imajINE Integrative Mechanisms for Addressing Spatial Justice and Territorial Inequalities in Europe

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Acronyms and Abbreviations

AROPE	At risk of poverty or social exclusion
EQLS	European Quality of Life Survey
EU	European Union
EU-SILC	European Union Survey on Income and Living Conditions
GE	Generalized Entropy
LAU	Local administrative unit
LIS	Luxembourg Income Study
MD	Material Deprivation
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
WP	Work Package

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Introduction

The Social Policy agreed and established by the European Union (EU) pursues social cohesion through enabling people to take advantage of social change and use it as a tool to improve their quality of life. Reducing inequality is essential for achieving this target. However, the EU embodies vast cultural diversity combined with significant disparities in the living conditions and material resources available for the inhabitants of the different European countries and regions, which makes it a very complex task.

In their book on the subject, Wilkinson and Pickett (2009) review the wide range of social issues raised by the international growing inequality of our time. In conclusion, they find that countries and regions affected by higher levels of economic inequality also suffer from severe health and social problems, which tend to be concentrated in the lower income households. Interestingly, these issues do not only affect the lower end of the income distribution, as they bear broader implications for society as a whole in terms of life expectancy, for example. Economic inequality also has a negative impact on other dimensions such as information and transaction costs, which in turn harms political stability, investment or knowledge diffusion (Pervaiz and Chaudhary, 2015). Another troubling aspect of economic inequality is its self-preserving character, as it impedes intergenerational mobility (Wilkinson and Pickett, 2009; Corak, 2013).

Regardless of the type of measures considered, the empirical literature agrees that inequality is generally bad for economic growth, especially in developing countries. Nonetheless, the result is more controversial for developed countries. Barro (2000), for example, claims that inequality enhances growth in wealthier countries, while Stiglitz (2012) notes that the higher levels of inequality in the United States are now holding growth back. To reconcile both sides, Forbes (2000) argued that inequality can boost economic growth in the short run, with the negative effects out-weighing the positive ones in the long term. The relationship between inequality and economic growth gets even more complicated when the redistribution policy and the interest of the government is added to the equation (Ostry et al., 2014; Bénabou 2005). Furthermore, studies show that people generally have an opinion on these economic inequalities, especially in European democracies where the reduction of disparities is considered an important engine of social welfare (Alesina et al., 2004; Sachweh, 2012), making the issue of inequality even more difficult to handle from a policy perspective.

It seems clear that the devising and implementation of measures oriented to improving living conditions and reducing economic disparities among countries and regions as different as the ones forming the European Union require detailed and timely information on how people live and the resources at hand in each area. In this sense, the lack of homogenous data and indicators at a spatially-disaggregated level remains one of the main difficulties despite the advances in data collection and data access enabled by the progress of information technologies

The main objective of the Work Package 2 (WP2) of the IMAJINE project is to provide new information about income, poverty and other economic indicators at local level to enlarge the knowledge of the inequalities between and within European regions, and assist the decision-making process in charge of tackling them. An appropriate first step towards that aim is the review of the indicators more commonly used to synthetize inequality, and of the trends shown

by European countries and regions in recent years. This is the objective of Deliverable 2.1 presented here.

This report is organized into three sections, with Section 1 containing a description of the main inequality indicators used in the literature, taking into account their strengths and disadvantages from a technical point of view. This exposition serves as an introduction to the measurement and conceptual specificities in the study of economic inequality. Section 2 presents the evolution of the most widely applied indicators, namely the Gini coefficient and Theil index, from 2006 to 2013, first for European countries and then in Section 3 for NUTS1 and NUTS2 regions, using the information available in the European Union Statistics on Income and Living Conditions (EU-SILC). Finally, Section 4 restates the main points offered in this initial assessment of economic inequality in Europe using the official information currently available.

1. TRADITIONAL MEASURES TO QUANTIFY INEQUALITY

1.1 Spatial inequalities and social justice: the spatial justice concept

Territorial inequality is a concept that goes hand in hand with the concepts of 'spatial justice' and 'territorial cohesion'. Those two concepts have been broadly discussed in previous Reports of the IMAJINE Project (See D1.1 *Conceptual review of the Scientific Literature*). The purpose of this report is to focus on how territorial inequality can be measured, or alternatively, the nature of the distribution of economic wellbeing over a particular population (residing in a country, region or locality) and the differences that might exist between different regions in Europe. To quantify territorial inequalities, only official data and the maximum level of spatial disaggregation that official data allows will be analysed in this report

As has been discussed by Soja (2009), space and time profoundly affect the socio-economic environment of any society, as they shape all the processes individuals and groups are immersed in. The differentiated effect of space is especially intense in terms of social change, environmental issues or demographic balance, for instance; and this capacity to mould different paths derives into the concept of spatial justice, linked to the idea of the desirability of disparities between social groups spread over a territorial area.

Inequalities can take several forms and refer to very different aspects of life. One of the most popular stances is the one proposed by Sen (1985, 1987), which characterizes justice in relation to the relative effective access a person has to the material and intangible resources needed to achieve subjective wellbeing. This 'capabilities' approach encompasses all the dimensions necessary to grant equality in opportunities, which should be the final goal of any policy aiming at reducing inequality in a broad sense. In this Work Package, we attempt to analyse and provide new insights into one of the component parts of the universe of dimensions that should be taken into account when addressing inequality: economic disparities. Although strictly speaking we are addressing outcome inequality, the distribution of income reveals deprivations of several types that may be preventing individuals from attaining personal realization and that may come from different sources depending on the regions of Europe under regard. In this way, the objective is to inform policy-making not only about ends, but possible means that can help to build a more territorially just Europe.

1.2 Inequality indicators

The analysis of *territorial inequality* generally begins with the study of regional *income* inequality. Income is a good proxy for living standards and wellbeing as it is a variable that represents all the advantages and disadvantages that can be associated with a certain geographical location including environmental quality, local public good provision, or any other resource availability or scarcity. Thus, individuals with the same income at different locations are, at least in principle, equally well-off.

Based on individual databases, there are a number of indicators that have been traditionally used to characterize and measure income inequality, both from an absolute and a relative perspective. What follows is a brief summary of the most common indicators:

- Range: Measure of absolute inequality expressed as the difference between the maximum and the minimum income in a certain population:

$$R = y_{max} - y_{min}$$

- Variance/Standard deviation: Dispersion measures indicating the distance between individual income and the mean income.

$$Var = \frac{1}{n}\sum_{i=1}^{n}(y_i - \bar{y})^2 \; ; \; SD = \sqrt{Var}$$

- Coefficient of variation: Ratio between the standard deviation and the mean income, a standardized measure of dispersion that does not depend on the measurement unit. Compared to the standard deviation by itself, this indicator gives more weight to larger deviations from the mean.

$$CV = \frac{SD}{\bar{y}}$$

- Quantile share ratios: Proportion between shares of income received by two different percentages of the population (ordered by wealth). The quintile share ratio is a common choice for measuring inequality, and compares the income received by the poorest 20% of the population (fifth quintile - S80) to the income of the richest 20% (first quintile - S20). In terms of the Lorenz Curve, the quintile share ratio can be expressed as:

$$S_{80/20} = \frac{1 - L(0.8)}{L(0.2)}$$

- Lorenz curve (Lorenz, 1905): Most popular graphical representation of inequality, depicting the cumulative share of the income received by the cumulative share of the population, ordered by wealth (from the poorest to the richest). A perfectly equal distribution will coincide with a 45-degree line, as a given share of the population would amount to the same share of income. In this case, the level of inequality is given by the distance between the 45-degree line and the Lorenz curve. Following the equation below, the Lorenz curve can be defined as a ratio of the sum of income of the poorest *p* percentage of the population, and the sum of all incomes:

$$L(p) = \frac{\int_0^p y(i)\, di}{\int_0^1 y(i)\, di} = \frac{1}{\mu}\int_0^p y(i)\, di$$

- Gini coefficient (Gini, 1912): Most popular measure of income inequality, closely related to the Lorenz curve as it quantifies the area between the Lorenz curve and the 45-degree line of equality, divided by the total area under it. A coefficient of 0 represents a perfectly equal society (the Lorenz curve would follow the line of equality). The more

the Lorenz curve deviates from the equal distribution, the higher the value of the Gini coefficient. A value of 1 (100%) represents a perfectly unequal distribution where all income belongs to only one person. Although the original book by Gini contains up to 13 definitions of the coefficient (Ceriani and Verme, 2012), the most widely used formulation is the following:

$$GC = \frac{1}{2n^2\bar{y}}\sum_{i=1}^{n}\sum_{j=1}^{n} y_i - y_j$$

- Atkinson Indices (Atkinson, 1970): Based on the notion of Social Welfare Functions and Rawlsian justice (Rawls, 1971), the objective of these measures is to find the share of the total income needed to reach the current level of social welfare under perfect equality. These indexes, which range between 0 and 1, allow for the inclusion of inequality judgements through an inequality aversion parameter (ε). The choice of the value of ε parameter determines the sensitivity of to the changes in different part of the income distribution: the higher ε, the more sensitive the index to inequalities at the bottom of the income distribution. Normally, the inequality aversion parameter is set and compared at the 0.5, 1, 1.5 and 2 levels.

$$A_\varepsilon = 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left[\frac{y_i}{\bar{y}}\right]^{1-\varepsilon}\right]^{1/(1-\varepsilon)}$$

- Generalized Entropy Indexes (Toyoda, 1975; Cowell, 1977): This family is grounded in Information Theory, and also includes a sensitivity parameter (α). For lower values of α, the index is more sensitive to inequalities at the bottom of the income distribution. Common values for α are 0 (mean logarithmic deviation), 1 and 2 (half coefficient of variation squared); 1 being the particular case of the Theil Index (Theil, 1967), in which equal weights are assigned to income differences across the whole distribution. An interesting property of these measure is that they can be decomposed to assess the effect of within- and between-inequality among population subgroups.

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right]$$

All the inequality indices described have mathematical advantages that can serve different purposes: easier computability and interpretation (i.e. the range), or decomposability (i.e. the generalized entropy measures). However, the researcher should be aware of the limitations and specific properties of each measure (especially with regards to the underlying form of redistribution assumed) when it comes to choosing one, as advised by Champernowne (1974) who argued that the different indexes differ greatly in their reaction to different types of inequality. He defined three groups of measures categorized according to their sensitivity to changes to the higher incomes of the distribution (α-type), to a greater dispersion of the intermediate values (β-type), or to changes associated with the lower (poorer) tail of the distribution (γ-type), and suggested the selection of the index that best deals with the specific inequality under study in each case. In terms of the indexes presented, the range, the standard

deviation and the variance, which are some of the simplest measures of inequality, are not independent of the income scale (a change in the non-extreme values of the distribution would leave the range unchanged, while doubling all incomes would quadruplicate the estimate of income inequality in the case of the variance). In the case of the coefficient of variation, it does not have an upper bound, and its two components (the mean and the standard deviation) are highly influenced by low or high income values. Although the Gini coefficient is widely used, it is worth noting that it is very sensitive to differences in the middle of the income distribution (β-type). In light of the variety of strong and weak points that an inequality measure can exhibit, a series of axioms has been set to define the characteristics of a proper indicator:

- Anonymity/Symmetry. This axiom requires that the inequality measure is independent of any characteristic of individuals other than their income.
- Population principle (Dalton, 1920). The population principle requires inequality measures to be invariant to replications of the population: merging two identical distributions should not alter inequality.
- Scale invariance. This requires the inequality measure to be invariant to uniform proportional changes: if each individual's income changes by the same proportion (for example, when the currency exchange rate changes), inequality should not change.
- The Pigou-Dalton principle of transfers (Dalton, 1920, Pigou, 1912). This axiom requires the inequality measure to rise (or at least not fall) in response to a mean-preserving spread: an income transfer from a poorer person to a richer person should register as a rise (or at least not as a fall) in inequality, and an income transfer from a richer to a poorer person should register as a fall (or at least not as an increase) in inequality (Atkinson, 1970, 1983; Cowell, 1985; Sen, 1973). Most measures in the literature, including the Generalized Entropy Indexes, the Atkinson family and the Gini coefficient, satisfy this principle (Cowell, 1995).
- Decomposability (subgroup consistency). This requires overall inequality to be related consistently to constituent parts of the distribution, such as population sub-groups. For example, if inequality is seen to rise amongst each sub-group of the population then we would expect overall inequality to also increase. Some measures, such as the Generalized Entropy class of measures, are easily decomposed into intuitively appealingly components of within-group inequality and between-group inequality. Other measures, such as the Atkinson set of inequality measures, can be decomposed but the two components of within- and between-group inequality do not sum to total inequality. The Gini coefficient is only decomposable if the partitions are non-overlapping, that is, the sub-groups of the population do not overlap in the vector of incomes.

Cowell (1995) shows that any measure that satisfies all of these axioms is a member of the Generalized Entropy (GE) class of inequality measures. The Gini coefficient satisfies the first four axioms listed above, but will fail the decomposability axiom if the sub-vectors of income overlap, as mentioned above. There are ways of decomposing the Gini (Yitzhaki and Lerman, 1991), but the components are not always intuitively or mathematically attractive as their combination does not necessarily add up to the total inequality (Fei et al, 1978).

When it comes to *spatial* inequality, first the information on individual incomes has to be aggregated to generate the average *regional* income. Regional income inequality exists if there is variability in regional mean incomes. However, this basic approach to territorial inequality disregards whether regional income differs due to high within-region income inequality as the incomes of individuals living in particular regions are replaced by their respective regional averages. There are several spatially-decomposable inequality indicators for which inequality among individuals residing in different regions of a country can be broken down into two components: the inequality *between* the (weighted) regional averages (*B* component) and the sum of (weighted) inequalities *within* the region (*W* component). The inequality within any of the subpopulations can be further additively decomposed in the same way depending on the information availability at the different spatial levels (supranational, national or NUT0, regional or NUTS2/3 and local or LAU1/2)[i].

The inequality indicators belonging to the family of Generalized Entropy indices, including the Theil coefficient, are decomposable and therefore suitable for analysing territorial inequalities. The Theil coefficient of income inequality may be written as:

$$T = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{y} ln \frac{y_i}{y}$$

where *T* denotes the overall income inequality, *n* is the population size, *y* is the average income per capita and y_i is the income of the *ith* individual. If the country is territorially divided into *k* mutually-exclusive regions, then T can be expressed as:

$$T = \left(\sum_{j=1}^{k}\frac{n_j}{n}\frac{y_j}{y} ln \frac{y_j}{y}\right) + \left(\sum_{j=1}^{k}\frac{1}{n}\frac{y_j}{y}\sum_{i=1}^{n_j}\frac{y_{ij}}{y_j} ln \frac{y_{ij}}{y_j}\right) = B + W$$

Overall inequality measured by the absolute Theil coefficient (*T*) falls within the interval between 0 (perfect equality) and *ln n* (maximum inequality). It is worth noting that if the average incomes of all regions are identical (*B* = 0), then T = W, which means that all inequality is due to income variability within the regions. On the other hand, if all individuals living in one region have the same income, but not necessarily the same income as their peers from another region, (*W* = 0), then all income inequality is due to regional disparities (*T* = *B*). Thus, *B/T* (or the *relative* Theil coefficient) ranges between 0 and 1.

2. POVERTY ANALYSIS

Regarding income inequality, the lowest part of the income distribution tends to be the subject of many social policies (and also of research). In order to better target policies aimed at redressing inequalities, it is pertinent to know what the characteristics of the more economically deprived people within the society are. Poverty analysis is concerned with studying the people at the lower end of the income distribution. The Europe 2020 Strategy of the European Union has intensified the emphasis on measuring results with respect to reducing poverty and social exclusion (European Commission, n.d.)

In order to quantify poverty, first we need to identify what population is (and is not) poor. We can then distinguish between *transient* versus *chronically* poor by comparing the value of the individual´s poverty measure to the Poverty line. *Poverty* can also be expressed in both absolute and relative terms. Measures of *absolute* poverty require calculating the minimum income standard, such as the value of the basket of goods considered essential to satisfy nutritional needs and afford basic necessities at a given point in time. The concept of *Relative* poverty, which came to fore after the seminal work of Townsend (1979), who also introduced the concept of *relative deprivation*, implies comparing the individual´s measures of poverty to the *poverty line* defined in terms of income, consumption, or other living standards.

It is very common to measure poverty at *household* level (as opposed to individual level). However, when adopting this approach, the distribution of resources within the household is not taken into account and the indicator obtained might overstate or understate the poverty level for different members of the household. In 2001 the EU adopted the term 'at risk of poverty' to denote people living in households with incomes below a specified threshold and therefore more likely to experience poverty. The poverty line set as the threshold is relative and commonly calculated at 50% or 60% of median equalised net income. There are related measures of 'persistent at-risk-of-poverty rate' which measures the risk of poverty in the current year and at least two of the three previous years; and the relative median poverty risk gap which measures how far the median at-risk-of-poverty person is below the poverty risk threshold.

In June 2010 the European Council set a target for promoting social inclusion in the EU, namely lowering by 20 million the population at-risk-of-poverty and/or living in severely deprived and/or in 'jobless' households. This target would be assessed by a multidimensional single indicator known as AROPE (rate of people at risk of poverty or social exclusion).

The AROPE indicator considers that an individual is at risk of poverty or social exclusion if he/she meets at least one of the following three criteria:

- Lives in a household with an income (including social transfers) below the poverty line, which is defined as an income that is 60% of the median of the national income's equivalent in consumption units.[1]

[1] The calculation of the units of consumption takes into account economies of scale in households and is based on the hypothesis that the joint expenditure of several persons residing in the same household is lower than what each would spend living separately.

- Lives in a household where its members cannot afford at least four of the nine basic consumption needs defined for Europe.[2]
- Lives in a household with low work intensity. The intensity of work is defined as the ratio between the number of months actually worked by all the members of the household and the maximum number of months that all people of working age in the household could theoretically work. Households that are considered to have low work intensity are those with a ratio of less than 0.2.

2.1 From household poverty to territorial poverty

The axiomatic approach to poverty is similar to that of inequality. When grouping individual (poverty) information or indicators into regions, we need to consider the axioms of symmetry (anonymity), the transfer principle, the population principle, the subgroup decomposability, the translation and the scale invariance described in the previous Section in relation to income inequality indicators (Cowell, 2016). Additional axioms specific to poverty analysis are: i) Focus, which requires incomes of the non-poor to be irrelevant to poverty comparisons; ii) Monotonicity, or the decrease of poverty if the income of a poor individual increases; and iii) Independence, which states that if the poverty measure of two different income distributions is the same, then that poverty measure should change by the same amount when income distributions also vary in the same value (Cowell, 2016).

Subgroup decomposability is one of the characteristics of the Foster-Greer-Thorbecke (FGT) poverty measures (Foster *et al* 1984). Poverty incidence (P_0), poverty depth (P_1) and poverty severity (P_2) (Foster *et al.* 1984, 2010) are calculated using the general formula:

$$P_\alpha(y, z) = 1/n \sum_{i=1}^{q} \left(\frac{z - y_i}{z}\right)^\alpha$$

where α is a positive real number, $y = (y_1, y_2, \ldots, y_n)$ is a vector of income in increasing order, $z > 0$ is a predefined poverty line, n is the total number of individuals under analysis, $(z–yi)/z$ is the normalised income gap of individual i and q is the number of individuals having income not greater than the poverty line z. The parameter α can be seen as a parameter of 'poverty aversion'. α takes on values of 0, 1 and 2, and the higher is α, the higher is the relevance assigned to the poorest individual (Foster *et al.* 2010).

By setting α equal to 0, the FGT index P_0 is poverty incidence or headcount and is equal to the percentage of the population with an income below the poverty line. When $\alpha = 1$, the FGT index P_1 is relative poverty, or depth, indicating how far below the poverty line the poor's incomes are on average. When $\alpha = 2$, the FGT index P_2 shows the severity of poverty and is the square of the normalized gap for each poor person. The square emphasizes the larger gaps relative to the

[2] The nine basic consumption concepts used are (1) late payment of rent, mortgage or utility bills of the primary residence over the last 12 months; (2) inability to keep the home adequately heated; (3) inability to take at least a one-week holiday each year; (4) inability to eat meat or protein at least every two days; (5) not having sufficient money for unforeseen expenses; (6) not having a telephone; (7) not having a color television; (8) not having a washing machine; and (9) not having a car.

smaller gaps. The squared gap or Foster-Greer-Thorbecke (FGT) measure index is the mean of the squared gap vector. It is sensitive to the prevalence of the poor, the extent to which their incomes fall below the poverty line, and the distribution of their incomes or shortfalls.

2.2 Wealth and expenditure-based approach towards poverty

Traditional income-based poverty measures "ignore the possibility that a consumer unit decreases accumulated savings to meet current needs." (Brandolini *et al.,* 2010). Although more appropriate, measuring poverty through *wealth* is challenging. Wealth-based poverty measures try "to capture whether a consumer unit could maintain a standard of living above the poverty line for a certain period if it had no income, nor any financial resources or borrowing ability other than accumulated wealth" (Brandolini *et al.*, 2010).

Including *wealth* into the definition of poverty enriches the analysis, as we can now define income-poor households, wealth-poor households or both. Advocating the inclusion of wealth in the definition of poverty, Meyer and Sullivan (2011) and Muller and Schmidt (2018) argue that since consumption can be financed by both income and wealth, the latter should play a key role in determining the level of poverty and well-being of households. Finally, *expenditure*-based poverty measures represent a very realistic approach to poverty as income could be under-reported by the households. Also, consumption expenditure is a better predictor of material deprivation and other adverse family outcomes than income (Meyer and Sullivan, 2003).

2.3 Material Deprivation

The modern approach to material deprivation measures dates back to Townsend's seminal work "Poverty in the United Kingdom" where he suggested indicators covering diet, clothing, fuel and light, household facilities, housing conditions and amenities, work environment, family support, recreation, education, health and social capital. Lacks or deficiencies in these areas indicated deprivation (Townsend, 1979).

Since 2009 two Material Deprivation (MD) indicators have been formally agreed by the EU and added to the EU's set of commonly-agreed indicators for social inclusion. The first indicator provides the proportion of people lacking at least three of nine items covering different aspects of economic strain and lack of durables[3] (housing deprivation was included in the EU portfolio as a separate indicator). The second indicator reflects the intensity of deprivation (i.e. the average number of items lacked by deprived people). MD indicators gained in importance in 2010 when EU leaders launched the Europe 2020 strategy and established in this framework an

[3] These include 1) arrears on mortgage or rent payments, utility bills, hire purchase instalments or other loan payments; 2) capacity to afford paying for one week's annual holiday away from home; 3) capacity to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day; 4) capacity to face unexpected financial expenses; 5) household cannot afford a telephone; 6) household cannot afford a colour TV; 7) household cannot afford a washing machine; 8) household cannot afford a car; 9) ability of the household to pay for keeping its home adequately warm

EU social inclusion target of lifting at least 20 million people out of the risk of poverty or social exclusion in the EU by 2020.

Although this approach, based on MD indicators, can be questioned on the grounds of whether the absence of items on the indicator list is a result of choice or income constraints (e.g., absence of a TV or a mobile phone may be a deliberate choice), the existence of correlations between indicators may be informative for policymaking (Marlier *et al*, 2012). For example, policies could focus on households experiencing both income and material deprivation, as suggested by Nolan and Whelan (2010), or combine the existence of low income and some material deprivation targets, as stipulated in the UK Child Poverty Act of 2010.

2.4 Multidimensional poverty measures

The EU's emphasis on 'poverty and social exclusion' reflects a growing acceptance that deprivation is a multi-dimensional concept. This concept of multidimensional poverty contains "a diverse range of characteristics such as limited financial resources, material deprivation, social isolation, exclusion and powerlessness, and physical and psychological illbeing". The concept of multidimensional poverty is supported by Sen's (1985) capability approach where poverty is defined as lacking capabilities such as being able to avoid hunger, escape avoidable morbidity, and take part in community life. This view of poverty is based on the notion of participation in society.

All those indicators showing the different dimensions of poverty can be evaluated as a set of indicators (dashboard approach) or the available information can be aggregated to create a synthesized index (counting approach). However, when interpreting the synthesized (or aggregated) index, one must be cognizant of Ecological Fallacy, i.e. the relationships observed at individual level may not be necessarily true at aggregate level and vice versa.

The EU has adopted a multidimensional indicator denominated the 'at-risk-of-poverty' (AROPE) indicator, which includes income poverty, severe material deprivation, and quasi-joblessness (when less than 20% of the members of the household are employed). Being *poor* in one dimension implies being *at risk of poverty.* Under this definition, known as the 'union definition', it is sufficient to be classified in any of these three dimensions to be considered at risk of poverty.[4]

There are different alternative definitions based on AROPE. Under the 'intersection definition' a household must be below the thresholds set in the three dimensions, but the 'between–poor definition' implies not being included in all dimensions but involves a discussion about substitutability of indicators or to what extent deprivation in one dimension can be substituted by deprivation in another. Depending on the definition chosen, different numbers of households will be included in multidimensional poverty, with a smaller number with the intersection definition than with the union definition.

[4] Another important consideration is the set chosen to comprise all the dimensions of a deprivation multidimensional index. The information can be based on experts´ opinions, or on existing studies; it can be context-specific or based on the opinion of the focus groups (Plotnikova et al 2018).

Multidimensional poverty measures based on the Alkire-Foster (2011) methodology have been used to measure multidimensional poverty in developing as well as developed countries, including the EU countries (Annoni and Weziak-Bialowolska, 2016). The adjusted headcount ratio (M_0) is the product of the *incidence* of poverty (the percentage of the population who are poor) and the *intensity* of poverty (the percentage of deprivations suffered by each person or household on average). The *depth* of poverty is the average 'gap' between the level of deprivation poor people experience and the poverty line. Adjusted Poverty Gap (M_1) is the product of the incidence, intensity and depth of poverty (Alkire and Foster, 2011).

Another issue with construction of the composite multidimensional indexes is that results can vary based on the choice of *weights* attached to the different component-dimensions of the overall index. The choice of weights is a normative question and equal weighting is common as it can be contentious to assign importance to some factors but not to others (Steinert, 2018). Recent studies suggest context-specific weights based on consultation with stakeholders (Plotnikova et al 2018).

3. INEQUALITY IN EUROPE OVER THE LAST DECADE

Spatial disparities in living standards have attracted significant attention in recent years. Worldwide, increasing inequality in the international distribution of *income* and its relationship with globalization trends have been salient topics in the research agenda since the beginning of the 21st century (see, for example, the works of Milanovic, 2002 and 2005; Piketty, 2014; or Davies et al., 2017; among others). The same concerns appear on an individual country basis, especially for those countries that followed a consistent path of inequality within its frontiers, when inequality becomes an instrument for supporting attitudes that generate conflict and divide societies, as shown by the result of the referendum in the UK in June 2016 to decide whether to remain in or leave the European Union.

As studied by Franzini (2009), there are large and persistent differences within European countries. The differences were very significant in the mid-2000s, presenting a clear divide between Northern and Mediterranean countries. Official records and several empirical studies have shown that while in Germany, Spain, Greece, Ireland, the UK, Italy, Poland and Portugal the Gini coefficient was around or above 0.30, Denmark and Sweden were the least unequal developed countries, with values of around 0.23 (OECD 2008, Brandolini and Smeeding 2008, Giammatteo, 2009).

Although these persistent differences match with worldwide trends, it is worth noting that there has been a generalized worsening of economic inequality in the majority of European countries from the 1980s. This increase has been particularly strong in Finland, Norway, Germany, Portugal and Italy, caused mainly by the rise in the relative income of the top quintile of the distribution (the richest 20% of households) which has been twice as large as that of the bottom quintile (the poorest 20%) (Franzini, 2009). As predicted by the International Labour Organization (2009), the recent crisis accentuated income inequalities and increased unemployment and poverty in many European countries. In the last two decades the general tendency shifted towards a reduced redistributive effectiveness (OECD 2008). It is plausible to conclude that the inequality worsened because of the adverse circumstances of the international economic downturn, and it remained high because of the weakened redistributive policies.

Another interesting perspective on the disparities in Europe is the one provided by the New Economic Geography literature that explains locational choices at the regional level as the result of the interplay between centrifugal and centripetal forces. From this angle, European economic integration promoted the concentration of economic activity (lowers transaction costs). Midelfart-Knarvik et al. (2000) show that production structures in EU countries have become more heterogeneous since the 1980s. In this scenario, cities shifted from sector- to function-specialization (Duranton and Puga, 2005). Mass-production industries have moved from central into peripheral regions. Hence, it can be expected that incomes in service-based, accessible regions are higher than in remote regions and cities.

The comparison between different territorial levels (country vs. region) is instructive. According to a study by Heidenreich and Wunder (2008), regional inequalities within countries in the enlarged EU increased around 15% between 1995 and 2003. During the same period, inequalities between countries fell by 45%. This duality was also observed in the previous works

of Duro (2004) and Puga (2002). This evidence highlights the need for analyses at the country and the regional levels, as economic processes can exhibit different behaviours and implications in one case or the other, calling for a differentiated treatment depending on the scope of the governmental stance concerned and raising an alarm about possible further inequalities that remain hidden within regions.

In this section, the main trends on income inequality within Europe are depicted in an attempt to disentangle the different patterns followed at different regional levels. Regional income inequality is a relevant topic *per se* within the European Union framework and its Cohesion Policy, but also it is important to understand the existing relationship between regional inequality and economic growth and development (Henderson et al., 2001; Anderson and Pomfret, 2004; Kanbur and Venables, 2005). In this sense, empirical studies show that a high level of income inequality creates a hostile environment for economic growth and development (Gallup et al. 1998, Gallup et al. 2003)[5].

Not only is it relevant to know the degree of territorial inequality but also its distribution across space. Location affects economic growth through the interaction between environment, space and society, and the myriad possible combinations and trends result in spatial disparities in living conditions, both within and between countries/regions (Deichmann, 1999; Henderson *et al.*, 2001).

3.1 EU-SILC database

The European Union Statistics on Income and Living Conditions (EU-SILC) is a comprehensive dataset that allows for cross-sectional and longitudinal analysis between countries and regions of several socio-economic indicators. This data set has been used since 2010 to monitor poverty and social inclusion, and to set cohesion goals under the Europe 2020 Strategy. The first wave of the EU-SILC was released in 2004, widening its national coverage along the years to finally reach all EU-27 members in 2007, with additional information on Iceland, Turkey, Norway and Switzerland. In 2010 Croatia and the Former Yugoslav Republic of Macedonia were also included. The individual version of the EU-SILC, the User Database (UDB), is more restricted in terms of territorial coverage: some countries do not provide data for most of the years (such as Germany for instance) or lack information on the region of residence. Only few countries provide regional figures, which in the best case correspond to NUTS2 regions.

3.2 Economic Inequality at the Country Level

Western European societies can be characterized by their low levels of economic inequality if compared to other areas of the world (Deininger and Squire, 1996). However, and as mentioned above, the gap between the rich and the poor has widened considerably in recent times (Brandolini and Smeeding, 2008; Hoffmeister, 2009; Emmenegger et al., 2011, Huber and Stephens, 2014; Nolan et al., 2014).

The international picture shown by two influential reports (OECD, 2008, 2011) has illustrated the fact that income inequality has been rising over recent decades in most OECD countries.

[5] The relationship between regional inequality and economic growth will be described in detail in WP3.

Using data from the Luxembourg Income Study (LIS) for 18 countries from 1985, Huber and Stephens (2014) conclude that inequality has increased in all welfare state regimes. They identify greater changes in the Anglo-American countries, but inequality also increased considerably in the Nordic countries and, to a lesser extent, in the Continental and Southern European countries. Tóth (2014) reports a similar trend in his study of the 30 richest countries using the Gini index, finding the largest increase within the EU-15 in Sweden. Along this line, Hoffmeister (2009) detects convergence in income inequality in Western Europe due to the increasing inequality in Scandinavian countries and a decrease in their Mediterranean counterparts, at least leading up to the international crisis. Another highlight from this analysis is the fall in between-inequality at the country level, which seems to be happening at the same time as the convergence in individual inequality towards the figures of the most unequal Member States in terms of income (Estonia, the United Kingdom, and the Mediterranean countries).

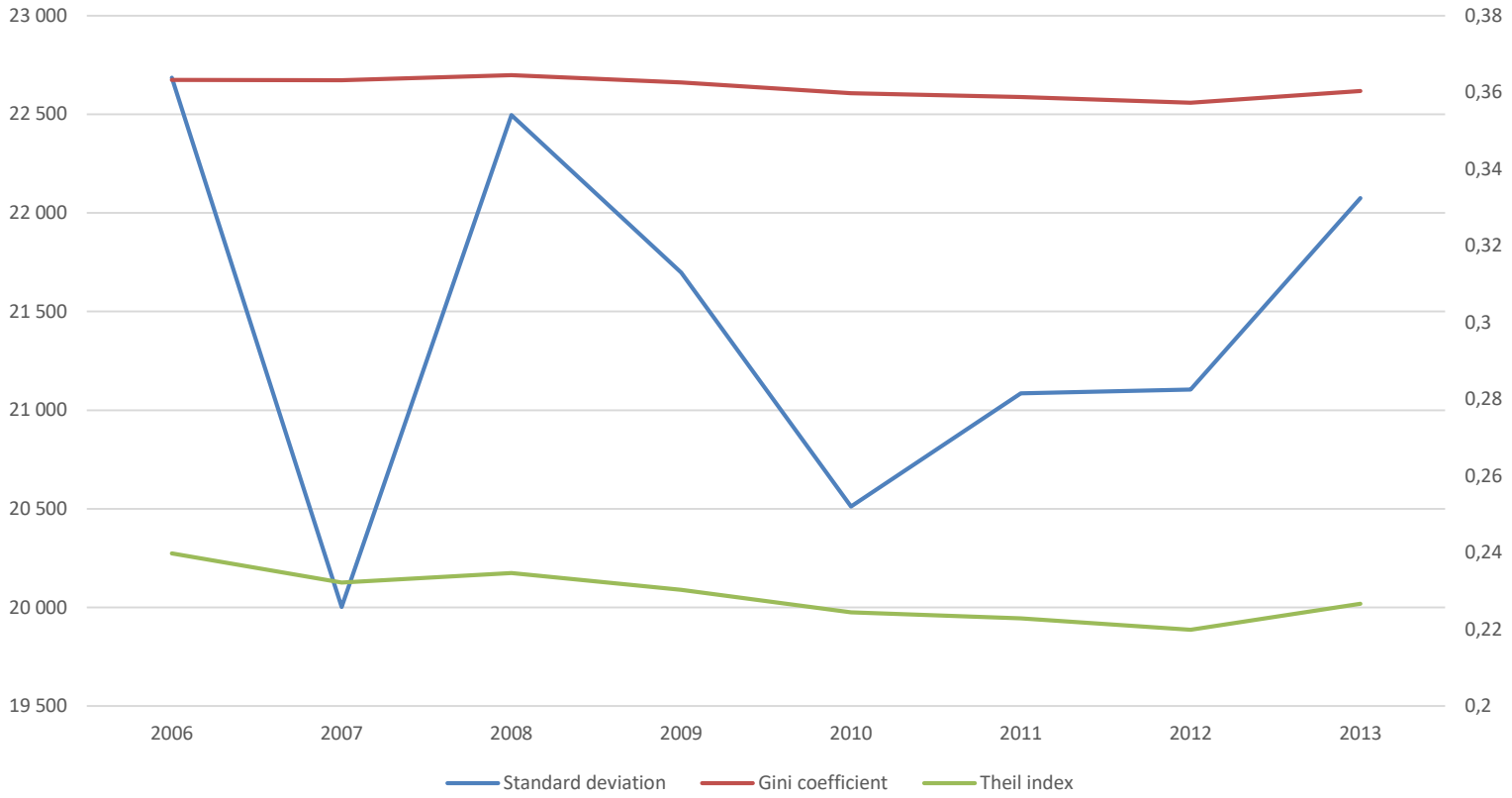
In this section we show the evolution of *income inequality* in Europe between 2006 and 2013 at the maximum level of disaggregation that an official data set such as the EU-SILC can offer.[6] Income disparities over time for all the European countries included in the EU-SILC microdata are displayed using three of the inequality indicators described in Section 1.1: the standard deviation, the Gini coefficient and the Theil index. Different indicators stress different aspects of inequality, which is reflected in the different trends shown in Figure 3.1.

The standard deviation exhibits a more volatile evolution around the mean value of 21,457.14 (right axis) in the period analysed, ranging from 20,001.97 in 2007 to 22,685.68 in 2006. This unstable path is the consequence of the scale dependency issue affecting the distance to the mean, which defines the standard deviation. After the pronounced bounce between 2006 and 2008, according to this indicator the mean distance to the average income descended until 2010, where it started to rise again until the end of the period.

The EU-wide Gini coefficient and Theil index exhibit more stable trends around their corresponding mean values of 0.361 and 0.239 (left axis), with minimums of 0.357 and 0.220, and maximums of 0.364 and 0.240. Given the different focus of these two indicators, the gap between them may be explained by the changes in income in different parts of the distribution: The Gini coefficient pays more attention to changes close to the mean, while the Theil index allocates the same weight to all the observations.

[6] Deliverable 2.4 will show income disparities at a higher level of disaggregation.

Figure 3.1: Evolution of Inequality indexes in Europe between 2006 and 2013



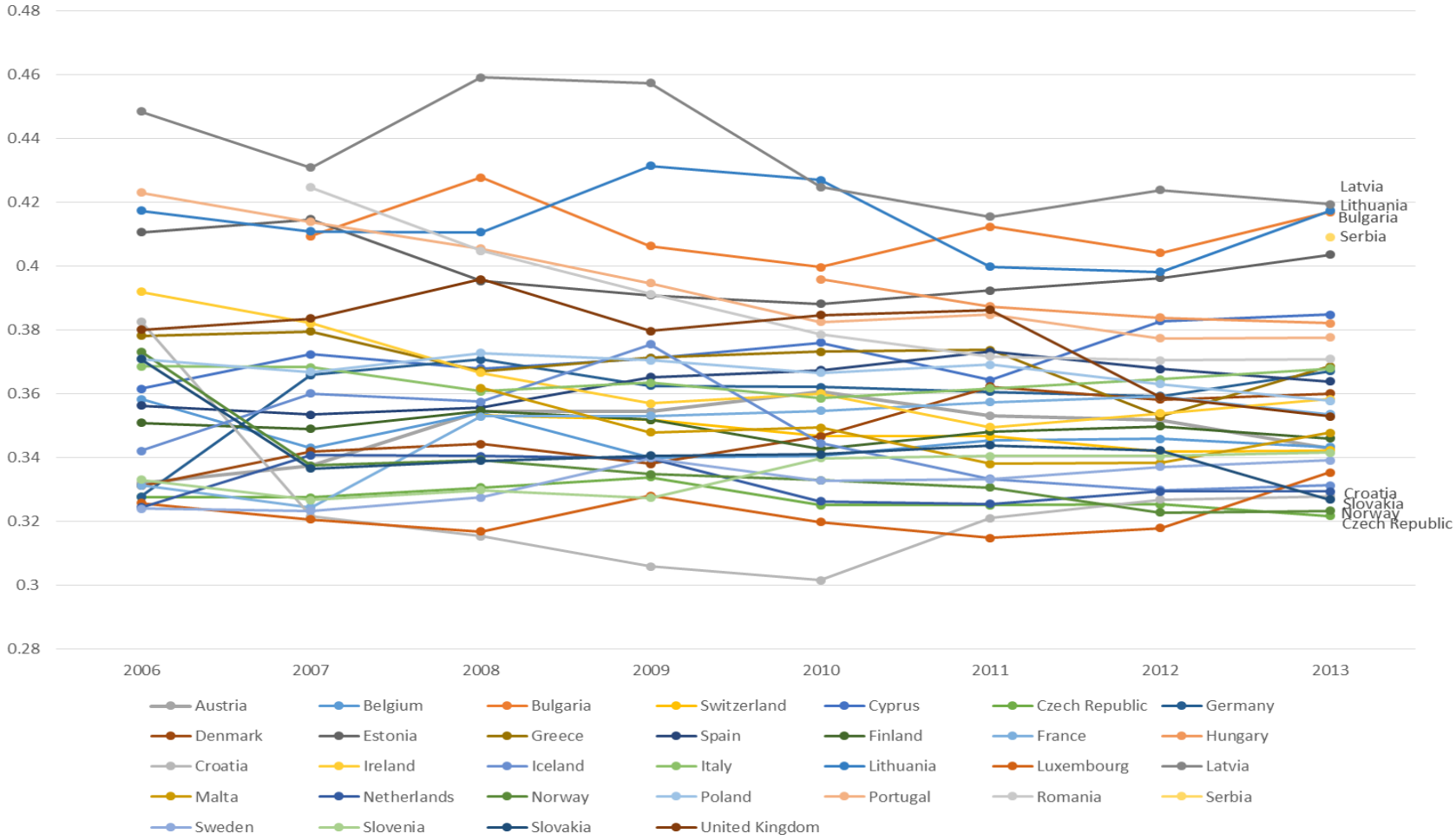
Source: Own elaboration using EU-SILC

The generally lower figures for the Theil index indicate that changes in inequality across the European countries between 2006 and 2013 are not due to large alterations in the lower end of the higher incomes as opposed to the changes in the middle of the distribution. According to this measure, general inequality even presented a downward slope until 2012.

In terms of international comparison, the EU scores higher in inequality in terms of the average Gini coefficient reported by the OECD (2016) of 0.318 between 2013 and 2014, but overall it lies below the three highest values of the US (0.391), Mexico (0.459) and Chile (0.465).

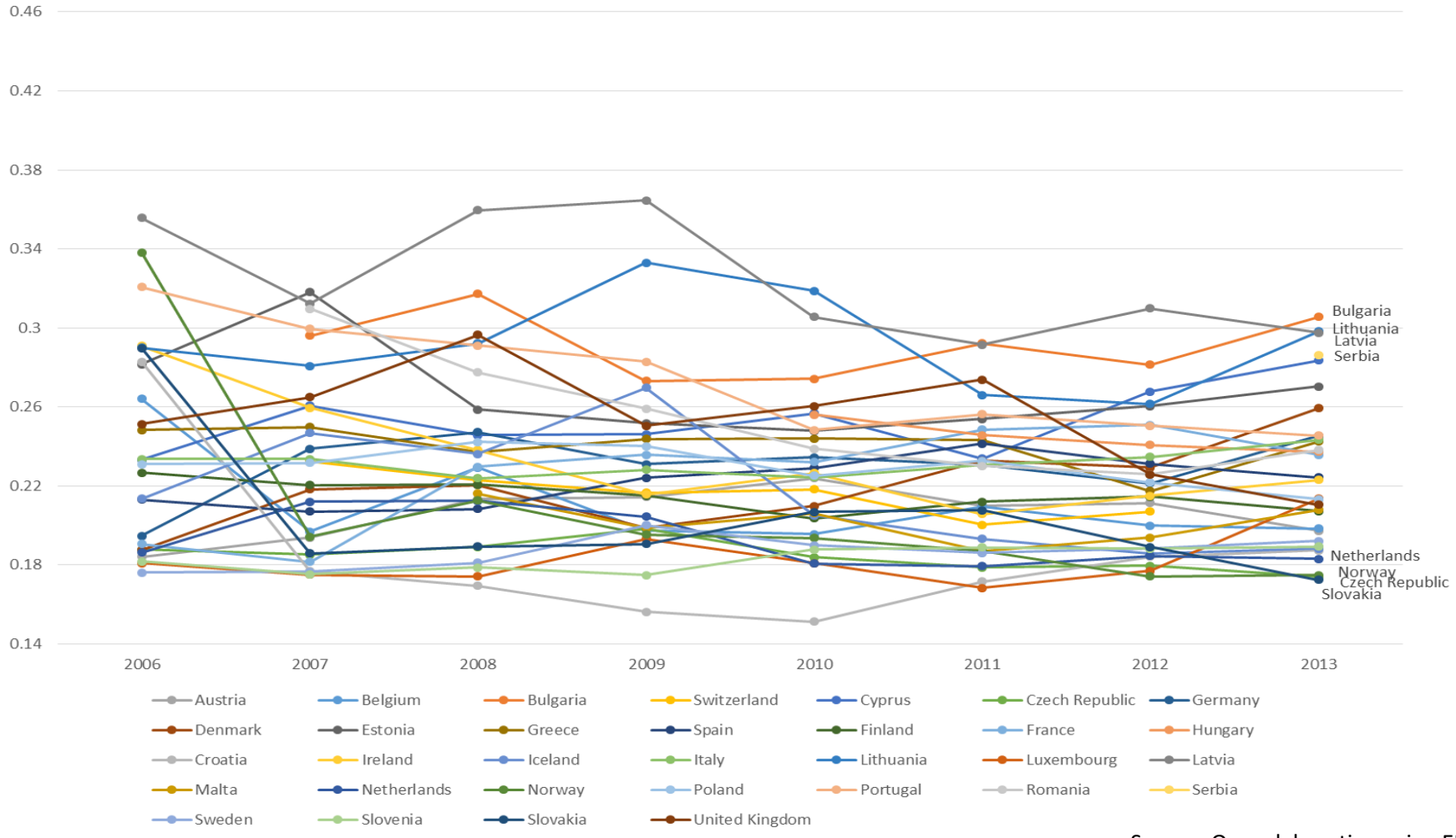
After a general overview of the evolution of inequality in Europe, the following Figures (Figure 3.2 and Figure 3.3) depict trends followed by each country.

Figure 3.2: Evolution of Gini Coefficient between 2006 and 2013.



Source: Own elaboration using EU-SILC

Figure 3.3: Evolution of Theil Index between 2006 and 2013.



Source: Own elaboration using EU-SILC

The evolution of Gini coefficient in Figure 3.2 and the Theil index in Figure 3.3 show a slight decrease in the distance between countries in 2013 with respect to 2006. This finding (less dispersion and a tendency towards the lower values of the indicators) is consistent with the overall catching-up effect between countries that amounts to the positive difference between the EU inequality at the end and at the beginning of the period, as appears in Figure 3.1. Although the EU-wide Gini coefficient and Theil Index are generally even, the analysis of these indicators at the country level already reveals more variability in each national path, and this instability is more marked than in the case of the standard deviation, especially in the case of the Theil index.

The classification of the countries is generally consistent across both measures, with some notable exceptions such as Luxembourg, Denmark, or Hungary: in 2013 these countries were ranked 25th, 13th and 6th respectively (in descending inequality order) according to the Gini coefficient; while the Theil index ranked them as 16th (9 positions higher), 6th (7 positions higher) and 12th (6 positions lower).

Around half of the countries represented reduced their inequality between 2007 (year of inclusion of several countries to the EU-SILC) and 2013, with the largest fall in Romania according to both indicators (-0.054 in the Gini coefficient and -0.072 in the Theil index). Portugal (-0.036) and the United Kingdom (-0.031) were next in terms of the Gini coefficient (-0.055), with Iceland (-0.058) and the United Kingdom (-0.055) following in terms of the Theil index. On the other hand, the country with the largest increase in inequality according to both measures is France (0.029 for the Gini coefficient and 0.054 for the Theil index), followed by Denmark (0.018) and Sweden (0.016) for the Gini coefficient and Denmark (0.041) and Luxembourg (0.038) for the Theil index.

On the spatial distribution of inequality across European counties, clusters of persistently high inequality can be clearly identified. Estonia, Latvia, Lithuania and Poland form a group with values above the average Gini coefficient and Theil index for most of the period considered. Moreover, some Southern countries exhibit high values of the Gini coefficient over time, such as Romania, Bulgaria, Greece, Cyprus, Croatia, Italy, Spain and Portugal. On the other side of the spectrum, Norway, Sweden and Finland consistently show low Gini coefficients. Regarding the Theil index, the Nordic block displays the same trend (if the atypically high value of Norway in 2006 is not taken into account), and a group of Central-Eastern countries formed by Switzerland, Austria, Slovakia, Slovenia, Czech Republic and Hungry also stands out with lower inequality according to this measure.

Taking advantage of the decomposability of the Theil index, *within* and *between* components were calculated for those countries where EU-SILC provides regional information (see Appendix). The results show that most of the inequality captured by this general entropy indicator stems from differences *within* regions (99.02%) rather than from differences *between* then, which calls for a deeper analysis at a more spatially disaggregated level.

3.3 Income Inequality at Regional Level

The country of residence is an important geographical reference for analysing economic inequality given its priority in the political decision-making process. However, there are wide disparities in incomes both within and between its regions.

In a broader and more heterogeneous regional scenario, such as that represented by the European Union, it is necessary to establish a set of common assumptions and methods to enable a meaningful comparison of the existing economic differences and to bring to light the significance of the spatial location in terms of inequality. This approach, defined as the study of relationships between *people*, *places* and *environments* (Geography for Life, 1994), requires the use of locational information to make better and more informed decisions (ESRI, 2002). It also implies that all development projects could benefit from a geographical analysis to determine the specific problems of a region/locality and find the most appropriate measures and resources to address them. Introducing a more profound geographic perspective requires exploring the spatial patterns and processes taking place. In this section we provide an overview of European regional economic inequality trends over the last decade at the finest level of spatial disaggregation allowed by the data provided by EU-SILC (NUTS1 or NUTS2, according to the country considered).

A common practice in the related literature dealing with economic disparities from a spatial perspective is to decompose inequality as expressed by any of the entropy indicators popularised initially by Theil (1967, 1972), and later explored by Shorrocks (1980, 1984, 1988), Cowell and Kuga (1981), or Foster and Shneyerov (2000). With regard to the Theil index, one component would be the weighted average of subgroup inequality values, referred to as the 'within-group' component of inequality (*W*), with the remaining part the 'between-group' contribution (*B*), which can be defined as the level of inequality obtained if the individual income were replaced with the mean income of the corresponding subgroup. In a spatial context, the contribution of the *within* component to inequality can be defined as the reduction in general inequality when the relative incomes in a region are equalised (ceteris paribus), while the contribution of the *between* component would be the reduction in general inequality if regional mean income differences were eliminated (keeping relative incomes within regions unchanged). The main advantage of this kind of decomposition is that the inequality indicator is subgroup-consistent: maintaining regional incomes and population sizes constant, increases in inequality within each region lead to increases in inequality in the country.[7]

There is a large and growing body of empirical literature on inequality that takes *territory* into account. However, the existing differences in income indicators, sample size, number of regions of interest and underlying assumptions make it difficult to draw general conclusions that unequivocally apply to all cases. Still, some stylized facts can be identified, as reviewed by Shorrocks and Wan (2005). One of these empirical regularities is that the between component

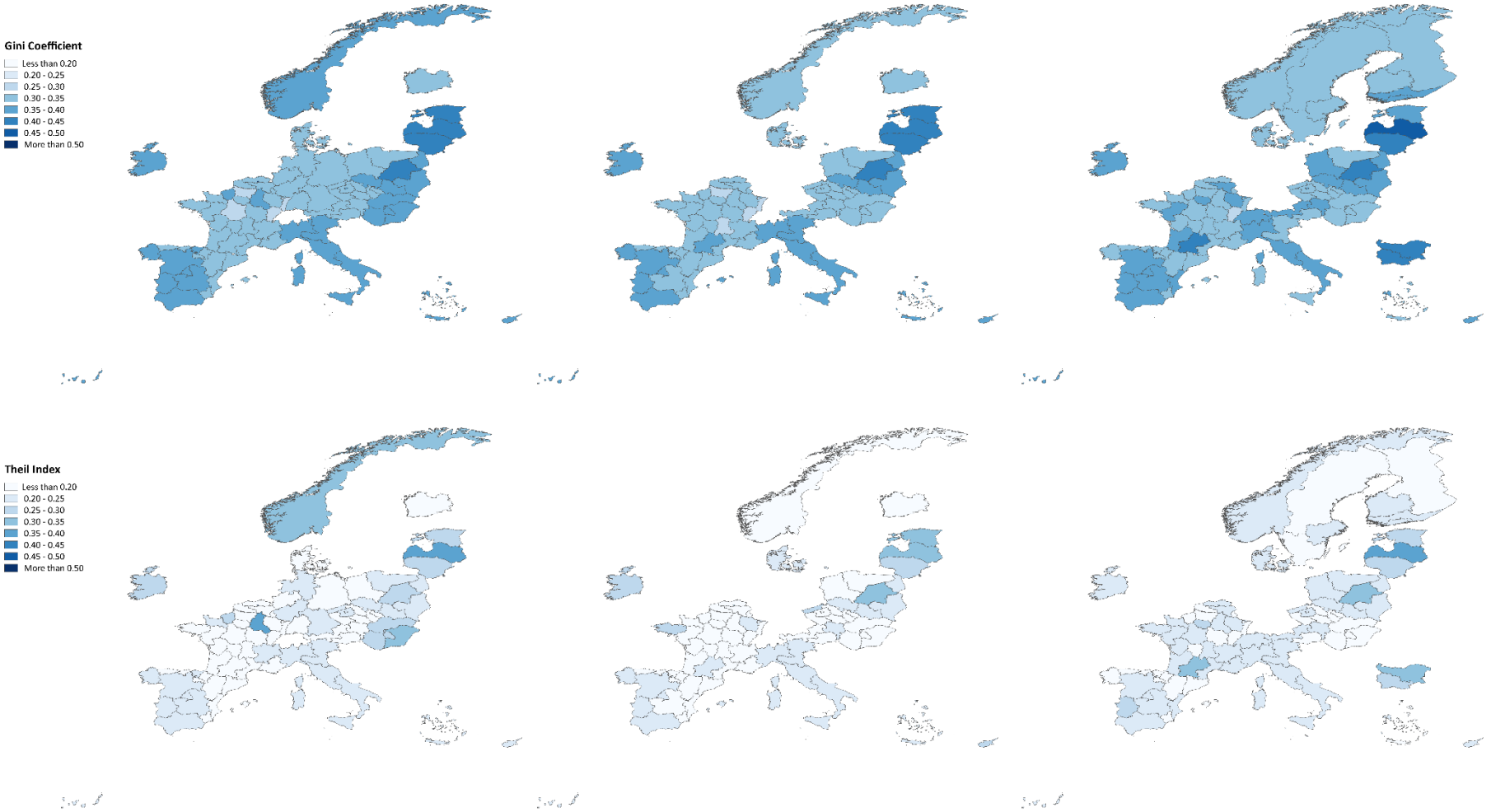
[7] This property is holds for the entropy measures, but not for the Gini coefficient, which consequently should not be subject to decomposition along these lines. Nonetheless, the Gini coefficient is an indicator widely used both in the research and policy-making contexts, so we include a global analysis of its regional evolution in this report.

is smaller compared to the within one for most studies (a finding that is supported by the national level figures presented in Appendix), which has led to the conclusion that location lacks relative explanatory power when assessing economic inequality (Cowell and Jenkins, 1995). Nevertheless, we should bear in mind that the definition of *space* entails many considerations with regards to the several dimensions interacting with it (culture, institutional background, environmental endowment, etc.), and consequently the choice of the geographical scope will affect the strength of the spatial effect observed in a certain scenario (Novotný, 2007).

Following this line of thought, Figure 3.4 represents the evolution of *income inequality* at the sub-national level in Europe from 2006 to 2013. The Gini coefficient and the Theil index have been calculated for each region where sub-national information was available in the EU-SILC database, and show the degree of income inequality existing within each of the European regions represented. [8]

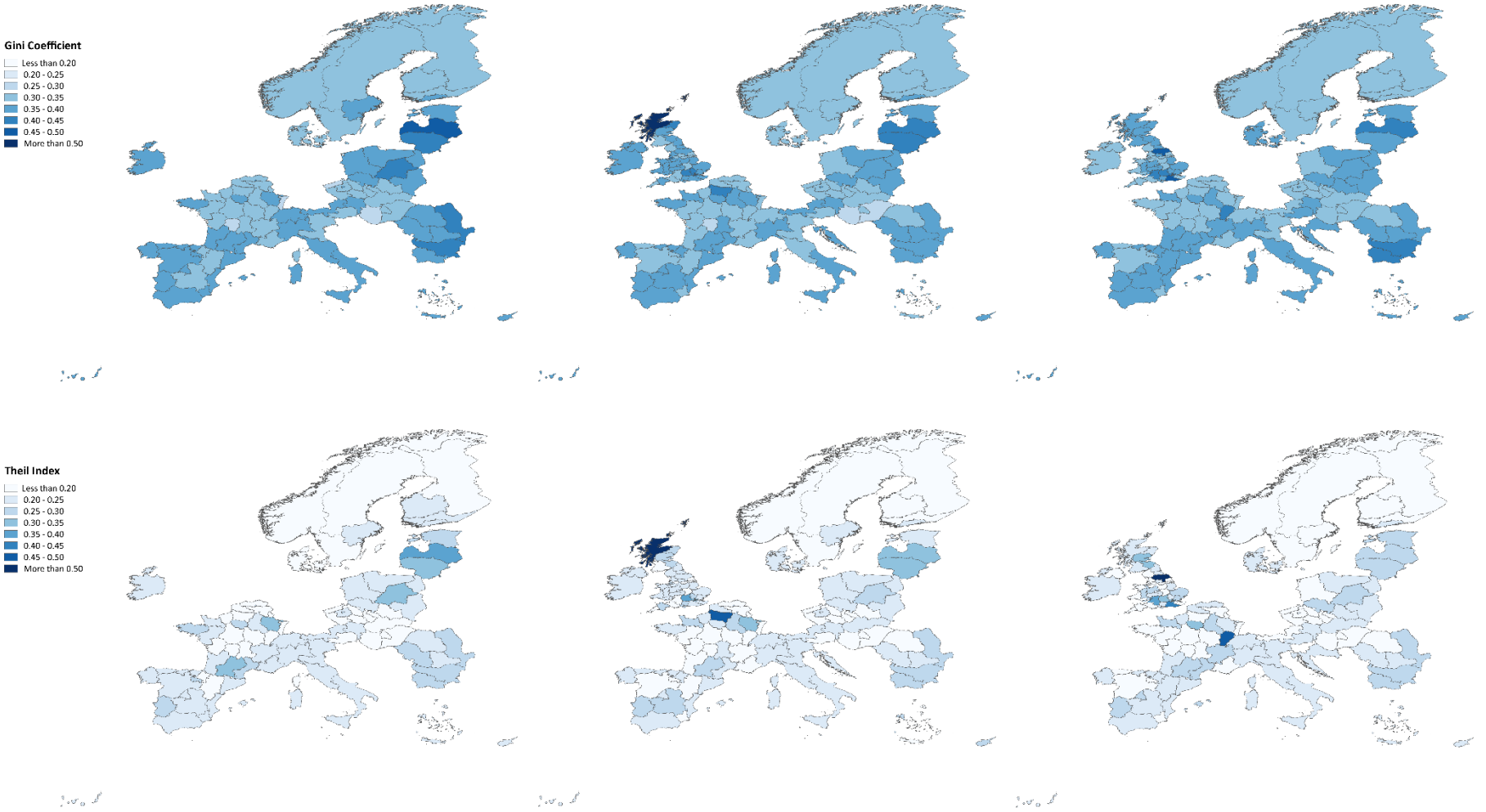
[8] These figures are the foundation for the more in-depth analysis that is carried out in Deliverable 2.4

Figure 3.4: Inequality INCOME indicators (Gini Coefficient and Theil Index) from 2006 to 2013 for NUTS1 and NUTS2 regions.



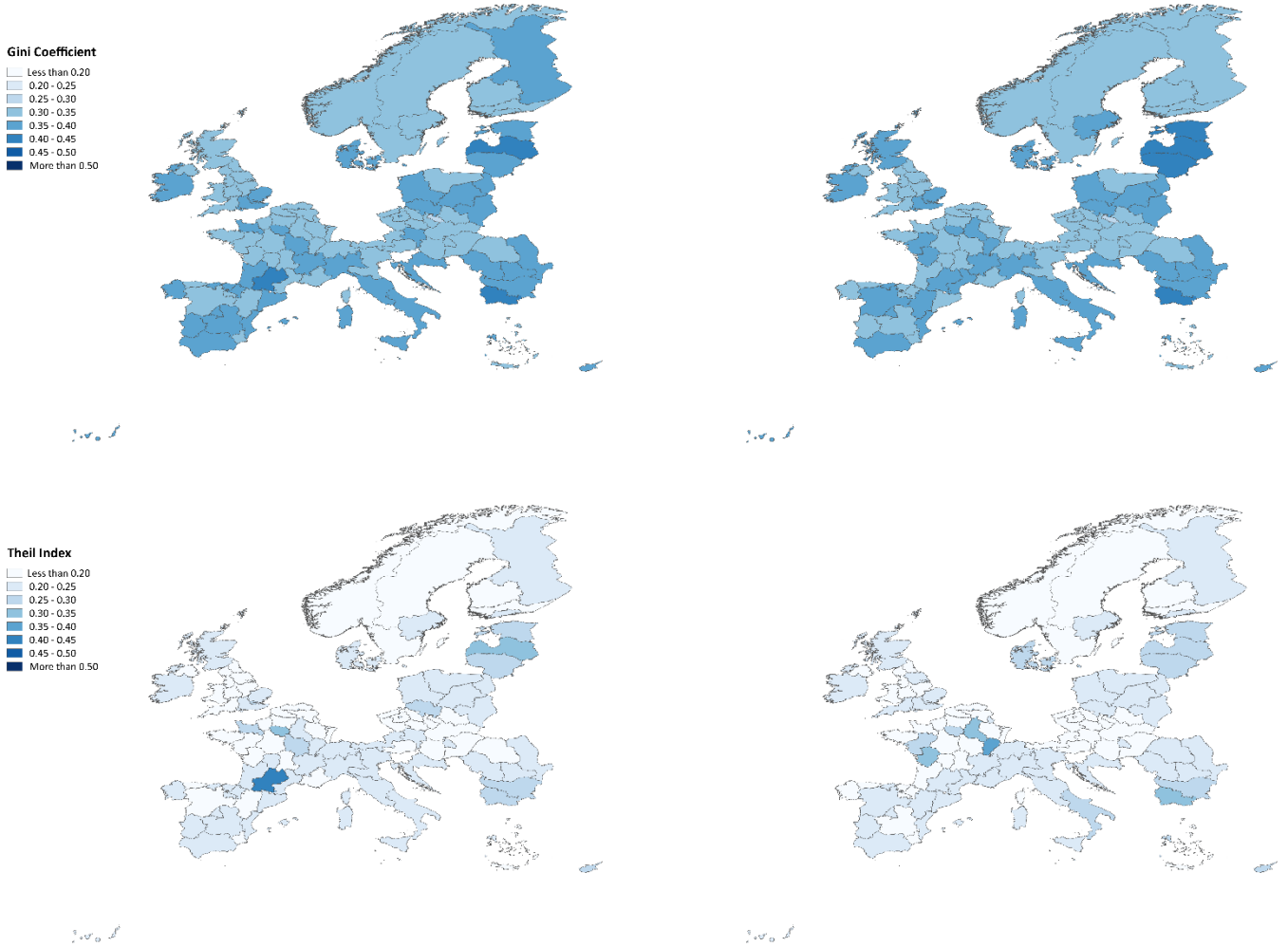
Source: Own elaboration using EU-SILC

Figure 3.4. Inequality INCOME indicators (Gini Coefficient and Theil Index) from 2006 to 2013 for NUTS1 and NUTS2 regions (continued)



Source: Own elaboration using EU-SILC

Figure 3.4. Inequality INCOME indicators (Gini Coefficient and Theil Index) from 2006 to 2013 for NUTS1 and NUTS2 regions (continued)



Source: Own elaboration using EU-SILC

Over the years examined (2006 to 2013), and conditional on the availability of data from the EU-SILC, both indicators show consistent results at the regional level. All the maps reflect the high level of income inequality existing in Eastern European Countries as Estonia, Latvia and Lithuania. Also, the Polish (NUTS1) regions exhibit high income disparities, especially those located in the eastern and the southern part of the country, similar to the Romanian (except the Macroregiunea Unu area in the north of the country) and Bulgarian NUTS1 regions. The gap between the Old and the New (Eastern) Member States has been studied extensively since the enlargement of the European Union in 2004 (Dunford and Smith, 2000; Förster et al., 2005; and Hoffmeister, 2009; among others), stressing the urgent challenge posed by the European Cohesion Policy. Many regions in the Mediterranean countries also suffer from high income disparities, as shown by the NUTS2 Spanish regions or the NUTS1 Italian regions (as well as the whole of Croatia and Cyprus). Interestingly, this North-South divide does not appear when regions are examined under the European lens, nor when talking about several specific countries (Rodríguez-Pose and Tselios, 2009).

Another noteworthy trend is the increase in the number of regions that move upwards in the quantile distribution of inequality (from lighter to darker shades in the Figure). This effect is clearly visible in French NUTS2 regions from the year 2008 onwards. It can be seen to concentrate later on in the north-eastern areas of Picardie and Franche-Comté, and in the southern areas of Midi-Pyrénées, whereas the centre of the country largely remains in the lower part of the inequality spectrum. The heterogeneity in the regional mosaic is especially evident in the case of the UK NUTS2 regions for the years 2010 and 2011, with some clusters of high inequality in several regions surrounding London, but also with remarkably high values in the regions of the Scottish Highlands and Islands, and North Yorkshire. On the contrary, Austrian, Slovakian and Hungarian regions remain in the lower values of the inequality indicators during the years considered.

3.4 Poverty at Regional Level

The EU-SILC data provides rich and varied information on poverty. According to EU-SILC data, one in six citizens are at-risk-of-poverty and they are to be found in all EU Member States. The extent of regional disaggregation in 'at risk of poverty rates' is limited, with just a few countries providing the data at NUTS2 level while others provide data at NUTS1 and country level only. Moreover, the extent of spatial coverage is not consistent across years, making comparisons over time difficult. Nevertheless, we can still find significant differences at regional level in the distribution of AROPE figures as well as in their temporal dynamics

Figure 3.5 represents the evolution of *AROPE* at the national or sub-national level provided by the EU-SILC database from 2006 to 2013[9] (same scale intervals for each year). AROPE maps display five categories of the measure: 1) lowest – less than 15.1% of population at risk of poverty; 2) low – between 15.1% and 20.3%; 3) moderate – between 20.3% and 25.6%; 4) high – between 25.6% and 32.6%; 5) highest – over 32.6%.

The areas with the highest AROPE tend to be found mainly in eastern European regions and southern regions - Portugal, southern Spain and southern Italy - and, somewhat surprisingly,

[9] Deliverable 2.4 will show AROPE estimates at a higher level of disaggregation

Finland. The areas with the lowest AROPE are Norway, the UK, the Netherlands, and Slovenia. Unlike other former socialist EU entrants, Slovenia has had one of the lowest AROPE rates. In 2011 the risk of poverty rose sharply to the moderate category but then returned to the lowest category in 2013. Other than Slovenia and the Czech Republic, Eastern European countries that entered the EU in 2004 had the uniformly highest levels of AROPE, above 32.2%. This pattern of uniformly high risk of poverty did not last and country as well as regional-level variation started to emerge during the years of the financial crisis. Eastern German regions improved their AROPE rates slightly and became more like Western German regions with high levels of AROPE. Regional variation emerged in Poland. The Czech Republic, which joined the EU with high levels of AROPE, achieved a reduction to intermediate and low AROPE level categories, albeit with some regional variation. Country-wide patterns of highest at-risk-of poverty risk persist in Lithuania, Latvia and in 2007 EU entrants Romania and Bulgaria.

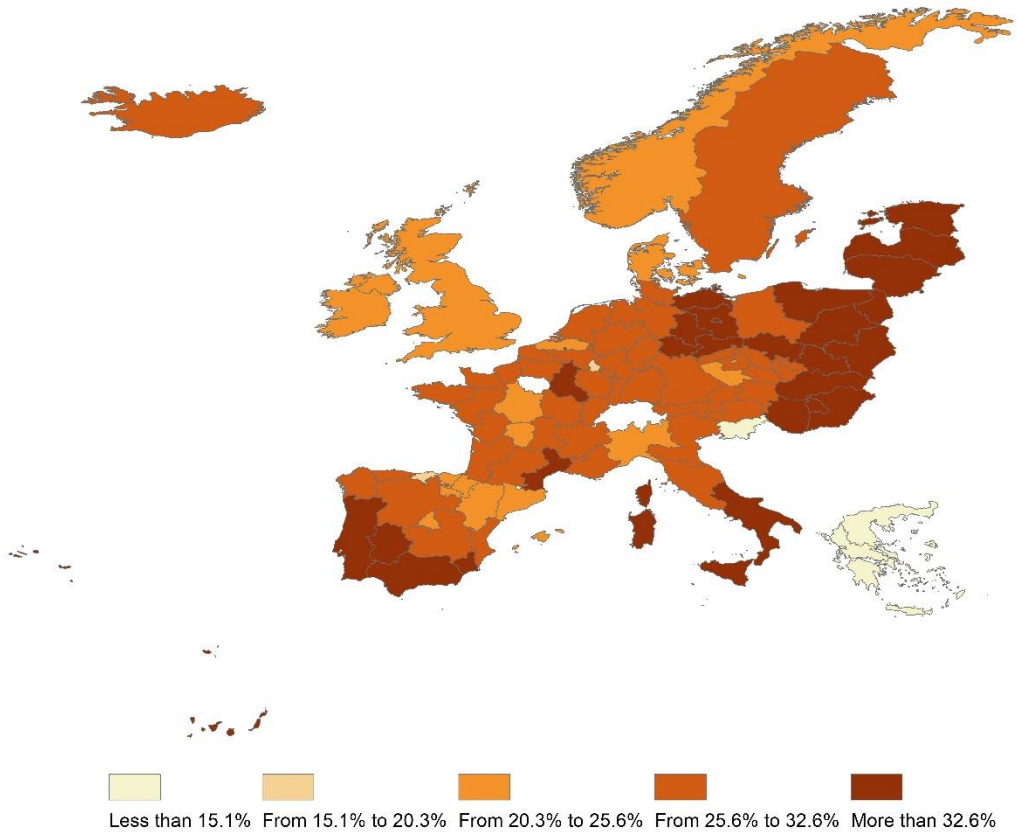
The financial crisis and the subsequent austerity measures have affected at risk of poverty rates in Greece where they went from the lowest to highest category in 2008 and remained at high levels through to 2013.

The UK is one of the few countries where AROPE disaggregation by NUTS1 and NUTS2 was possible albeit only from 2010. While we observe relatively high variation in AROPE rates at NUTS2 level in 2010 and 2011, the variation at NUTS1 level is much lower in 2012 and 2013. The case of the UK illustrates that regional differences within countries can be substantial and call for detailed analysis at disaggregated level.

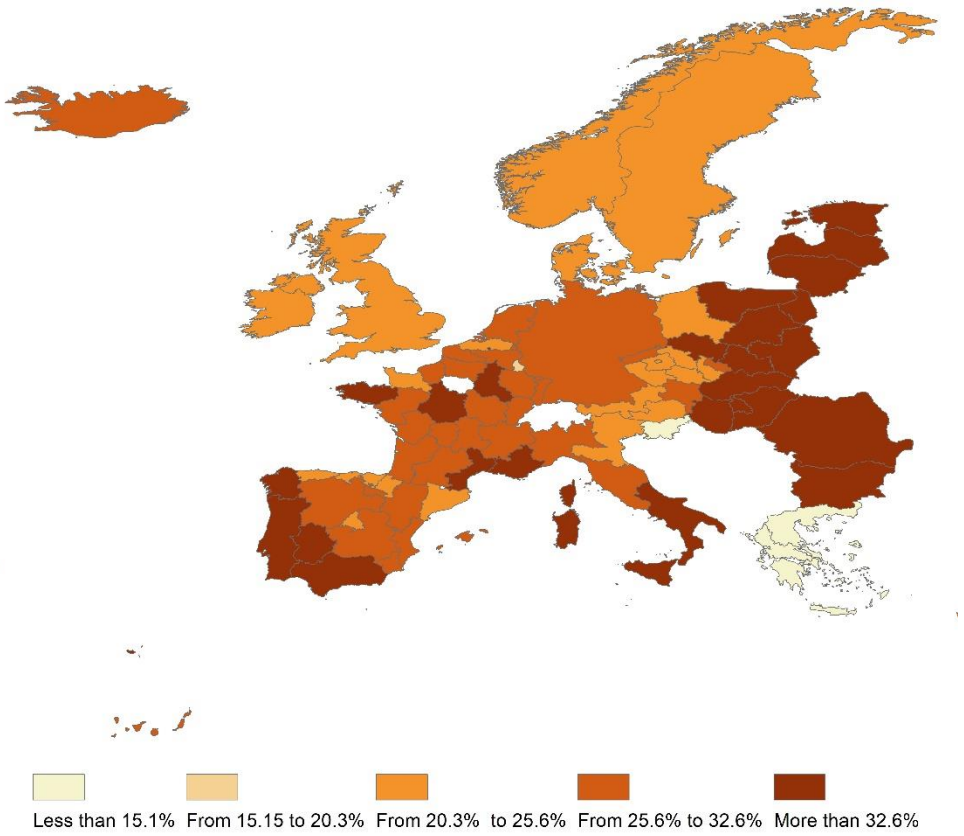
The policy implication of this type of analysis is that it can be used to identify and monitor areas that are not likely to achieve Europe 2020 goals with respect to poverty reduction. Considering the results of both poverty and inequality analysis, the question arises as to whether the regions with high income inequalities are the same ones that display high values on the poverty indicators. This is certainly the case for the most recent EU entrants, namely the Eastern and South-Eastern European countries, suggesting that, at least for these areas, policies aimed at reducing poverty go hand in hand with policies to reduce income inequality.

Figure 3.5: AROPE figures from 2006 to 2013 at the level of disaggregation provided by EU-SILC (country and/or NUTS1 or 2 regions).

2006



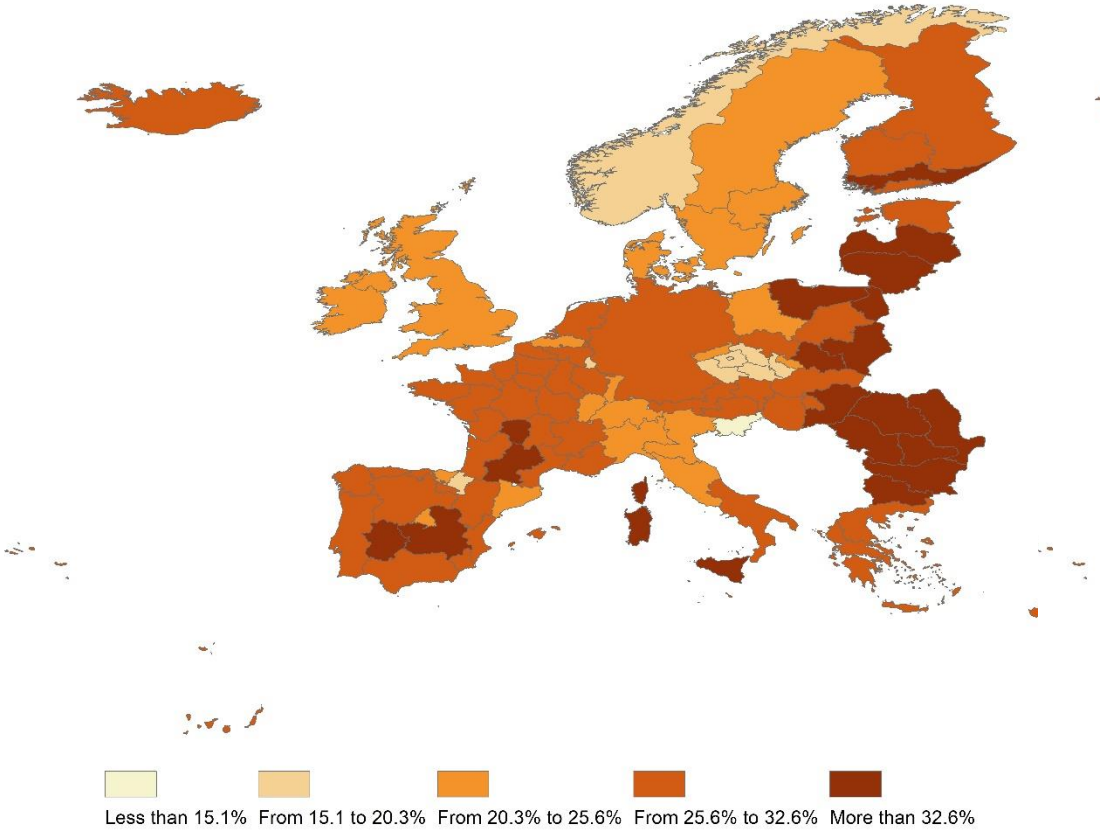
2007



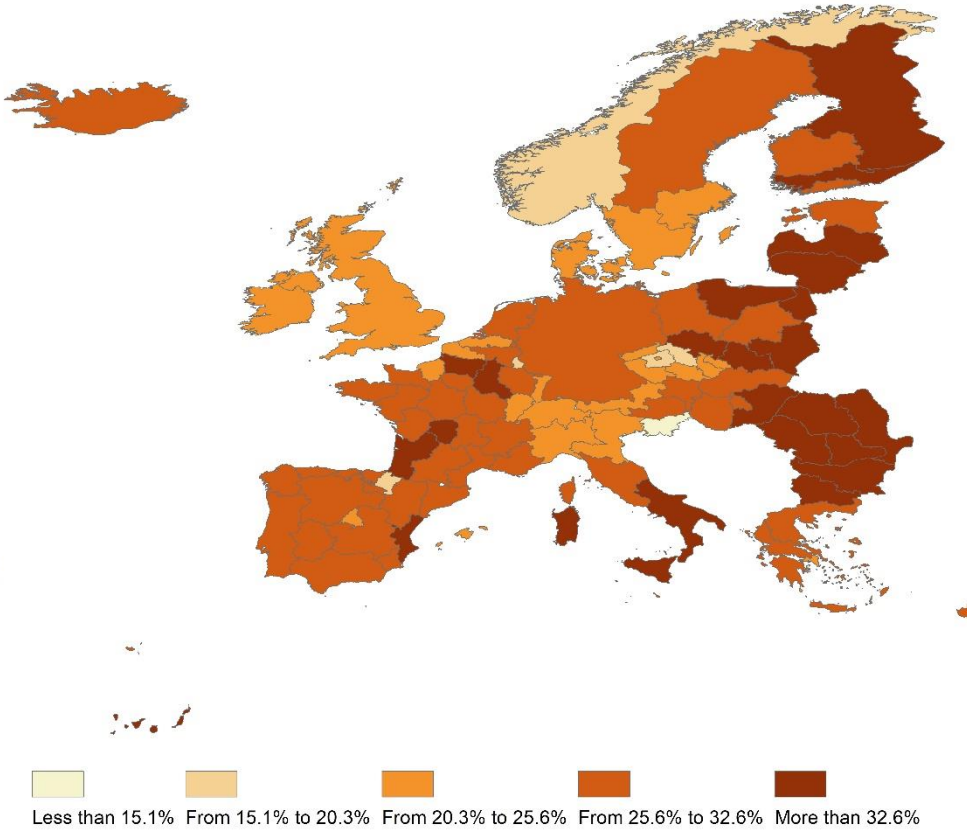
Source: Own elaboration from EU-SILC

Figure 3.5. AROPE figures from 2006 to 2013 at the level of disaggregation provided by EU-SILC (country and/or NUTS1 or 2 regions) (continued)

2008



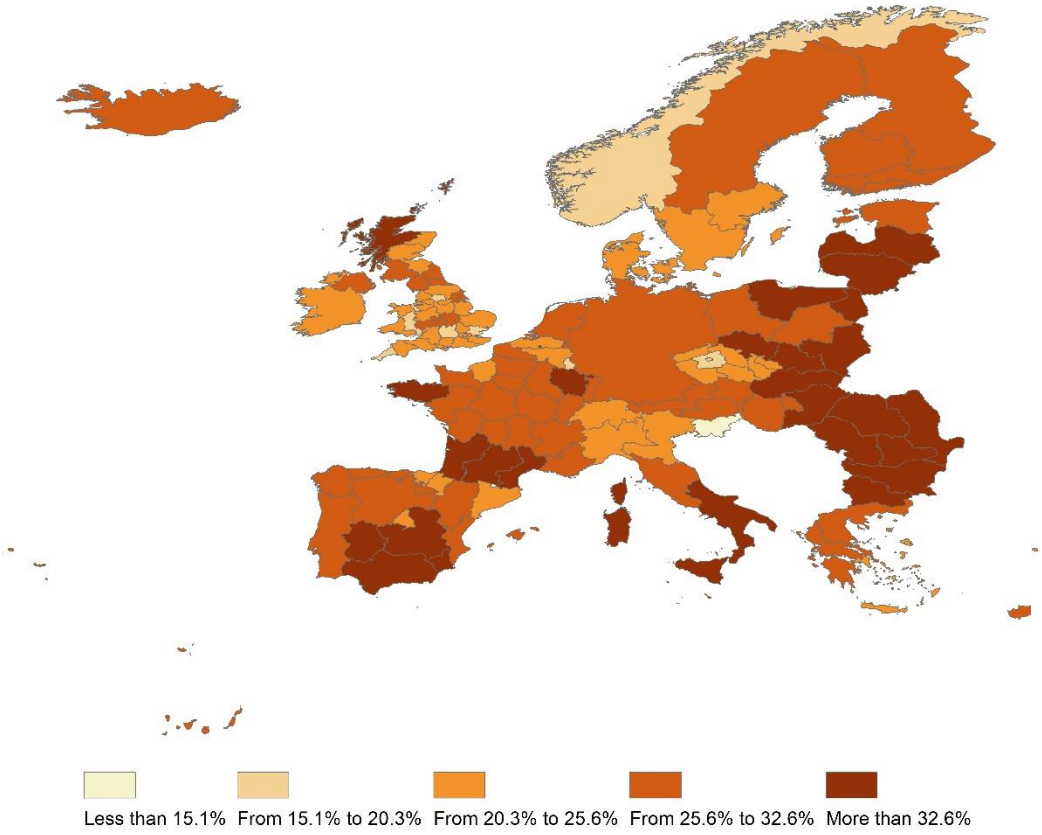
2009



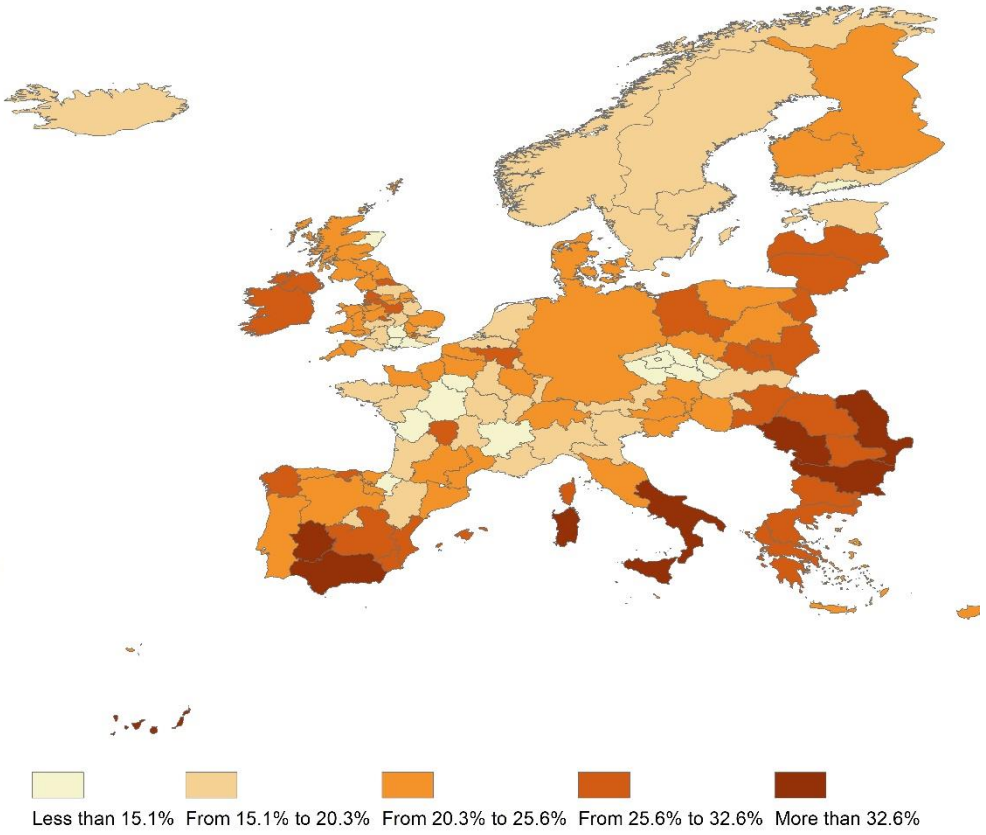
Source: Own elaboration from EU-SILC

Figure 3.5. AROPE figures from 2006 to 2013 at the level of disaggregation provided by EU-SILC (country and/or NUTS1 or 2 regions) (continued)

2010



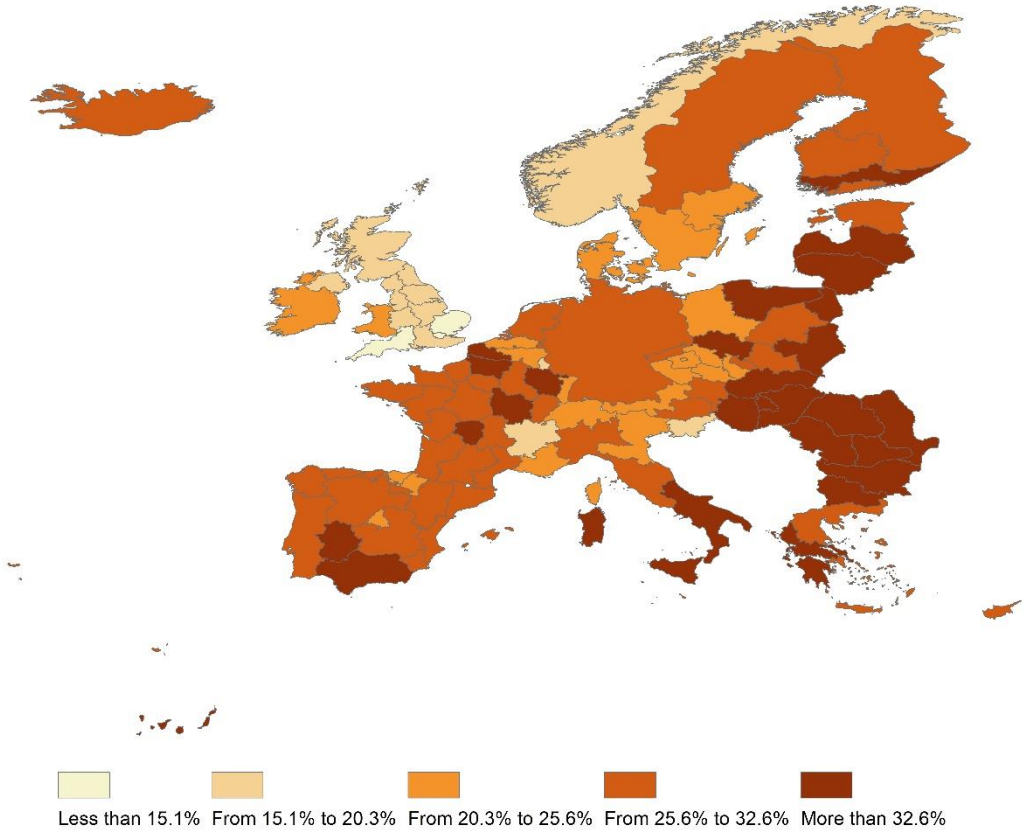
2011



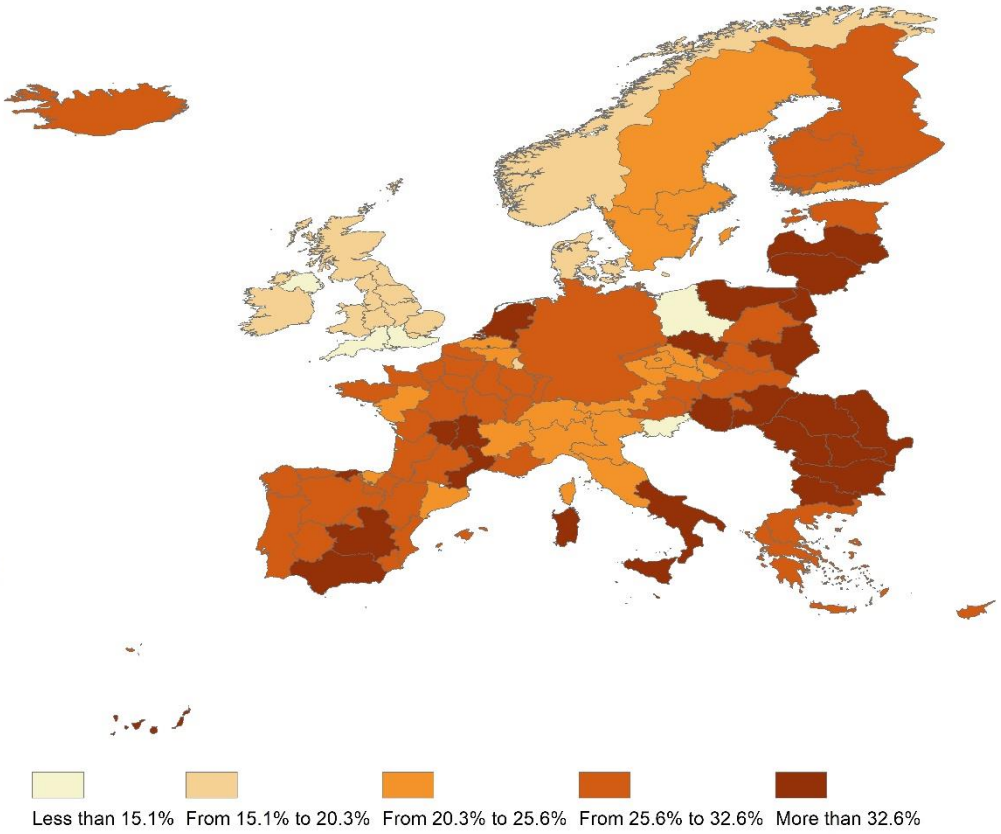
Source: Own elaboration from EU-SILC

Figure 3.5. AROPE figures from 2006 to 2013 at the level of disaggregation provided by EU-SILC (country and/or NUTS1 or 2 regions) (continued)

2012



2013



Source: Own elaboration from EU-SILC

4. FINAL REMARKS

In this report we have aimed to show the importance of spatially disaggregated analysis as a means to explain the regional inequality trends observed in Europe and to inform the place-based policy initiatives that can shape the path of the cohesion objectives set by the European Union. The failure to acknowledge this may led to the accentuation of the already marked regional disparities in terms of the North-South and the East-West divides.

The implications of neglecting economic disparities may not only weaken economic growth prospects but may also compromise the social perception of the European integration process: If European integration policies are perceived as instruments that reinforce income inequalities, Euroscepticism will gain more and more strength over time, and the probability of conflict scenarios akin to the current one between the UK and the EU will grow.

As highlighted by Shorrocks and Wan (2008), the quantity, quality and availability of datasets to analyse economic inequality has nowadays fostered the revitalisation of the discipline towards more detailed and sophisticated analysis. However, researchers are still constrained in terms of the access to rich micro datasets, and generally have to resort to aggregated information that prevents the detection of local dynamics that may be promoting or deterring inequality. The ongoing need for methodologies that allow obtain information to be obtained from aggregated data to study inequality can be seen in the works of Milanovic (2002, 2005), Capéau and Decoster (2004), or Dowrick and Akmal (2005). While there are still plenty of controversial issues to be addressed regarding economic inequality, the limited access to microdata remains one of the major handicaps. Work Package 2 of the IMAJINE Project represents an attempt to reduce this barrier in the European context by producing a new dataset that will enable the study of inequality trends at a more highly disaggregated level than currently available. In this way, disparities at the local level may be observed in further detail, permitting analysis of the interrelationship between economic inequality and several other dimensions affecting European societies.

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APPENDIX

Inequality indicators at the country level between 2006 and 2013

Country	Year	Standard deviation	Gini coefficient	Theil index	Theil index (within)	Theil index (between)
Austria	2006	20645.36	0.3321	0.1842	0.1836	6.51E-04
	2007	22458.32	0.3374	0.1938	0.1930	8.47E-04
	2008	24976.03	0.3545	0.2134	0.2127	6.29E-04
	2009	26023.23	0.3544	0.2143	0.2133	9.94E-04
	2010	27827.64	0.3608	0.2239	0.2229	1.03E-03
	2011	26829.74	0.3531	0.2099	0.2093	6.00E-04
	2012	27823.28	0.3517	0.2113	0.2106	7.28E-04
	2013	25980.28	0.3430	0.1974	0.1972	2.00E-04
Belgium	2006	42381.71	0.3584	0.2640	0.2623	1.70E-03
	2007	21002.57	0.3431	0.1968	0.1947	2.10E-03
	2008	28340.01	0.3540	0.2294	0.2268	2.58E-03
	2009	24634.41	0.3401	0.1975	0.1957	1.85E-03
	2010	23728.11	0.3405	0.1956	0.1931	2.50E-03
	2011	29886.19	0.3454	0.2097	0.2072	2.53E-03
	2012	24033.88	0.3459	0.2000	0.1974	2.54E-03
	2013	26341.51	0.3434	0.1985	0.1958	2.73E-03
Bulgaria	2006					
	2007	3014.94	0.4095	0.2960	0.2960	2.22E-16
	2008	4608.82	0.4279	0.3172	0.3115	5.67E-03
	2009	4857.00	0.4063	0.2732	0.2689	4.26E-03
	2010	5557.67	0.3998	0.2742	0.2663	7.90E-03
	2011	5714.57	0.4124	0.2922	0.2860	6.19E-03
	2012	5126.75	0.4042	0.2813	0.2767	4.56E-03
	2013	5821.22	0.4171	0.3055	0.2972	8.27E-03
Switzerland	2006					
	2007					
	2008	45293.10	0.3533	0.2325	0.2325	-1.55E-15
	2009	43441.54	0.3519	0.2229	0.2229	-2.22E-16
	2010	44636.25	0.3469	0.2165	0.2165	2.22E-16
	2011	51356.39	0.3467	0.2183	0.2183	-4.44E-16

	2012	50306.06	0.3420	0.2003	0.2003	-2.22E-16
	2013	56337.48	0.3423	0.2070	0.2070	-2.22E-16
Cyprus	2006	25491.13	0.3616	0.2331	0.2331	-2.11E-15
	2007	31527.49	0.3725	0.2606	0.2606	-1.11E-15
	2008	29929.43	0.3680	0.2458	0.2458	1.33E-15
	2009	30202.76	0.3712	0.2462	0.2462	-2.22E-16
	2010	31992.63	0.3761	0.2567	0.2567	6.66E-16
	2011	30479.96	0.3643	0.2339	0.2339	-9.99E-16
	2012	33964.54	0.3828	0.2678	0.2678	-1.22E-15
	2013	37397.62	0.3849	0.2836	0.2836	8.88E-16
Czech Republic	2006	6574.63	0.3277	0.1878	0.1843	3.58E-03
	2007	7308.62	0.3275	0.1853	0.1822	3.02E-03
	2008	8049.59	0.3307	0.1891	0.1858	3.29E-03
	2009	10358.64	0.3339	0.1982	0.1927	5.53E-03
	2010	9359.87	0.3251	0.1840	0.1787	5.30E-03
	2011	9340.69	0.3251	0.1787	0.1731	5.63E-03
	2012	9538.53	0.3254	0.1795	0.1752	4.29E-03
	2013	9154.89	0.3217	0.1740	0.1695	4.56E-03
Germany	2006	19537.26	0.3278	0.1948	0.1924	2.31E-03
	2007	25006.43	0.3659	0.2389	0.2389	-1.11E-16
	2008	26728.32	0.3708	0.2472	0.2472	-1.11E-15
	2009	24784.16	0.3626	0.2310	0.2310	4.44E-16
	2010	26725.19	0.3622	0.2344	0.2344	-4.00E-15
	2011	26186.70	0.3607	0.2305	0.2305	-4.44E-16
	2012	24365.62	0.3593	0.2214	0.2214	2.67E-15
	2013	30250.77	0.3672	0.2452	0.2452	2.22E-16
Denmark	2006	24137.31	0.3312	0.1877	0.1877	6.66E-16
	2007	32779.29	0.3420	0.2182	0.2182	6.66E-16
	2008	34315.51	0.3443	0.2204	0.2204	8.88E-16
	2009	28316.10	0.3381	0.1988	0.1988	6.66E-16
	2010	29779.47	0.3468	0.2099	0.2099	3.33E-15
	2011	32936.47	0.3623	0.2328	0.2328	3.33E-15
	2012	33972.99	0.3583	0.2294	0.2294	1.11E-15
	2013	50886.24	0.3601	0.2594	0.2594	1.55E-15
Estonia	2006	5727.30	0.4107	0.2815	0.2815	-5.55E-16

	2007	9437.65	0.4148	0.3181	0.3181	2.67E-15
	2008	7715.50	0.3954	0.2587	0.2587	-3.33E-16
	2009	8603.67	0.3909	0.2517	0.2517	-3.33E-16
	2010	8025.26	0.3883	0.2479	0.2479	2.22E-16
	2011	7873.06	0.3925	0.2539	0.2539	-2.22E-16
	2012	8582.05	0.3964	0.2604	0.2604	1.11E-15
	2013	9734.83	0.4036	0.2703	0.2703	2.22E-16
Greece	2006	16669.04	0.3783	0.2484	0.2447	3.72E-03
	2007	17386.19	0.3796	0.2498	0.2427	7.12E-03
	2008	18271.00	0.3672	0.2370	0.2315	5.43E-03
	2009	19544.78	0.3713	0.2437	0.2357	7.99E-03
	2010	19943.21	0.3733	0.2439	0.2335	1.03E-02
	2011	17641.52	0.3738	0.2431	0.2396	3.52E-03
	2012	13933.21	0.3530	0.2174	0.2072	1.02E-02
	2013	13708.45	0.3686	0.2425	0.2334	9.16E-03
Spain	2006	16618.69	0.3564	0.2132	0.2055	7.69E-03
	2007	17050.62	0.3535	0.2071	0.1988	8.34E-03
	2008	17480.93	0.3558	0.2084	0.1997	8.71E-03
	2009	21934.97	0.3653	0.2242	0.2147	9.54E-03
	2010	22114.22	0.3674	0.2291	0.2201	8.97E-03
	2011	22999.38	0.3732	0.2415	0.2314	1.01E-02
	2012	21400.86	0.3678	0.2312	0.2207	1.05E-02
	2013	19946.87	0.3639	0.2244	0.2122	1.22E-02
Finland	2006	26650.62	0.3510	0.2268	0.2255	1.36E-03
	2007	26069.43	0.3490	0.2204	0.2184	1.95E-03
	2008	25942.23	0.3547	0.2207	0.2156	5.11E-03
	2009	26155.71	0.3519	0.2151	0.2104	4.66E-03
	2010	25390.37	0.3428	0.2036	0.1993	4.21E-03
	2011	27842.88	0.3483	0.2121	0.1971	1.50E-02
	2012	30140.12	0.3499	0.2146	0.2100	4.68E-03
	2013	29496.05	0.3461	0.2073	0.2031	4.17E-03
France	2006	20353.31	0.3313	0.1906	0.1859	4.71E-03
	2007	20375.64	0.3244	0.1815	0.1775	4.01E-03
	2008	29752.35	0.3529	0.2298	0.2250	4.77E-03
	2009	32260.34	0.3531	0.2357	0.2301	5.51E-03

	2010	32072.41	0.3547	0.2321	0.2277	4.43E-03
	2011	37623.92	0.3574	0.2485	0.2417	6.77E-03
	2012	40283.01	0.3592	0.2510	0.2445	6.51E-03
	2013	34730.34	0.3536	0.2358	0.2298	6.02E-03
Hungary	2006					
	2007					
	2008					
	2009					
	2010	9048.46	0.3959	0.2562	0.2491	7.14E-03
	2011	8398.03	0.3875	0.2458	0.2458	0
	2012	7974.97	0.3839	0.2407	0.2407	1.11E-15
	2013	7620.37	0.3822	0.2373	0.2373	-2.22E-15
Croatia	2006	7831.45	0.3827	0.2829	0.2774	5.53E-03
	2007	5060.45	0.3216	0.1769	0.1724	4.43E-03
	2008	5424.61	0.3154	0.1695	0.1647	4.83E-03
	2009	5476.94	0.3059	0.1562	0.1522	4.06E-03
	2010	4811.63	0.3016	0.1512	0.1465	4.67E-03
	2011	5663.34	0.3211	0.1716	0.1656	6.07E-03
	2012	6365.58	0.3269	0.1842	0.1780	6.16E-03
	2013	6275.14	0.3279	0.1873	0.1808	6.51E-03
Ireland	2006	44769.01	0.3921	0.2909	0.2909	6.66E-16
	2007	41895.07	0.3821	0.2596	0.2596	1.55E-15
	2008	40460.21	0.3666	0.2382	0.2382	-1.67E-15
	2009	32593.15	0.3570	0.2157	0.2157	2.00E-15
	2010	32719.20	0.3601	0.2264	0.2264	-1.55E-15
	2011	27879.24	0.3496	0.2057	0.2057	-1.44E-15
	2012	28499.42	0.3539	0.2151	0.2151	2.67E-15
	2013	30176.11	0.3584	0.2231	0.2231	8.88E-16
Iceland	2006	42967.18	0.3421	0.2135	0.2135	1.55E-15
	2007	50502.25	0.3601	0.2467	0.2467	3.11E-15
	2008	53096.82	0.3575	0.2362	0.2362	2.22E-15
	2009	40908.53	0.3755	0.2697	0.2697	6.66E-16
	2010	24151.58	0.3446	0.2050	0.2050	4.44E-16
	2011	24084.16	0.3333	0.1932	0.1932	-2.22E-16
	2012	23731.75	0.3299	0.1856	0.1856	-1.89E-15

	2013	26559.13	0.3314	0.1883	0.1883	4.44E-16
Italy	2006	22011.48	0.3686	0.2337	0.2269	6.86E-03
	2007	22506.21	0.3684	0.2337	0.2268	6.99E-03
	2008	22496.70	0.3608	0.2239	0.2178	6.03E-03
	2009	23078.01	0.3635	0.2283	0.2211	7.16E-03
	2010	24061.68	0.3587	0.2244	0.2185	5.93E-03
	2011	25031.55	0.3617	0.2309	0.2222	8.63E-03
	2012	25018.50	0.3646	0.2347	0.2269	7.81E-03
	2013	26195.29	0.3680	0.2434	0.2356	7.84E-03
Lithuania	2006	22011.48	0.3686	0.2337	0.2269	6.86E-03
	2007	22506.21	0.3684	0.2337	0.2268	6.99E-03
	2008	22496.70	0.3608	0.2239	0.2178	6.03E-03
	2009	23078.01	0.3635	0.2283	0.2211	7.16E-03
	2010	24061.68	0.3587	0.2244	0.2185	5.93E-03
	2011	25031.55	0.3617	0.2309	0.2222	8.63E-03
	2012	25018.50	0.3646	0.2347	0.2269	7.81E-03
	2013	26195.29	0.3680	0.2434	0.2356	7.84E-03
Luxembourg	2006	36905.89	0.3258	0.1808	0.1808	4.44E-16
	2007	38288.48	0.3206	0.1750	0.1750	-1.67E-15
	2008	40068.77	0.3169	0.1742	0.1742	1.11E-15
	2009	45012.76	0.3281	0.1932	0.1932	-1.22E-15
	2010	43964.63	0.3199	0.1810	0.1810	-2.11E-15
	2011	40130.40	0.3148	0.1684	0.1684	-7.77E-16
	2012	42786.49	0.3180	0.1771	0.1771	-3.33E-16
	2013	55115.96	0.3354	0.2136	0.2136	-1.11E-15
Latvia	2006	5706.59	0.4486	0.3558	0.3558	-1.33E-15
	2007	6150.49	0.4310	0.3123	0.3123	-1.89E-15
	2008	9396.09	0.4592	0.3595	0.3595	-1.55E-15
	2009	11105.11	0.4575	0.3646	0.3646	-9.99E-16
	2010	8000.93	0.4249	0.3056	0.3056	1.78E-15
	2011	7148.97	0.4156	0.2915	0.2915	2.22E-16
	2012	8199.44	0.4239	0.3100	0.3100	-9.99E-16
	2013	8141.53	0.4195	0.2975	0.2975	-4.44E-16
Malta	2006					
	2007					

	2008	14200.49	0.3619	0.2162	0.2162	-8.88E-16
	2009	14398.71	0.3480	0.1988	0.1988	-2.89E-15
	2010	14838.30	0.3495	0.2062	0.2062	1.55E-15
	2011	13922.85	0.3381	0.1870	0.1870	-1.33E-15
	2012	15547.47	0.3383	0.1939	0.1939	-2.44E-15
	2013	18005.80	0.3478	0.2080	0.2080	-1.89E-15
Netherlands	2006	21982.21	0.3245	0.1863	0.1863	-2.55E-15
	2007	25898.19	0.3408	0.2120	0.2120	-2.89E-15
	2008	28286.52	0.3405	0.2125	0.2125	-1.22E-15
	2009	26460.69	0.3398	0.2045	0.2045	-3.89E-15
	2010	23450.34	0.3263	0.1806	0.1806	-9.99E-16
	2011	23415.80	0.3255	0.1794	0.1794	-3.33E-15
	2012	24065.53	0.3295	0.1846	0.1846	1.33E-15
	2013	23817.14	0.3295	0.1831	0.1831	1.11E-15
Norway	2006	87802.32	0.3733	0.3381	0.3381	-6.66E-16
	2007	30639.95	0.3375	0.1944	0.1944	2.00E-15
	2008	44068.73	0.3393	0.2127	0.2127	-8.88E-16
	2009	38790.50	0.3349	0.1953	0.1953	-4.44E-16
	2010	37044.93	0.3329	0.1936	0.1936	-6.66E-16
	2011	38295.77	0.3306	0.1872	0.1872	4.44E-16
	2012	39282.56	0.3228	0.1741	0.1741	3.33E-15
	2013	42132.83	0.3233	0.1749	0.1749	-2.22E-16
Poland	2006	5187.50	0.3710	0.2311	0.2290	2.10E-03
	2007	6145.01	0.3669	0.2317	0.2297	1.96E-03
	2008	7533.80	0.3729	0.2423	0.2400	2.33E-03
	2009	9317.44	0.3705	0.2400	0.2377	2.27E-03
	2010	7074.64	0.3666	0.2253	0.2238	1.51E-03
	2011	8388.73	0.3692	0.2327	0.2319	8.66E-04
	2012	8132.57	0.3631	0.2218	0.2207	1.09E-03
	2013	7890.91	0.3578	0.2133	0.2124	9.42E-04
Portugal	2006	16588.77	0.4231	0.3206	0.3206	-2.22E-16
	2007	16329.14	0.4139	0.2995	0.2995	-4.44E-16
	2008	16573.25	0.4055	0.2910	0.2910	8.88E-16
	2009	17124.06	0.3947	0.2828	0.2828	-7.77E-16
	2010	14667.00	0.3826	0.2483	0.2483	-7.77E-16

	2011	15013.59	0.3849	0.2564	0.2564	-7.77E-16
	2012	14532.74	0.3774	0.2504	0.2504	8.88E-16
	2013	13812.15	0.3777	0.2454	0.2454	-2.22E-16
Romania	2006					
	2007	3338.30	0.4248	0.3097	0.3097	8.88E-16
	2008	3632.70	0.4049	0.2775	0.2618	1.57E-02
	2009	3807.00	0.3914	0.2592	0.2527	6.51E-03
	2010	3391.20	0.3786	0.2387	0.2312	7.43E-03
	2011	3360.77	0.3718	0.2301	0.2234	6.74E-03
	2012	3245.65	0.3705	0.2259	0.2191	6.74E-03
	2013	3201.92	0.3709	0.2381	0.2313	6.75E-03
Serbia	2006					
	2007					
	2008					
	2009					
	2010					
	2011					
	2012					
	2013	4787.26	0.4091	0.2862	0.2862	-9.99E-16
Sweden	2006	17722.31	0.3240	0.1762	0.1762	0
	2007	19215.84	0.3234	0.1765	0.1765	-2.00E-15
	2008	21338.59	0.3276	0.1811	0.1799	1.21E-03
	2009	24493.08	0.3398	0.2002	0.1970	3.15E-03
	2010	21566.32	0.3328	0.1899	0.1886	1.34E-03
	2011	24254.80	0.3332	0.1861	0.1849	1.23E-03
	2012	25784.64	0.3372	0.1885	0.1871	1.46E-03
	2013	27943.56	0.3392	0.1922	0.1906	1.55E-03
Slovenia	2006	11456.80	0.3331	0.1818	0.1818	2.44E-15
	2007	11958.43	0.3268	0.1752	0.1752	0
	2008	13091.50	0.3298	0.1788	0.1788	-2.78E-15
	2009	14028.34	0.3274	0.1748	0.1748	-1.22E-15
	2010	13703.26	0.3398	0.1878	0.1878	-6.66E-16
	2011	13891.39	0.3405	0.1888	0.1888	-2.22E-15
	2012	13774.83	0.3405	0.1883	0.1883	1.78E-15
	2013	13570.17	0.3416	0.1894	0.1894	-3.78E-15

Slovakia	2006	9204.97	0.3710	0.2898	0.2898	-7.77E-16
	2007	5116.13	0.3366	0.1858	0.1858	1.55E-15
	2008	6270.45	0.3391	0.1894	0.1894	2.67E-15
	2009	7672.79	0.3407	0.1906	0.1906	-1.11E-15
	2010	10374.53	0.3411	0.2069	0.2069	-9.99E-16
	2011	10166.16	0.3439	0.2078	0.2078	8.88E-16
	2012	9011.12	0.3423	0.1892	0.1892	1.11E-15
	2013	8397.41	0.3269	0.1725	0.1725	-3.33E-15
United Kingdom	2006	30586.31	0.3801	0.2513	0.2513	0.00E+00
	2007	38076.00	0.3836	0.2650	0.2650	-2.22E-15
	2008	39958.79	0.3960	0.2964	0.2964	0
	2009	25816.04	0.3798	0.2505	0.2505	1.55E-15
	2010	28165.83	0.3848	0.2605	0.2486	1.19E-02
	2011	32050.60	0.3863	0.2739	0.2581	1.58E-02
	2012	28386.17	0.3590	0.2259	0.2166	9.33E-03
	2013	25157.22	0.3529	0.2104	0.2049	5.52E-03

[i] Official income figures are only available at NUTS2 level and therefore inequality within EU regions remains unknown. While Deliverable 2.2 will describe the methodology applied to estimate income at a higher level of disaggregation than NUTS2, Deliverable 2.4 will show income inequality indicators at local level.