for the single market is nourished.'

To address these issues, this paper proposes new contributions to the investigation of income inequality at the supranational level. In detail, it assesses the relevance of between-country inequality to the overall EU-28 and euro area-wide inequality (henceforth, E(M)U inequality). It then expands to the role played by between-region inequality. Finally it estimates the effect of the country of residence in predicting incomes at the EU-28 and euro area-level (henceforth E(M)U level).

These three issues are examined using cross-sectional data from the European Union Statistics on Income and Living Conditions (EU-SILC) from 2007 to 2014.

The structure of the paper is as follows. Section 2 sets the theoretical stage of the study and Section 3 describes the data available. Sections 4 and 5 present the study's findings and Section 6 summarises the conclusions.

2. THEORETICAL STAGE AND PREVIOUS RESEARCH

Inequality has been extensively dealt with at the national or subnational level but its investigation at the supranational level may also be insightful in many respects. In a globalised world, in which transportation costs are falling and information about living conditions all over the world is publicly available online, it is common for people to compare their income with that of another country to make decisions about migration strategies. This may happen even more frequently for the citizens of an economically integrated and culturally homogeneous area such as the EU.

Standard migration models assume that income differentials induce migration from poorer to richer areas (Todaro 1969).³ Therefore, the study of inequality within a large and integrated area may also inform about the migration flows within that area.

Moreover, by analysing inequality trends on a supranational scale, important conclusions can be drawn about social cohesion in that supranational entity. For example, Ferroni, Mateo and Payne (2007) explore how inequality is negatively associated with social cohesion in the case of Latin American countries. Similarly, this argument may in principle be extended to a supranational case such as the EU. When inequality between the different areas composing a federation or union of states grows it may result in declining social cohesion between the different areas of the Union, as Milanovic (2010) argued in the chapter 'Can several countries exist in one?'

These issues appear to be of paramount relevance in the current phase of the European Union. For example, intra-EU mobility has considerably increased since 2009, with EU-28 movers mostly migrating from Southern and Eastern European countries towards the core countries (European Commission 2017b).⁴

³ The same research strand also investigated the reverse effect, namely whether migration occurring as a consequence of geographic inequality reduces inequality and brings about convergence (Kanbur and Rapoport 2005). However, the investigation of this reverse effect is not the scope of this paper.

⁴ Over 2009-2014 the mobility inflow was positive especially in core European countries such as Germany (+219 %), Austria (+86 %), and in Scandinavian countries, as more EU-movers relocated to Germany and Austria from both Southern and Eastern European countries.

Therefore estimates of income inequality at the EU level have recently been produced and the first associated findings have been disseminated. For example Heidenreich (2016) estimated EU-wide inequality with EU-SILC data and decomposed the mean logarithmic deviation of disposable incomes into between-country and within-country inequality. Previously, Dauderstädt and Keltek (2014) computed the s80/s20 ratio, also by means of EU-SILC data. They found that, according to this index, the income inequality between countries had fallen in the EU-28, at least until the crisis.

Brandolini (2007) also used the predecessor of EU-SILC, the European Community Household Panel, to estimate a portfolio of inequality measures at the EU level for the year 2000 and demonstrated how EU enlargement had caused an increase in income inequality, due to the new Eastern European countries joining the EU, but at the same time assessed inequality as being smaller in the EU than in the US. New inequality estimates have also recently been provided by Darvas (2016), who used imputation techniques to estimate the EU-level Gini from national indices without recurring to household surveys and by Benczúr et al. (2017) who estimated EU-wide income inequality with EU-SILC data to show the evolution of income inequality measures for different clusters of European countries. A recent Eurofound publication has also recently documented EU-wide inequality, measured with the Gini and the Theil index as well as a first EU-wide decomposition in between-country and within-country inequality (Eurofound 2017).⁵

Building upon these studies, this study aims at obtaining an income distribution representative of the EU-28 and the euro area and then assessing the respective inequality levels. E(M)U-wide inequality indices are decomposed by country to ascertain how much of the inequality in the E(M)U is attributable to inequality within countries or between the countries that compose it.

Thus, the study first investigates how much between-region inequality accounts for the total inequality, thereby complementing the between-country contribution analysis to recognise the importance of the cross-regional variation at play in the E(M)U.

Finally the magnitude of the country effect in determining income at the E(M)U level is quantified. That is, how much of the income variability in the E(M)U is explained by a model that incorporates just the country of residence as explanatory variable.

3. METHODS AND DATA

The inequality dimension that is assessed here for the E(M)U is income inequality. The emphasis on income over other economic dimensions is justified by the possibility of comparing it with prior research, data availability and the acknowledgement that income is the most comprehensive approximation of living standards (Atkinson and Marlier 2010).

The data collection used to obtain EU-wide inequality measures is the European Union Statistics on Income and Living Condition (EU-SILC). It is an *ex-ante* harmonised data collection covering most European countries whose main item is income and the national microdata composing it are derived from a common collection framework.⁶ Its structure therefore makes EU-SILC the most reliable data source to carry out cross-country income comparisons in Europe and to obtain an EU-wide income distribution.

⁵ This is discussed in depth in Section 4.3.

⁶ The common framework 'consists of common procedures, concepts and classifications, including harmonised lists of target variables to be transmitted to Eurostat' (Wolff *et al.* 2010, 40). For other data comparability issue (sampling designs, fieldwork period, etc.) see also the same publication.

Data quality between the countries in EU-SILC may vary as some countries collect data from surveys while others derive them from existing administrative registers.⁷ It is indeed well-known that register income data are usually more precise, since income data collected from surveys are based on self-declaration and tend to under detect incomes, especially at the top of the distribution (Törmälehto and Jäntti 2013). Nevertheless, the analysis is carried out with the confidence that, also in the case of EU-SILC, the comparability between different data sources will be further improved both for future waves and ideally for past ones.

The dataset dates back to 2004, but given that some countries joined EU-SILC only later, the analysis starts with the 2007 cross-sectional file, which covers almost all the EU-28 countries,⁸ and continues until the 2014 file. The income reference period usually refers to the previous year, although the fieldwork period of the surveys varies slightly from country to country.⁹ The only exception is the UK, in which the survey respondents are asked about their current income. To solve this reference period mismatch, the income variables for the UK in every EU-SILC cross-sectional file are substituted with those of the previous year. As a result, our analysis carried out with EU-SILC files from 2007 to 2014 actually refers to the period 2006-2014.

The definition of income considered in this study is that of net disposable income and market income. These two income concepts comprise the income components shown in Table 1. In addition, a slightly different disposable income concept that also includes imputed rents is used.¹⁰

Table 1. Income Concepts

Net disposable income		Market income	
+	gross employee cash or near cash income	+	gross employee cash or near cash income
+	company car	+	company car
+	gross cash benefits or losses from self-employment	+	gross cash benefits or losses from self-employment
+	pensions received from individual private plans	+	pensions received from individual private plans
+	income from rental of a property or land	+	income from rental of a property or land
+	regular inter-household cash transfers received	+	regular inter-household cash transfers received
+	interests, dividends, profit from capital investments	+	interests, dividends, profit from capital investments
+	income received by people aged under 16	+	income received by people aged under 16
+	family/children related allowances		
+	social exclusion not elsewhere classified		
+	housing allowances		
+	unemployment benefits		
+	old-age benefits		
+	survivor' benefits		
+	sickness benefits		
+	disability benefits		
+	education-related allowances		
-	regular taxes on wealth		
-	regular inter-household cash transfer paid		
-	tax on income and social insurance contributions		

Income is considered at household-level and therefore adjusted for the household size by applying the modified OECD scale, whose choice is discussed in the Annex.

⁷ The register countries are Sweden, Finland, Slovenia, the Netherlands. Moreover, in recent years, France, Italy, Latvia and Ireland have also started to use income data from registers, along with Spain and Austria.

⁸ The only exceptions are Malta, for which data are available from the 2008 SILC wave and Croatia, for which data are available from the 2010 wave.

⁹ For further information see: 'EU statistics on income and living conditions (EU-SILC) methodology — data collection' (Eurostat 2015).

¹⁰ Inequality figures for disposable income including imputed rents are in the Annex.

Subsequently, to make the income concepts comparable across all countries the income variables are corrected for national price-level indices from Eurostat (prc_ppp_ind), selecting them for different levels of aggregation (GDP or household final consumption expenditure (HFCE)). In the following analyses the results presented derive from the income distributions corrected for the GDP-based price-level indices, in any case the results for the HFCE-corrected income distribution strictly follow those presented here and are available on request.¹¹ The ppp correction is gauged on the year of reference (e.g. 2015 EU-SILC data are corrected with 2014 ppp except for the UK, which is corrected with 2015 ppp).

The country concept used in the analysis refers to the country of residence at the time of data collection. The same applies to the region concept used in Section 4.4. This choice mostly depends on the data available, as these are the country and region variables of EU-SILC. The use of the country of residence instead of the country of origin poses some interesting questions especially for the interpretation of the results in Section 4.3, in which this aspect is discussed.

Finally a remarkable advantage of the EU-SILC data is the sample-weighting procedure. In each wave a variable of individual weights is recorded to account for both the different probabilities of selection and survey non-response at the individual level. Moreover the weighting variable is constructed in such a way that it makes the merged sample of all EU countries representative of the EU population when it is applied to EU-wide statistics.

4. INEQUALITY ANALYSIS

4.1. Plan of the analysis

Having obtained the equivalised ppp-adjusted income distributions for both the net disposable and the market income concept, in Section 4.2 income inequality is computed for the EU-28 and the euro area as measured through the widely used Gini coefficient or the shares measures popularized by Piketty.

In Section 4.3 the E(M)U-wide inequality is decomposed by country of residence to assess to what extent E(M)U-wide inequalities depend on between-country vs within-country-inequality. To carry out this analysis a property of some inequality indices is exploited, namely decomposition in non-overlapping groups of individuals. This property holds for the indices of the family of generalised entropy indices such as the Theil index and the mean logarithmic deviation.

Finally, in Section 4.4 the E(M)U-wide inequality is decomposed by region of residence to integrate the previous decomposition. This is especially in view of the fact that some EU policies occur at the regional level, so an assessment of the between-region inequality component in the E(M)U may also inform regional policies about their need and scope in tackling this issue.

Box: the Theil index

The Theil index measures an entropic 'distance' the population is away from the egalitarian state of everyone having the same income. The numerical result is expressed in terms of negative entropy so that a higher number indicates more order that is further away from complete equality. Formulating the index to represent negative entropy instead of entropy allows it to be a measure of inequality rather than equality.

The Theil index is an entropy measure, firstly devised by Theil (1967) from information theory. In plain words, the index aims to quantify the level of disorder within a distribution. That is why it is often used in the case of income distributions. Thus, for a population of N individuals whose individual income is characterised by x_i and the mean income is μ the index is built as:

¹¹ Following also ESTAT practice to use GDP-based ppp to express poverty thresholds in ppp.

$$T = \frac{1}{N} \sum_{i=1}^N \frac{x_i}{\mu} \ln\left(\frac{x_i}{\mu}\right)$$

The statistic uses the expected information content of the income distribution to measure the level of inequality and may lie between 0, in the case of perfect equality and $\ln(N)$ in the case of perfect inequality. The Theil index is widely used in inequality studies especially in light of its property of decomposability by population subgroups which turns out to be very useful in many empirical applications, among which the decomposition by country and by region applied in this paper. For more information on the properties of the index, and how it differs from other generalised entropy measures of inequality see Jenkins's paper on the measurement of inequality (1991).

For example, the overall inequality measured by the Theil index (GE_1)¹² can be additively decomposed as the sum of the between-country and the within-country inequality:

$$T(Y) = T^B(Y) + T^W(Y) \quad (1)$$

with:

$$T^W(Y) = \sum_{m=1}^M v_m T(Y^{(m)}) \quad (2)$$

where v_m is country m 's share of the total income and $T(Y^{(m)})$ is the inequality within country m . In turn, $T^B(Y)$ is the between-country inequality, in which each individual is assigned the mean income of the country where he or she lives in.

4.2. A first anatomy of inequality levels at the E(M)U level

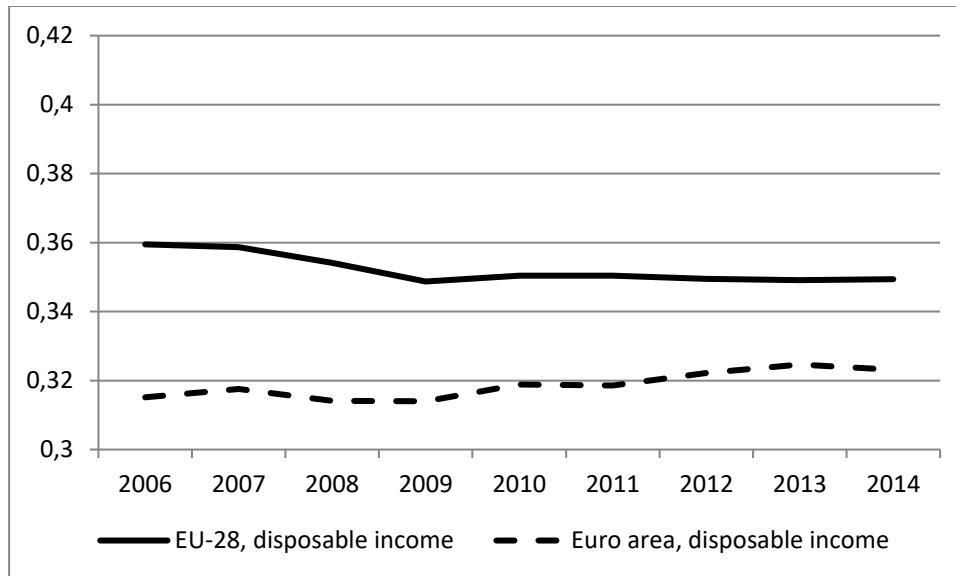
Having obtained the equivalised ppp-adjusted income distributions for both the net disposable and the market income concept, income inequality is computed for the EU-28 and the euro area. It must be noted that the Member States (MSs) of the EU and the euro area have changed over the time span considered. For the sake of simplicity, for the whole period under scrutiny the EU-28 and the EA-19 are considered as they were composed at the time of writing.¹³

Here inequality is mostly shown as it is measured through the Gini coefficient or the shares measures.¹⁴ The Gini coefficient was chosen as it is the most widespread inequality index allowing us to make comparisons with previous inequality studies for the US, while the shares measures, recently popularised by Piketty (2014), were employed to complement the inequality measurement provided by the Gini coefficient. This is because the Gini coefficient is particularly sensitive to income differences around the centre of the distribution so it is less informative about distributional changes at the top and the bottom. The caveats about the under detection of top incomes in surveys described in Section 3 apply here, so the share measures must be interpreted cautiously. However, given that EU-wide inequality analysis is a nascent field, this is valuable information anyway, maybe to be corrected in the future when register data become available for all EU countries.

The Gini index for the disposable income in the EU-28 and the euro area is illustrated in Figure 1.

¹³ The EU-28 and EA-19 are considered in their present day composition even though some countries joined the EU-28 or adopted the euro over the course of the period under examination, 2006-2014 (e.g. LV adopted the euro in 2014 but it is considered in the euro area also for previous years and so SI, CY, MT, SK, EE, LT).

¹⁴ Other inequality measures, such as the generalised entropy family of indices, the Atkinson indices and some quantile ratios, were also computed and are available on request.

Figure 1. Inequality comparison: The EU-28 and the euro area. Gini index

As may be noted, the Gini coefficient displays different trends for the EU-28 and the euro area. For the former there seems to be a decreasing trend, at least until 2009, after which it stabilises at around 0.35. The Gini coefficient in the euro area, though smaller than that in the EU-28, has slowly increased, especially after the crisis, to a peak of 0.32 in 2013.

This difference in inequality trends between the euro area and the EU-28 seems to indicate potential income convergence of the countries outside the euro area (mostly the Eastern European countries). This hypothesis, documented in the annual review of "Employment and Social Developments in Europe (ESDE) 2016" in the chapter 'Convergence and divergence in the E(M)U and the role of employment and social policies' (2016), will be tested in Section 4.3.

The EU-wide inequality appears to be slightly smaller when imputed rents are taken into account, as the figures show an average reduction in the Gini index of respectively 4 % and 3.5 % for the EU-28 and the euro area (Annex). This is probably due to the higher proportion of home ownership in South-Eastern countries (Törmälehto and Sauli 2010), which is likely to increase incomes in these countries and, as a result, decrease EU-wide inequality levels.¹⁵

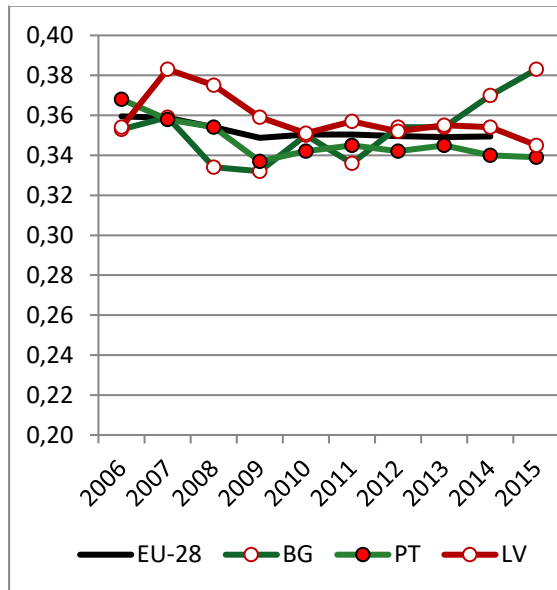
To visualise how unequal the EU-28 income distribution is in relation to the Member States that compose it, Figure 2 plots the Member States that display Gini coefficients more (dis)similar to the EU-28 Gini,¹⁶ which are BG, PT and LV.

¹⁵ However, the lack of imputed rents data for Germany prevented the study from using distributions including imputed rents in the following analysis and ultimately the question of whether the inclusion of imputed rents affect EU-wide inequality through a within- or a between-country lever is still open.

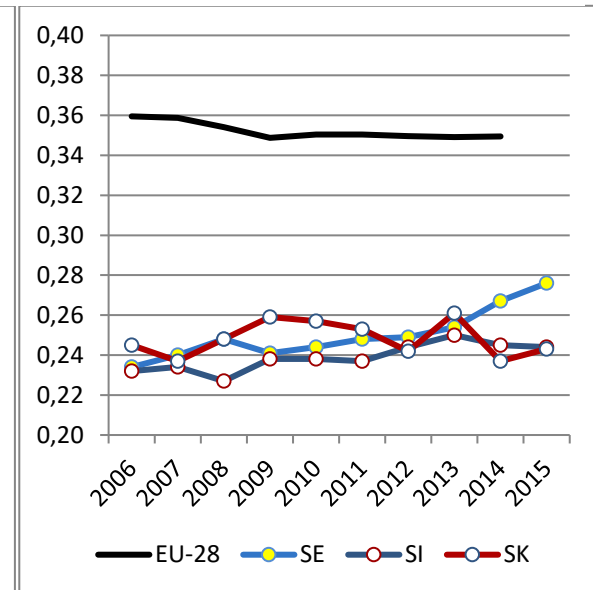
¹⁶ Similarity is expressed in terms of the time average of squared deviations from the EU-28 Gini.

Figure 2. Inequality comparison. The EU-28 and some Member States. Gini index, net disposable income

a) Most unequal EU Member States



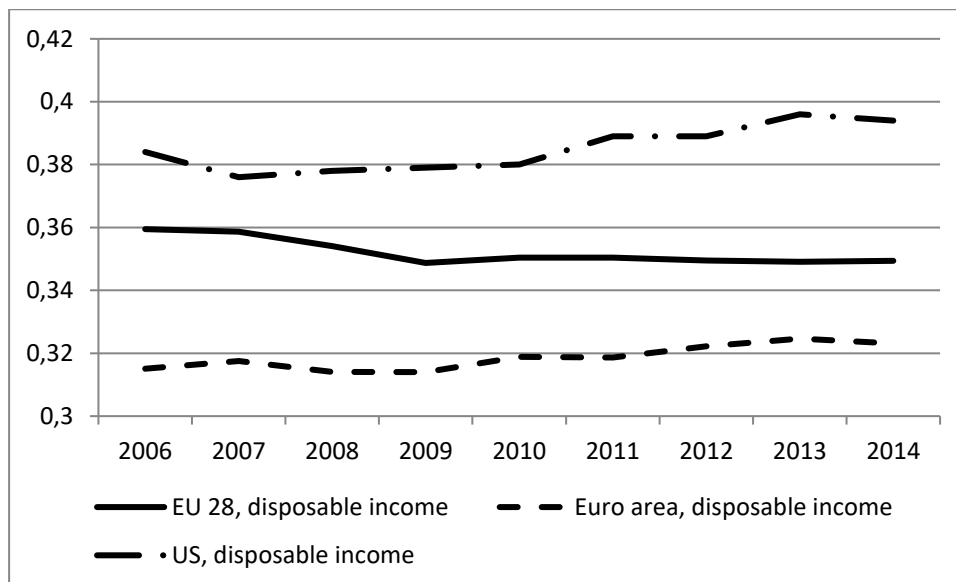
b) Most equal EU Member States



This shows that the EU-28 as a whole is as unequal as the most unequal among its Member States. Conversely, its most equal Member States, specifically SE, SI, and SK, have their incomes ca. 30 % more equally distributed than in the EU-28 as a single entity.

If inequality is examined in comparison with the US,¹⁷ as shown in Figure 3, the inequality ranking looks clear-cut with the US topping the list, followed by the EU-28 and the euro area. Considering the trends, the US Gini is also growing similarly to the euro area one but from much higher levels until it reached a peak of 0.40 in 2013.

Figure 3. Inequality comparison. The US, the EU-28 and the euro area. Gini index



¹⁷ The US Gini coefficient is derived from OECD data (OECD Social and Welfare Statistics, DOI: 10.1787/socwel-data-en) in which the household income is equivalised with the square root of the household size.

We also compute the share measures for the EU-28 to integrate the inequality assessment provided by the Gini coefficient, as shown in Figure 4.

Figure 4. Share of disposable income possessed by different deciles (%)

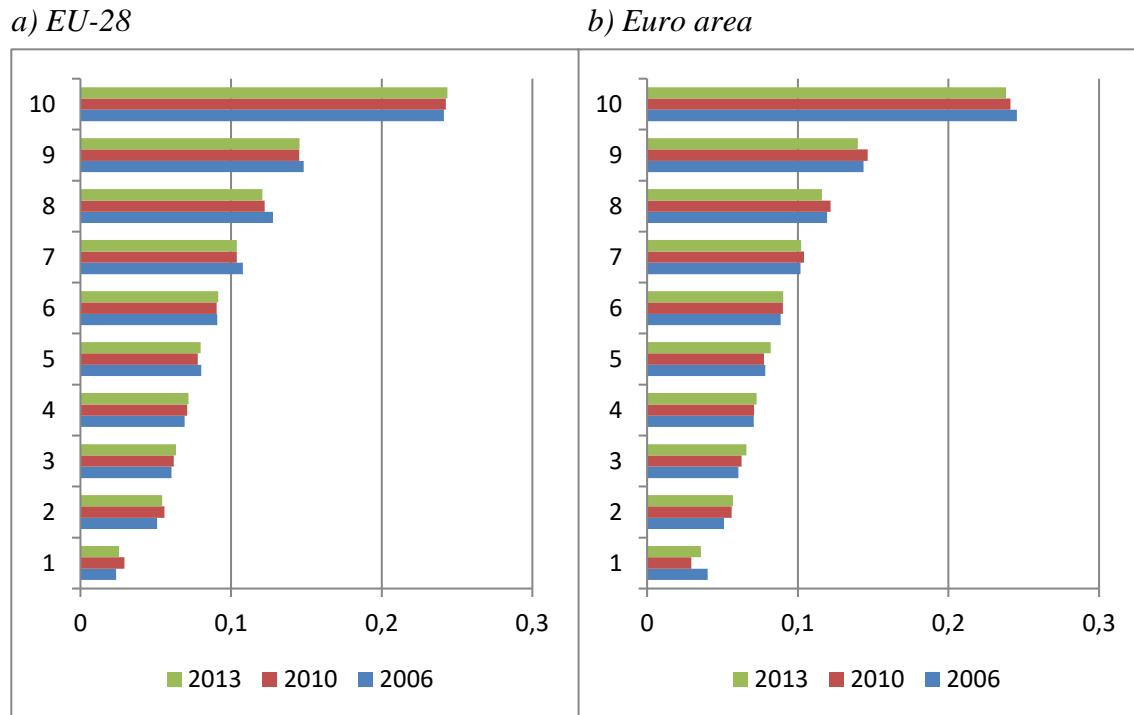


Figure 4 shows how much of the total disposable income for the EU and euro area-wide distribution is appropriated by the different population deciles for 2006, 2010 and 2013, loosely corresponding to the years before, during and after the crisis. To interpret the figure, consider for example panel a): those at the 70th percentile in the EU-28 income distribution appropriated approximately 10 % of the total EU-28 income in 2013.¹⁸

4.3. Decomposition by country

In this section the overall EU and euro area-wide inequality is decomposed into a within- and between-countries component.

As sketched in Section 2, this issue may be relevant as an increase in the between-country component may influence intra-EU mobility and undermine social cohesion.

Thus, two indices of the family of generalised entropy indices are computed — the Theil index (GE_1) and the mean logarithmic deviation (GE_0) — and subsequently decomposed by country.

In the following results only the Theil index decompositions are presented but the figures for the mean logarithmic deviation are available in the Annex.¹⁹

¹⁸ If you are interested in exploring which individuals from which countries are more likely to be found in different parts of the EU-wide income distribution see Eurofound 2017 (Figures 2 and 3).

¹⁹ The levels of the between-country contribution to overall inequality are sensitive to the index chosen, especially in the case of the EU-28 income distribution. This is due to the different function of 'distance' between income shares incorporated in the different measures of the generalised entropy family (Jenkins 1991). This is the main reason why more emphasis is put on the general *trends* of the inequality decomposition, which are similar regardless of the index chosen, rather than on the *levels*.

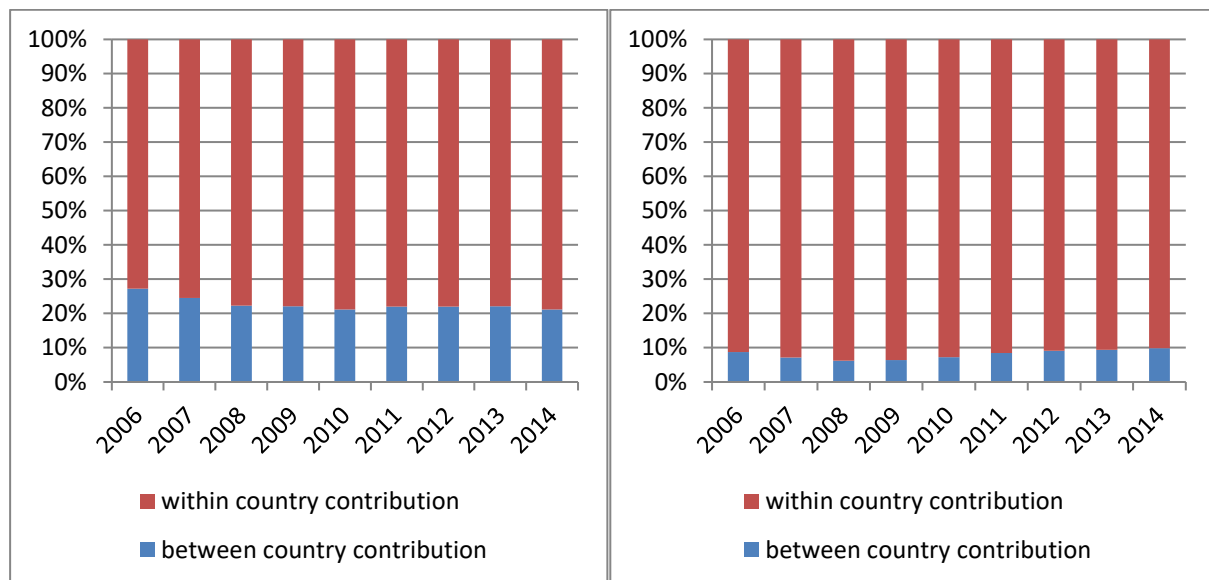
Country should be intended as country of residence, as explained in Section 3. In such a fashion, the between-country component of the decomposition should be interpreted as inequality between the mean incomes of citizens *residing* in the different European countries. Therefore, European cross-border migration is already taken into account as citizens born, say, in Greece but residing in Germany are treated as German residents.

The decomposition results for the EU-28 are presented in Figure 5.

Figure 5. Theil decomposition by country, disposable income

a) EU-28

b) Euro area



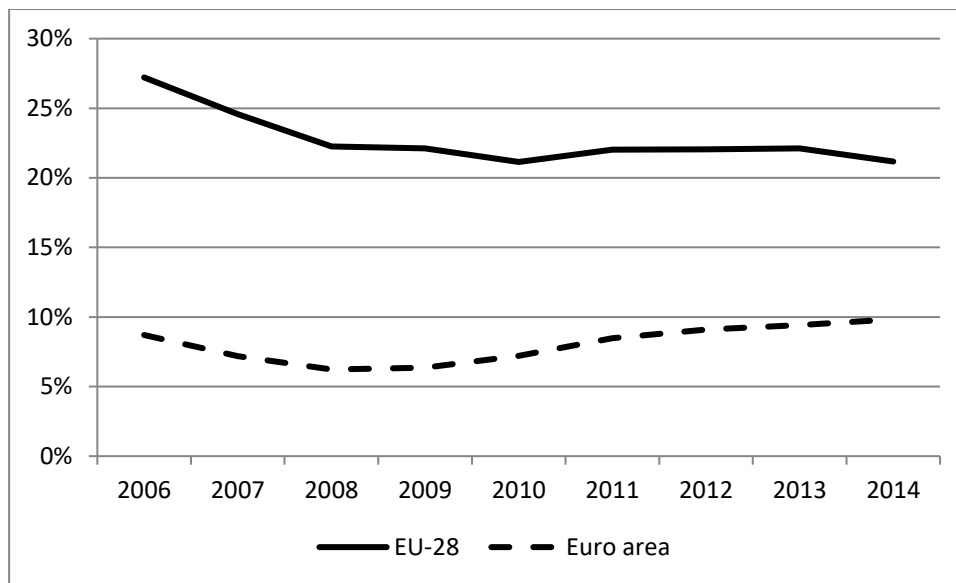
They show that inequality between the EU Member States accounted for almost 30 % of the overall inequality in the EU-28 before the crisis, with a declining trend until 2010 and then a stationary contribution to total inequality slightly above 20 %.

The decomposition evidence for the euro area, illustrated in panel b), points to a much smaller contribution of between-country inequality, never accounting for more than 10 % of the inequality, as the euro area countries have more similar mean incomes than the EU-28 countries, but with a seemingly increasing trend.

To obtain a synoptic view of the between-country contribution to the overall inequality in the two areas their trends are plotted in Figure 6. As is clear, the levels are quite different, but the trends provide us with an interesting comparison: in the EU-28 the inequality between countries accounted for almost 30 % of the total inequality in 2006 but this figure constantly reduced to 22 % in 2010, probably due to the catching up of mean incomes in some Eastern countries — for example the success story of Poland is well-known. However, as of 2010 the between-country inequality path has arrested its decline.

The trend in the euro area looked similar until 2008, with inequality between the euro area Member States in decline until the historical low of 6 % of overall euro area inequality in 2008, but, in the aftermath of the crisis, the mean incomes between the euro area countries diverged as a result of different economic performances so that between-country inequality in 2014 accounts more (ca. 10 %) for the total euro area inequality than it did back in 2006.

Figure 6. Between-country contribution to Theil index, disposable income (%)



In brief, a pick-up of the convergence process would reduce the total inequality in the EU and the euro area up to respectively about 20 % and 10 %.

To put these figures further into perspective with the inequality trends in the two areas as a whole, it is useful to remember what was evidenced in Section 4.2: that is, inequality in the euro area has slowly increased over the last 5 years while it has remained stationary in the EU-28, even though in 2014 it was still 8.5 % higher.²⁰

4.4. Decomposition by region

So far the analysis has investigated the extent to which overall income inequalities existing in the EU are due to inequality between countries and documented how this component has changed over time in the two areas. Nevertheless, the subnational level has not been considered in the analysis while recent studies show how much inequality also takes place at the regional level, even within the same country, in the EU (OECD 2014).

The data used here are the same as in the previous analysis, with the exception that instead of country, the region of residence is used in the decomposition exercise: thus the two addends of the decomposition in (1) become the *within-region* and the *between-region* inequality.

The regional identifier is recorded in the EU-SILC data as the region of residence at the moment of the interview, so, as for the country, migration from a region different from that of birth is already taken into account. Unfortunately, some countries do not provide a regional identifier in the EU-SILC data, as shown in Table 2.

1.1.1. ²⁰ According to the Gini index, if using the Theil index, also for consistency issues with decomposition analysis, the inequality in the EU-28 is actually 16 % higher than in the euro area.

Table 2. Countries with No Regional Identifier in EU-SILC

	2006	2007	2008	2009	2010	2011	2012	2013
DE	x	x	x	x	x	x	x	x
NL	x	x	x	x	x	x	x	x
PT	x	x	x	x	x	x	x	x
SI	x	x	x	x	x	x	x	
SK	x							
UK	x	x	x					

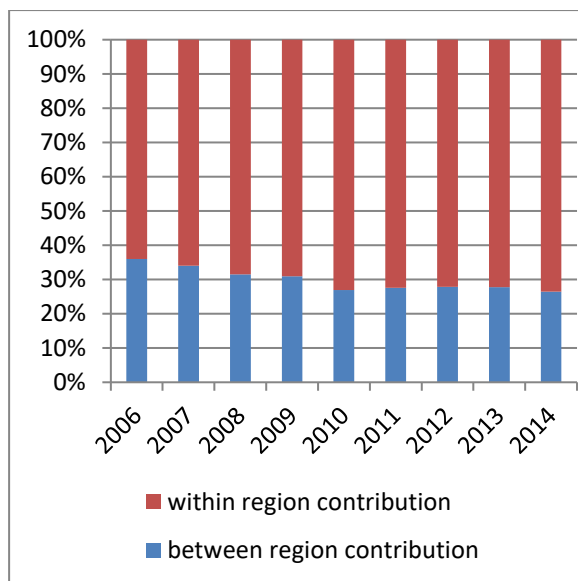
For countries with limited regional variation such as Slovenia or the Netherlands, the lack of regional identifiers is not an insurmountable limitation but in the case of Germany, well-known for long-running regional disparities, this lack is a major shortcoming.

Therefore, the following results are obtained by decomposing an E(M)U-wide distribution excluding the countries lacking a regional identifier (e.g. DE, PT and the NL in 2014), so the results must be interpreted with caution and bearing in mind the absence of these countries from the supranational distribution.

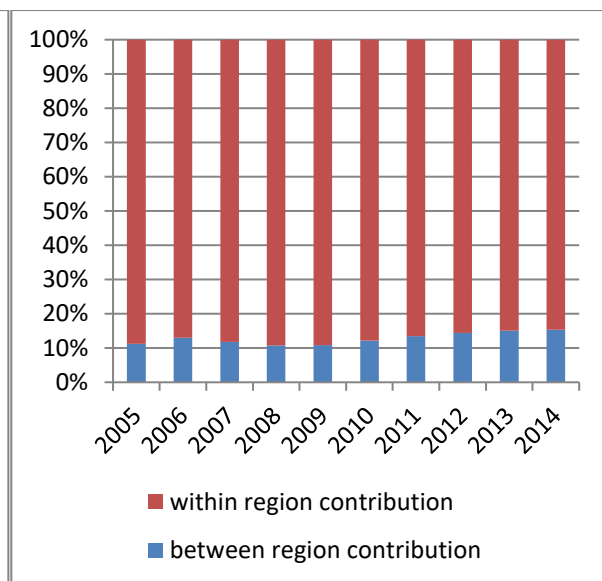
The decomposition results show that the inequality between regions accounts for about a third of the overall EU-wide inequality,²¹ as shown in Figure 7.

Figure 7. Theil decomposition by region, disposable income

a) EU-24



b) Euro area (Without DE, SI, PT, NL)



The trend of the between-region component declines slightly until 2010 reaching 28 %, similar to the trend of the inequality between countries. Therefore, the convergence of regional mean incomes also seems to have stopped after the crisis.

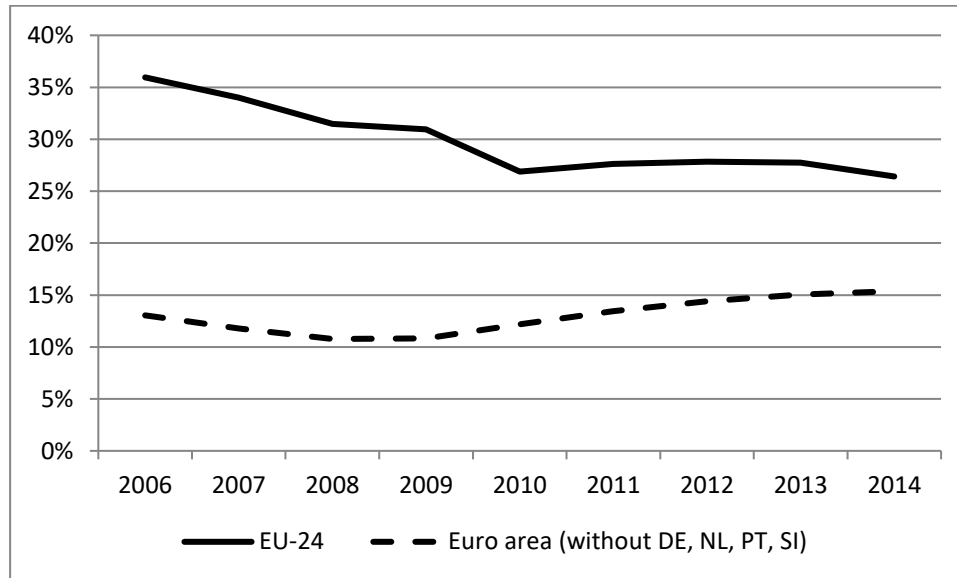
The same exercise is repeated for the euro area (Panel b), excluding the countries lacking a regional identifier, and the results indicate that the total euro area inequality would reduce by about 15 % if convergence within euro area countries (i.e. of their regional mean incomes) would increase.

To better underscore the trends of the between-region component in the two areas, they are plotted separately in Figure 8.

²¹ With the exclusion of the countries highlighted in Table 2.

Here also, the trends of the between-region inequality component for the EU and the euro area mirror those obtained for the between-country component, albeit at higher levels, as the inequality between regions is greater than that between countries for both the EU-28 and the euro area.

Figure 8. *Between-region contribution to Theil index, disposable income (%)*



All in all, this evidence points to the need to address income inequality in its regional dimension as well, as the divergence (lack of convergence) of mean incomes experienced by countries in the euro area (EU-28) is also at play for regions and with a greater magnitude, as expected.

5. HOW MUCH ARE EU-WIDE INCOMES DETERMINED BY COUNTRY OF RESIDENCE?

This section aims to quantify the extent to which individual incomes in the EU-wide distribution depend on the country of residence. This 'country effect' has recently been studied by Milanovic (2015) on a global scale. He argues that around two thirds of the income variability among individuals in the global income distribution was explained by their country of origin in 2008. This result is particularly relevant in the framework of the equality of opportunity. This strand of research indeed maintains that disparities in income are less acceptable if they are the result of external circumstances as opposed to individual efforts (Roemer 2008). Whether income differences are explained to a great extent by the country of origin, over which the individual has no control, this may be interpreted as an incentive for individuals who want to reduce inequality of opportunities to migrate.

The same theoretical framework can be applied in the context of supranational income distributions as in the EU-28 or the euro area. Whether the effect exerted by the country of residence in determining individual incomes in the supranational distribution is particularly relevant, this may flag a potential propensity for individuals to move from one country to another one within the EU. Thus, this evidence is closely related to the convergence in mean country incomes, which determines the between-country inequality of Section 4.3.

The method used here follows the research strategy used by Milanovic (2015), adapted to the E(M)U context to trace the country effect over 2006-2014 with EU-SILC data. Therefore the previous definition of ppp-adjusted disposable income is used as already described in Section 3 and the (log of) individual net disposable incomes are regressed on country dummy variables such as in (3):

$$\log(y_{ij}) = \beta_0 + \beta_1 \text{Country}_1 + \beta_2 \text{Country}_2 + \dots + \beta_{J-1} \text{Country}_{J-1} + \varepsilon_{ij} \quad (3)$$

where the income of individual i in country j just depends on country dummies with countries $j=1,2, \dots, J$, and more specifically $J=28$ for the EU-wide distribution while $J=19$ for the euro area-wide distribution.

Individual characteristics are not taken into account as the objective of this section is not to provide a comprehensive explanation of all the factors affecting individual incomes in the EU, rather to devise a model that concisely takes stock of the 'country effect' in determining income variability across EU countries.

This least square dummy variable regression (LSDV) may then be interpreted as a model in which the variability in incomes at the E(M)U level is just explained by the country of residence.

The country dummy chosen to be removed are respectively Romania and Latvia for the regression of the EU-wide and the euro area-wide income distribution as the poorest countries in the two areas. Thus, the regression coefficients are to be interpreted as the % advantage of living in a country that is different from the baseline country, i.e. Romania or Latvia.²²

As discussed in Section 3, country is defined in EU-SILC as country of residence and so the effect of interest should be interpreted as the effect of *residing* in a particular country on income.²³

Naturally, this model is not meant to describe comprehensively the determinants of individual incomes on the E(M)U scale as it explicitly excludes many individual- and country-level variables that are known to affect income. Hence, the interpretation of the coefficients is very likely to be affected by omitted variable bias, but the inspection of the r-squared may inform about the relevance of the country effect and tracking its evolution over time may illustrate how much it has changed.

National population sizes are treated following two different approaches. First the current E(M)U population size is taken into account by running population-weighted regressions so as to consider the country effect in the E(M)U as it is (EAI). Along with that, a second strategy is used to treat countries as having the same population.²⁴ This is to give account of a counterfactual situation in which EU individuals compare their income with the income they might have had if they moved to the income distribution of another EU Member State by migrating. From this individual viewpoint (IV), population sizes of the receiving countries do not matter.

Thus, the first approach (EAI) gives account of the magnitude of the real country effect in determining income in the E(M)U-wide distribution, the second one (IV) identifies the advantage an individual would in principle gain by moving from one country to another one within the E(M)U.

Regressions are respectively run in 2007, 2010 and 2014 to identify the evolution of this effect.

The R-squared in the EU and in the euro area is inspected as they are in their population size (EAI).

²² However, the focus of the analysis will be on the interpretation of the r-squared therefore the regression coefficients are not presented here but are available on request.

²³ The same analysis is also performed on the sample of the native-born individuals. Results are in the Annex, Table II.

²⁴ This is achieved by adjusting personal weights (RB050) so that the sum of the personal weights is equal in each country.

Table 3. Regression Output

EU-28 as it is				Euro area as it is			
	2007	2010	2014		2007	2010	2014
Country dummies' significance	All	All	All	Country dummies' significance	All but LT	All but LT	All but LT
# of observations	554,376	565,056	555,272	# of observations	377,352	378,120	388,284
R-squared	0.3616	0.2969	0.2901	R-squared	0.1038	0.1035	0.1291
EU-28, Individual viewpoint				Euro area, Individual viewpoint			
	2007	2010	2013		2007	2010	2013
Country dummies' significance	All	All	All	Country dummies' significance	All	All	All
# of observations	554,376	565,056	555	# of observations	377,352	378,120	388,284
R-squared	0.4226	0.3843	0.3466	R-squared	0.3044	0.3044	0.2559

As Table 3 shows, for the EU-28 the country of residence explained as much as 35.8 % of the overall net disposable income variability in the 2007 distribution while subsequently this figure declined to 29.6 % in 2010 to stabilise around this percentage in 2014. Thus the process of convergence that brought about a reduction in the country effect from 2007 to 2010 seems to have stopped in recent years.

For the euro area the country effect is much smaller, as expected, slightly more than 10 %. However, it must be noted that while this effect reduced from 2007 to 2010, it has recently increased, to the extent that the country of residence explained more income variability in 2014 than it did back in 2007.

Similar results hold, with a greater magnitude, for the sample of the native-born individuals, to remove the effect of those who already migrated, maybe pushed by the incentive to gain greater incomes embedded in the 'country effect'.²⁵

In a sense the evidence collected in Section 4.3 about the increasing relevance of the between-country component in explaining income inequality is also confirmed in this analysis, albeit with a slightly different interpretation.

The same regression approach, when framed under the individual viewpoint, reveals slightly different trends as illustrated in the bottom panels of Table 3.

From the individual viewpoint, the country effect in the EU-28 is stronger than in the EAI framework but slightly decreasing. The same effect in the euro area stands at much higher levels compared to the euro area-as-it-is approach but is slowly reducing its relevance in explaining income variability: from around 30 % in 2010 to 25.5 % in 2014.

To enlarge the EU perspective on a wider scale, the following summary table (Table 4.) presents the difference of this effect for the E(M)U and the world, as computed by Milanovic (2015) for 2008.

Table 4. Country effects

	EU-28	Euro area	World (2008)
E(M)U (World) as it is	0.316	0.112	0.733
Individual viewpoint	0.385	0.288	0.657
Country effect for the world is derived from Milanovic (2015).			
Country effect for the EU-28 and the EA is their time average over the period 2007/2013			

The much smaller magnitude of the country of residence in explaining income variability in the E(M)U with respect to the world appears clear from this table. However, the comforting result that the country of residence at the euro area-level explains no more than one seventh of the individual incomes at the world-level should also be interpreted

²⁵ See Table II in the Annex.

in light of the historically much closer income levels of the European countries and bearing in mind that this country effect in the euro area is nevertheless on the rise (while it is decreasing at the world-level). To this end, it would also be interesting to compare these results with those estimated in such a way for the US, to check whether levels and trends of the country effect in explaining incomes on a federal level are similar with those documented for the E(M)U but such a study has not yet been carried out for the US.

Finally, an analysis of the 'regional effect' could also inform us about the need for convergence from a regional point of view, but the mentioned lack of regional identifiers for some EU countries is a big limitation to conduct such an analysis.

6. CONCLUSIONS

This study has expanded the prior research on supranational income distributions to shed light on the role of the country of residence in contributing to the overall inequality and in determining people's income in the E(M)U as a whole.

The results obtained are examined in comparison with the US and with a national and regional decomposition of the E(M)U-level inequality.

The decomposition analysis can be summarised as follows. If the mean national incomes converged and so, with a leap of imagination, inequality between countries were eliminated, the total inequality would reduce:

- by ca. 20 % in the EU-28 and
- by ca. 10 % in the euro area.

Likewise, if the inequality between regions²⁶ disappeared, the overall inequality would reduce:

- by ca. 30 % in the EU-28 and
- by ca. 15 % in the euro area

In terms of trends, the main evidence points in the direction of a slow decline in between-country inequality in the EU-28, at least before the crisis, followed by a stationary level of between-country inequality versus increasing between-country inequality in the euro area in recent years, although for levels no greater than 10 % of the overall inequality in the euro area.

Similar between-region inequality trends are observed, but for larger between-region contributions to overall inequality.

These results are further validated by an assessment of the country role in determining individual incomes in the E(M)U-wide income distribution, which displays the same trends as the between-country contribution to inequality both for the EU-28 and the euro area.

Finally, this study paves the way for improvements and follow-up research as the analysis of EU-wide income distribution is a relatively nascent field of investigation both from an empirical and from a theoretical point of view.

²⁶Among the regions in the analysis, without considering the regions of DE, NL, SI and PT.

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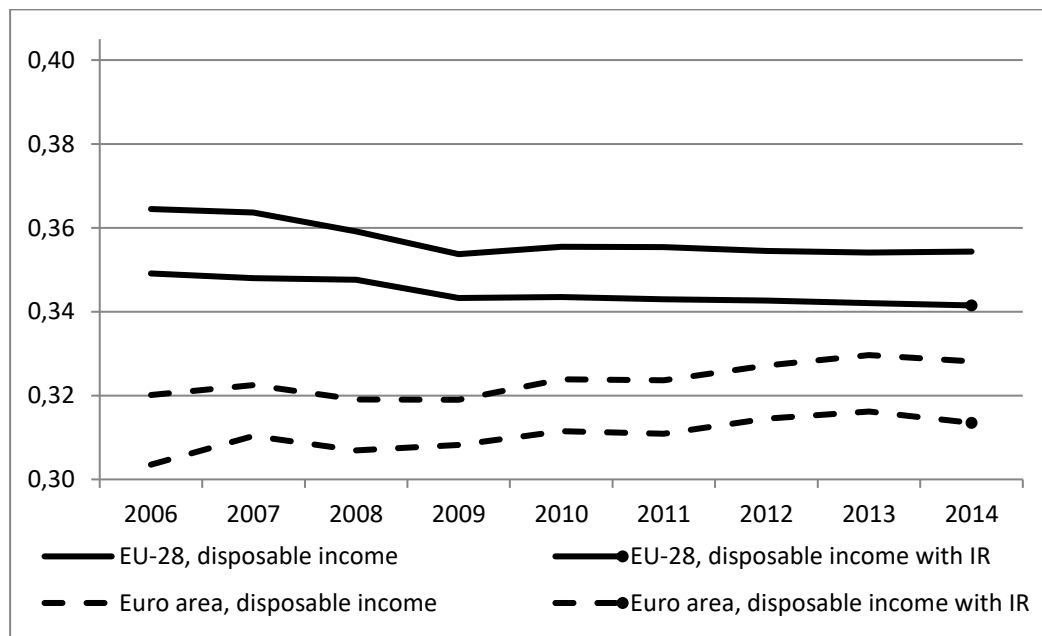
ANNEX

Additional tables and figures

The equivalence scale

The choice of which equivalence scale to apply may affect inequality measurements as family composition varies across the European countries, with Southern and Eastern European countries displaying a larger household size than Northern European countries (Iacovou and Skew 2011). The modified OECD scale appreciates the incomes of numerous households more than the old OECD scale but less than the square root of the household size, so the inequality assessment may in principle be sensitive to the equivalence scale chosen (Brandolini 2007). Aware of this issue, to follow previous income studies at the EU level the equivalence scale used here is the modified OECD scale. However, the same figures were computed using as equivalence scale the square root of the household size and are available upon request. In any case, results are not significantly altered.

Figure I — Inequality comparison: EU-28 and euro area, imputed rents. Gini index



NB. Imputed rents unavailable for Germany.

Table I — Inequality comparison: EU-28 and euro area, imputed rents. Gini index

	EU-28		Euro area	
	/	Imputed rents	/	Imputed rents
2006	0.3595	0.3441	0.3151	0.2985
2007	0.3587	0.3430	0.3175	0.3053
2008	0.3541	0.3426	0.3141	0.3019
2009	0.3487	0.3383	0.3140	0.3032
2010	0.3504	0.3385	0.3189	0.3065
2011	0.3504	0.3379	0.3186	0.3059
2012	0.3495	0.3376	0.3222	0.3095
2013	0.3491	0.3370	0.3246	0.3112
2014	0.3494	0.3365	0.3231	0.3085

Figure II — Between-country contribution to overall inequality (%), disposable income

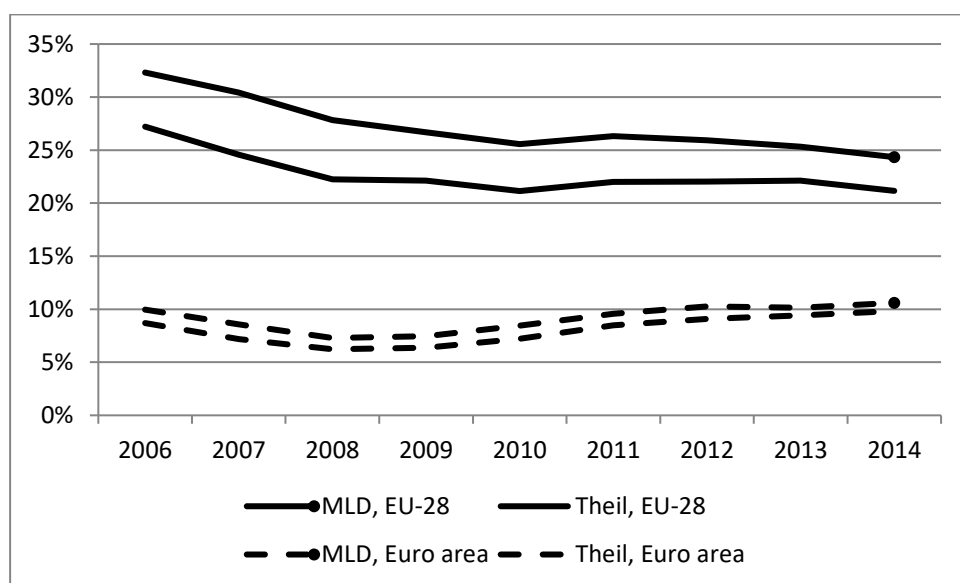


Figure III — Between-region contribution to overall inequality (%), disposable income

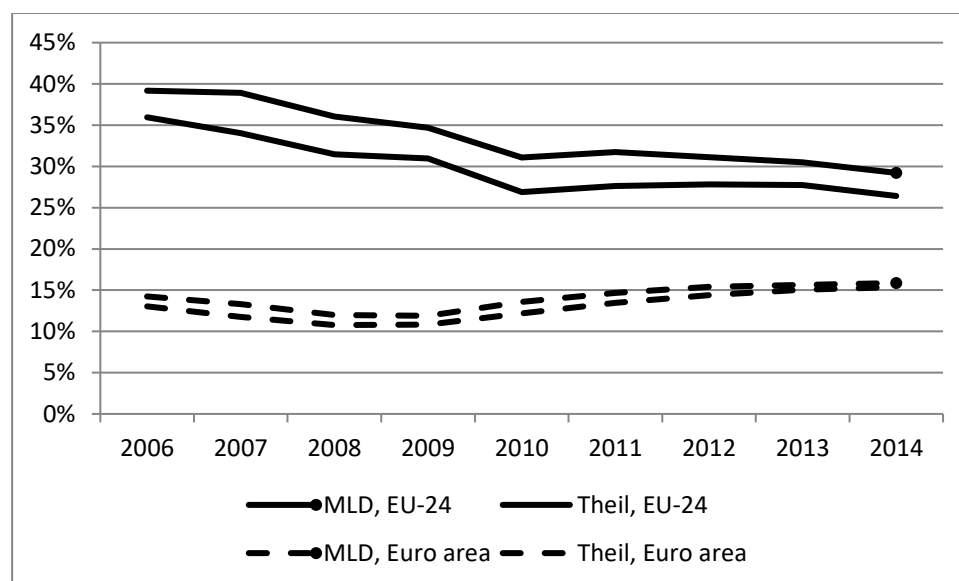


Table II. Regression output, for the total resident population and for the native-born population.

EU-28 as it is				Euro area as it is			
	2007	2010	2014		2007	2010	2014
Country dummies' significance	All	All	All	Country dummies' significance	All but LT	All but LT	All but LT
# of observations	554,376	565,056	555,272	# of observations	377,352	378,120	388,284
R-squared	0.3616	0.2969	0.2901	R-squared	0.1038	0.1035	0.1291
EU-28 as it is (only native born)				Euro area as it is (only native born)			
# of observations	509,672	515,336	486,297	# of observations	341,159	337,827	349,214
R-squared	0.3894	0.3258	0.3334	R-squared	0.1107	0.1107	0.1312

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