MAPPING POVERTY AT REGIONAL LEVEL IN GREECE

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Abstract - Poverty *has been a matter of great academic and political concern for decades. In the recent years, the interest has increased considerably at the European Union level because poverty seems to be a relatively persistent phenomenon and a* threat to *economic prosperity and social cohesion of the Union. The aim of this paper is to* assess *and map, for the first time, the distribution of poverty at the NUTS III level in Greece, as well as to evaluate and map the regional impact of the ongoing economic crisis on poverty, by comparing the poverty rates before and during the crisis. For this purpose a Small Area Estimation technique is employed in order to estimate poverty rates at low levels of geographical aggregation. Spatial variation is a relatively neglected dimension of poverty analysis and poverty maps that provide a description of the spatial distribution of welfare and poverty within a country at different spatial levels may be a useful tool for policy-making.*

Key words - INCOME, REGION, GREECE, POVERTY MAPPING, SMALL AREA ESTIMATION

JEL Classification - C53, D63, I32, R13

This research was conducted as part of the project TIPSE - Territorial Dimensions of Poverty and Social Exclusion in Europe, - as part of the ESPON 2013 programme, (European Observation Network for Territorial Development and Cohesion), funded by the European Union. Texts and maps stemming from research projects under the ESPON programme presented in this report do not necessarily reflect the opinion of the ESPON Monitoring Committee.

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1. INTRODUCTION

In the recent years, the interest for poverty has increased considerably both at the global and at the European Union (EU) level. At the global level, several scholars have concluded that poverty has declined significantly in the last decades in both absolute and relative terms (Sala-i-Martin, 2004; Chen and Ravallion, 2004; Nielsen, 2009)[1], although the rate of decrease has not been uniform in different countries (Fosu, 2010) and many studies have shown that poverty and inequality are likely to rise in the future (Hillebrand, 2008).

At the EU level, poverty seems to be a relatively persistent phenomenon and *a* threat to economic prosperity and social cohesion of the Union. In their introduction for *Breadline Europe*, Gordon and Townsend (2000) expressed their concern that poverty might become intractable and that the wounded confidence on the ability to combat it had to be restored. Ten years later, similar concerns were evidently present in the adoption of the Europe 2020 strategy, while many European countries were starting to face the impacts of the global economic crisis. Meanwhile, in an environment marked by continuous growth at least until 2007, the EU-15 at-risk-of-poverty (AROP) rate showed no signs of decrease. On the contrary, it had increased from an estimated 15% in 2000 to 16.3% in 2010, when the AROP rate of the enlarged EU-27 was almost identical, at 16.4%. In addition to this, according to the last available Eurostat data (SILC data) that reflect the impact of economic crisis, the EU-27 AROP rate rose to 16.9% in 2011 and 2012. Since the Eurostat AROP rate refers to a relative income threshold (60% of the median income) which is not fixed and decreases in times of recession, the increase of poverty would be quite higher if seen in absolute terms. Indeed, using the corresponding threshold of 2005 the EU-28 AROP rate increased by 2.1 percentage units between 2010 and 2012 (from 13.5 to 15.6%), while the condition is more alarming the eighteen Eurozone countries, where the AROP rate rose from 14.6 in 2010 to 17.8 in 2012.

In light of all these facts, it is not surprising that the reduction of poverty (as well as social exclusion) is now one of the central objectives of the EU and its member States[2]. At the Lisbon meeting in 2000, the European Council set the strategic goal of "greater social cohesion" and committed to take steps "to make a decisive impact on the eradication of poverty". This strategy put poverty and social exclusion at the heart of EU social policy and led to the adoption in 2001 of the Laeken social indicators including, among others, poverty indicators. Tackling poverty is also one of the objectives of the Europe 2020 Strategy. This objective is defined on the basis of three indicators: the number of people considered "at-risk-of-poverty", the number of materially deprived persons and the number of people aged 0–59 living in "jobless" households (European Commission, 2010b).

[1] The decrease in poverty concerns the reduction of people considered as poor using either absolute or relative thresholds. There are indices that the ratio of the income of the poor to the income of the non-poor tends to decrease (Nielsen, 2009).

[2] For a discussion about poverty issues in the EU see Marlier and Atkinson, 2010; Whelan and Maıtre, 2010 and Betti et al., 2012.

In the context of broader European developments, Greece is in any sense a remarkable case. The country faces one of the most serious economic crises in its modern history caused by exogenous (i.e., the global financial crisis) as well as endogenous (i.e. clientelism, bureaucracy and structural weaknesses) factors (Psycharis et al., 2014). The national GDP showed a rapid decrease since 2008, even in nominal terms. With an AROP rate of 20.9% (representing about 2.15 million people), Greece scored poorly among the EU-15 countries as early as in 2003. After some fluctuations, the corresponding figure was almost the same in 2010, but three points higher in 2012. More tellingly, if one uses the fixed 2005 threshold, the AROP rate increases from 22.9% to 32.3% in the same two years. At the same time, Greece is in the bottom-five EU countries regarding income inequalities, as depicted by the Gini coefficient (Mitrakos, 2014). In this situation, the response of the Greek welfare state seems to be inadequate (Lyberaki and Tinios, 2014).

Spatial variation is a relatively neglected dimension of poverty analysis both at the national and at the EU level. Typically, poverty analysis is based on national level indicators that are compared over time. This kind of analysis ignores the fact that large variations may exist among different spatial entities, i.e. that poverty is a spatially heterogeneous phenomenon. The comparison of the regional dispersion of poverty in different national contexts might reveal the relationship between national performance and regional disparities in the sense that higher national poverty rates may be accompanied by concentration of poverty in specific regions or, on the contrary, by widespread poverty across regions (Jesuit et al., 2002; Lelkes and Zólyomi, 2008). Positive or negative changes in the national value may equally mask contradictory trends between regions, which means that there might exist regions in which poverty increases despite aggregate decrease or the opposite. The risk of poverty might be more prevalent in this or that kind of regions (for example in urban as opposed to rural ones), thus revealing constant spatial patterns.

Furthermore, differences between regions may relate to regional growth rates as well as to dynamic structural transformations of the regional economies (Förster et al., 2003). For example, the current crisis is not a monolithic and homogenizing process. On the contrary, it has broadly transformed the socio-economic status of various areas, affecting their income levels as well as poverty in a very unequal way. This has been confirmed both for Greece (Monastiriotis, 2011; Psycharis et al., 2011; Bakas and Papapetrou, 2012; Psycharis et al., 2014) and for the EU (Committee of the Regions, 2010: 3).

All in all, regional differentiations of poverty risk should be taken into serious consideration in policy making and policy implementation. Poverty might have strong local characteristics and this is something that should be carefully examined by policy makers because, sometimes, targeted policies might be more effective than general interventions. National level indicators are useful to monitor the global trends but disaggregated information for lower geographical (administrative) areas is probably more useful for policy-makers. On the other hand, regional explanations of poverty should not be overestimated and the same applies to regionally differentiated (i.e. area based) policies. It is possible

that inequalities between regions come as the result of restructuring at higher geographic levels and/or policy decisions taken at the national or supranational level and from that perspective interventions focused especially on 'problematic' areas may have poor results in reducing poverty. If, for example, poverty in specific ageing regions has to do with reforms in the national pension system, then it is questionable whether policies to increase employment in those regions would be more effective than a reconsideration of the redistribution effect achieved through pensions.

From all these perspectives, poverty maps that provide a description of the spatial distribution of welfare and poverty within a country at different spatial levels and can be used to investigate the relationship between poverty and other economic, social and geographic factors, might be a useful tool for analysis and policy-making.

The aim of this paper is to *assess* and map, for the first time, the distribution of poverty at the NUTS III level, as well as to evaluate and map the impact of the ongoing economic crisis on poverty, by comparing the regional AROP rates before and during the crisis (in 2005 and 2011). The data used were obtained from two sources: survey data obtained from EU-SILC micro datasets and population census data obtained from the Hellenic Statistical Authority (EL.STAT.) In order to estimate poverty rates and to elaborate poverty maps, a sophisticated statistical technique, known as Small Area Estimation (SAE) is used. The goal of this technique is to generate estimates of households' living standards at low geographical levels, combining both the detailed information about living standards usually included in survey databases and the more extensive geographical coverage of census databases (Baschieri et al., 2005).

The remainder of the paper is organized as follows: The next section presents an overview of the main and most recent empirical studies concerning poverty in Greece. Section 3 gives a description of the methods used in empirical analysis, section 4 gives a description of the data and variables used in the study and discusses poverty measurement issues, while section 5 maps the estimated AROP rates before and during the economic crisis. A brief summary and discussion of the results and suggestions for future research follow in the final section.

2. (REGIONAL) POVERTY IN GREECE

Greece is divided into 13 NUTS II Regions (*Perifereies*) and 51 NUTS III Regions (*Nomoi).* The latter have an average resident population size of 212,084 (2011 census) but with a high coefficient of variation (2.6). In fact, with its 3.8 million inhabitants, the capital region of Attiki (mainly consisting of the metropolitan region of Athens) accommodates about 35% of the total population, while the second biggest region of Thessaloniki is responsible for another 10%. There are large differences among the NUTS III regions in terms of development level and regional economic structures, reflected in varying employment structures and inequalities in regional GDP per capita. In 2011 the richest NUTS III Region had an average income 2.9 times higher than that of

the poorest. Relatively recent investments in transportation and communication infrastructure have started to alter the historical fragmentation of the national space. However, the NUTS III regions continue to be internally homogeneous spatial economic units, as it is indicated by the importance of their boundaries in the delineation of local labor markets (Kallioras et al., 2012).

The literature on regional poverty in Greece is scanty mainly due to data availability reasons (regional micro-data available only at NUTS I level)[3]. As a result, the few previous studies that have examined regional poverty in the EU have not included Greece in their analysis (e.g. Jesuit et al., 2003).

According to a series of studies based on data from the national Household Budget Surveys (HBS) and European data sources (ECHP, EU-SILC), poverty and inequalities in Greece declined almost continuously during the last four decades, but remain at levels higher than the European average (Tsakloglou, 1990; Tsakloglou and Panopoulou, 1998; Mitrakos and Tsakloglou, 2012; Mitrakos, 2014). The decrease of relative poverty was remarkable especially in the first decade after the collapse of the dictatorship in 1974 and showed signs of stabilization afterwards, while the decrease of absolute poverty continued during the whole period. Kikilias et al. (2005) and Georgiadis (2007) depict the variance of AROP rates across demographic groups and socioeconomic categories. At the individual level, AROP rate is higher than the average for people aged less than 25, i.e. for children and those still in education or at the early steps of their working life. The lowest rate is that for those between 25 and 44, while then the AROP rate tends to increase with age, showing the highest scores for people older than 75. Relatively higher AROP rates appear among the economically inactive persons, the unemployed and the less educated, although there seems to be an increase of the AROP rate among those with medium and higher education (Mitrakos, 2014).

Some recent studies, analyzing the impact of economic crisis on national economy, highlight the increase of poverty in Greece. Matsaganis and Leventi (2013), focusing mainly on their distributional effects of economic crisis, suggest that the relative income poverty has risen slightly in the last years (until 2011). Matsaganis and Leventi, (2014), show that poverty in Greece increased moderately from 20 per cent in 2009 to 21.3 per cent in 2012, but when fixing the poverty line at pre-crisis levels, poverty have risen sharply to 37 per cent in 2012. Dagoumas and Kitsios (2014), examining the impact of the economic crisis on energy poverty (using the electricity consumption per capita), suggest that economic crisis has a considerable effect on the electricity consumption, as well as on the capability (or willingness) of people to pay their bills. The effect of the crisis seems to be more obvious in bigger cities (e.g. Athens, Piraeus and Thessaloniki) while more remote areas, such as Peloponnese and Epirus have been affected less. This is an indication that the shift of poverty from rural to

[3] Most regional income studies have focused on inequality issues rather poverty (Petrakos and Artelaris, 2008). However, the findings about disparity might be different from the results about poverty because of distributional effects.

urban areas that started four decades ago (Mitrakos, 2014) continues in the period of crisis.

Poverty analysis at the regional level has been conducted only by Kikilias et. al. (2005). The authors identified three groups of NUTS II regions with different performances. Trying a more detailed categorization of five groups (using the natural breaks classification technique) the picture that emerges shows the distinctive disadvantaged position of the Region of Ipeiros in North Greece. The best performing Region of Attiki is followed by a group shaped by the islands Region of Kriti and V. Aigaio. The rest of the country is divided in two parts, one with low-medium rates comprising the northern Regions of K. Makedonia, D. Makedonia, Thessalia, the Ionian island and the N. Aigaio islands; and one with medium-high rates, comprising the central and southern Regions of D. Ellada, S. Ellada and Peoloponnisos and the Northern Region of A. Makedonia – Thraki. However, the values provided by Kikilias et al. are based on relatively small samples at the NUTS II level and consequently exhibit high standard errors. As a result, though these values are the first attempt to measure regional poverty in Greece at the NUTS II level, they should be interpreted with caution.

The decrease of the national GDP is not experienced in a similar way by all sub-national regions, even those located relatively close to each other. Indicatively, using 2005 as the base year, the regional GDP in 2011 had remained stable in Kozani but had been reduced by almost one third in Kilkis, both NUTS III regions in North Greece. An emerging question is whether regional disparities in AROP rates are connected with disparities in regional level of prosperity as represented by the GDP per capita[4].

3. METHOD OF ANALYSIS

Poverty mapping involves employing relatively new methods to estimate poverty rates at lower aggregation levels (e.g. regions, provinces, municipalities), using data that are usually available at the national level. These methods are based heavily on the literature on Small Area Estimation techniques. The aim of these sophisticated techniques is to estimate quantities of interest within a partition of a country (Haslett and Jones, 2010) combining, in the case of poverty, sample survey and population census information. Typically, household surveys, such as the EU-SILC, collect very detailed information on household characteristics, including measures of income and/or consumption on which the estimation of poverty rates can be based. However, these samples are rarely reliable at low levels of aggregation mainly because of small sample sizes. On the other hand, census data enable (spatial) disaggregation but do not usually

[4] There is a vast literature on the relationship between poverty and growth in various countries and regions of the world (Ravallion, 2001; Kalwij and Verschoor, 2007; Fosu, 2010), although only a part of it concerns the sub-national regional dimension of this relationship directly (Ferreira et al., 2010). Findings are commonly suggestive of a negative relationship, as higher growth tends to be coupled with poverty reduction, but this relationship is mediated by income distribution (and in turn by those factors that influence income distribution, such as regional economic structure or regional disparities in social protection systems).

provide information on income or consumption, or measure these variables poorly (Elbers et. al., 2003). This has led to the need of developing alternative and sophisticated methods aimed at combining data from the aforementioned databases (Baschieri et al. 2005). As a result, the main aim of the poverty mapping statistical procedure (small area estimation) is to combine data from both sources to estimate poverty rates at low levels of geographical aggregation (Elbers et. al. 2002).

This field is rapidly expanding since small area statistics have become an increasingly important analytical means of estimating and detecting poverty trends as well as guiding policies in several countries. Currently, there is a project of the World Bank supported by the European Commission, aiming at producing small-area estimation (SAE) poverty maps for new Member States of the European Union (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia).

Elbers et al. (2003) developed a small area estimation approach for income-based (or expenditure-based) poverty measures to estimate poverty rates based on regression models of income (or expenditure) at the level of survey clusters[5]. To estimate poverty rates, survey data are used to elaborate a model of income (income prediction model), employing a series of explanatory variables that are common in both databases. The parameter estimates from this model are then applied to census data to produce estimates of household income as well as poverty rates at smaller geographical units.

This method includes three stages of poverty mapping. First, in the stage of comparability, common variables from both sources are identified, selected and compared. Evidently, these variables have to be strongly related with households' living conditions and welfare (as for example the variables of age, gender, education, marital status, status in employment, nationality etc). Only variables that have the same definition and similar distribution in both databases can be used in the second stage, described as the stage of modeling. In this stage, a number of regressions are run in order to model the household income (or expenditure) and decompose the random unexplained components[6]. In this stage, only the variables that contribute significantly to the explanation of household income are selected for inclusion in the final model. In other words, the rest of the variables are dropped from the model. In this stage, a statistical test for heteroscedascity is necessary determining the method employed. Finally, in the last stage, known as simulation stage, the model parameters are applied to the census database, the income is predicted and the poverty statistics are derived at a variety of levels of spatial disaggregation.

[5] This technique has been used by the World Bank to estimate poverty rates in several countries; it has been incorporated into the World Bank software "PovMap".

[6] It is worth noting that endogeneity that typically hampers the interpretation of the parameter estimates can be ignored in this model, because the objective of the model is not the interpretation of the parameters but the prediction of income.

Following Elbers et al. (2003), the empirical model of household income (consumption) is defined as:

$$\ln y_{ch} = E(y_{ch} \mid x_{ch}) + u_{ch}$$

where *c* is the subscript for the cluster or location (a spatial aggregation level common in the two databases which is typically defined by survey data), *h* is the subscript for the household within cluster *c*, $\ln y_{ch}$ is the logarithm of per capita income (or expenditure) of household *h* in cluster *c* , X_{ch} is a vector of observed household characteristics for household *h* in cluster *c* (available in both the survey and the census datasets) and u_{ch} is the error term ($\varepsilon \sim N(0, \sigma^2)$). The model is simplified by using a linear approximation to the conditional expectation $E(y_{ch} \mid x_{ch})$ and decomposing u_{ch} into uncorrelated terms:

$$u_{ch} = n_c + \varepsilon_{ch}$$

where n_c a location error term common to all households within the location (cluster component) and ε_{ch} is a household specific error term (household component). It is further assumed that n_c is uncorrelated across locations and ε_{ch} is uncorrelated across households. Under these assumptions, the fully specified simulation model is defined as follows:

$$\ln y_{ch} = x_{ch}\beta + n_c + \varepsilon_{ch}$$

4. POVERTY MEASUREMENT, DATA AND VARIABLES

4.1. Poverty measurement

Poverty is sometimes seen as an unproblematic unidimensional concept that reflects the conditions in which peoples' basic needs are not met. This one-dimensional view is questionable because it ignores other crucial aspects of poverty such as health and education (Sen, 1985). The definition of poverty and the identification of the poor is a controversial and multi-faceted issue. Until now, there is no commonly accepted way of identifying who is poor. Despite the wide problematization, not only about causes and effects but also about the indices of poverty, unidimensionality seems to be the result of official definitions that focus on income distribution (Azpitarte, 2012). Thus, while there has been extensive discussion on whether poverty has to be considered in absolute or relative terms (or both), i.e. defined according to a fixed poverty line or a poverty line somehow related to the median income of a society[7], available income has emerged as the most common poverty indicator, adopted as a legitimate measure in national and international contexts.

[7] The concept of absolute poverty appears to be more relevant to low income countries, while relative poverty is of more relevance to high income countries (cf. Garroway and de Laiglesia, 2012).

In this study, poverty is estimated following the Eurostat definition (European Commission, 2010a). According to this, the common threshold applied to at-risk of- poverty indicators is that of 60 % of (national) median equivalised disposable income (after social transfers). In other words, the poverty rate is defined in relative terms, as the percentage of people or households who have a net income of less than 60% of the national median equivalised disposable income. In order to take into account the size of the household, Eurostat uses the OECD modified equivalence scale[8]. Poverty thresholds can be defined in each region separately, according to the regional median income or, alternatively, global thresholds may be applied, following the median income at the national level (Jesuit et al., 2003; Kangas and Ritakallio, 2007). Here we selected the latter method that is representative of the comparative position of each region against the national poverty rate.

4.2. Data

The two sources of data are used to extract poverty rates for Greece are (i) the EU-SILC 2005 and 2011 databases[9] and (ii) the population census databases of 2001 and 2011. The European Union Statistics on Income and Living Conditions (EU-SILC) survey is conducted every year, contains information on a wide range of variables including, among others, demographics, education, health status, as well as income measures This database is the main reference source for the three indicators of the target of poverty and social exclusion adopted in the Europe 2020 strategy (European Commission, 2010b). EU-SILC for Greece[10] produces poverty estimates at national level as well as for large geographical divisions, allowing reliable spatial analysis of poverty only at the NUTS I level. Both census databases offer a complete coverage of all households in each point in time.

4.3. Variables

Twelve common variables were identified in the two databases. From them, eleven explanatory variables were selected and used in the elaboration of the income model as they present similar distributions in both databases, while ten of them contribute significantly to the explanation of the (log) household income. Table 1 presents the dependent and the explanatory variables that are selected by the stepwise method for the final two models.

[8] This assigns a weight of 1.0 to the first adult, 0.5 to the second and each subsequent person aged 14 and over and 0.3 to each child aged under 14.

[9] It would be desirable that the two databases had the same reference year, as one main requirement of this technique is that the census and the survey databases represent the same population and implicitly the same point in time (Baschieri et. al., 2005). However, the selection of the 2005 EU-SILC database corresponds better to our objective to compare poverty rates before andduring the crisis.

[10] EU-SILC for Greece collects data on the characteristics of over 6,000 households and 13,000 individuals.

Table 1. Dependent and explanatory variables

Variables used for 2005	Variables used for 2011
Equivalised disposable income (Dependent Variables)	
Before housing costs	Before housing costs
After housing costs	After housing costs
Demographic characteristics	
Household size: (HX040)	Household size: (HX040)
Age: (RX020)	Age: (RX020)
Sex: (RB090)	Sex: (RB090)
Citizenship: (PB220A)	Citizenship: (PB220A)
Socio- economic characteristics	
Basic Economic Activities: (RB210)	Basic Economic Activities: (RB210)
Highest ISCED attained: (PE040)	Highest ISCED attained: (PE040)
Tenure: (HH020)	Tenure: (HH021)
NACE (REV 1.1): (PL110)	Marital Status: (PB190)
Housing characteristics	
Bathroom/toilet: (HH080)	Bath or shower in dwelling: (HH081)
Indoor flushing toilet : (HH090)	Indoor flushing toilet (HH091)

5. EMPIRICAL RESULTS

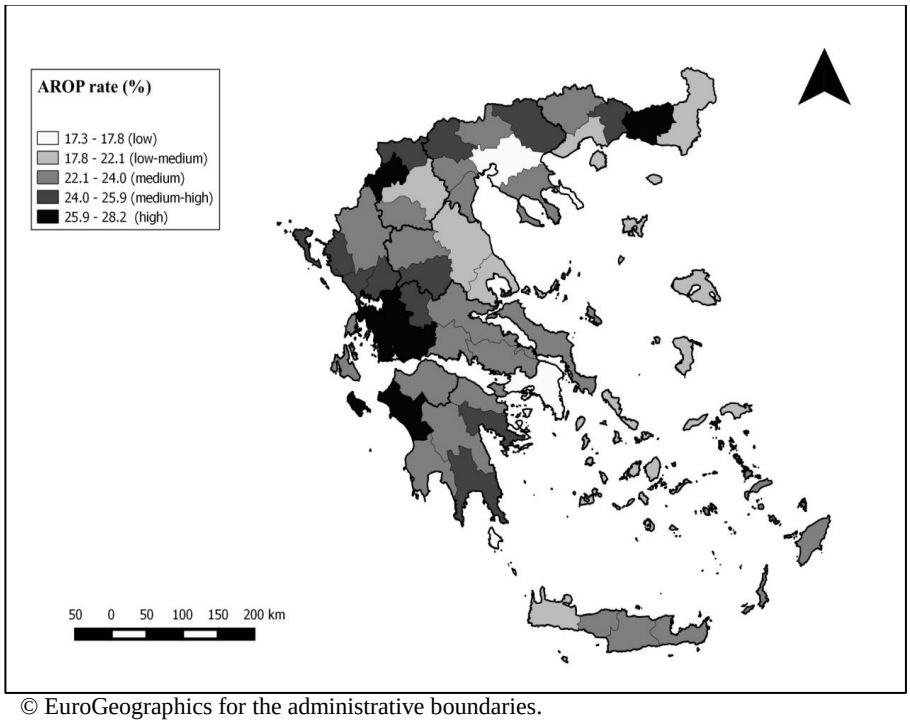
The estimated AROP rates[11] at the NUTS III level for 2005 (Model 1) range between 17.3% in Attiki and 28.2% in Zakynthos (an island in Ionia Nisia). With a coefficient of variation of a mere 0.09 and only 13 out of the 51 regions falling more than one standard deviation below or above the national average, the distribution of the regional values gives a picture of relative evenness regarding regional performances.

On the other hand, the related spatial pattern (Map 1) reveals at least one cluster of regions with similar high and medium-high AROP rates in western Greece, consisting of eight both continental and island NUTS III regions, shared by four different NUTS II regions. A second smaller cluster appears at the north-western borders of the country, while the northern border can be described altogether as an area of medium to high AROP rates, at least with the exception of the eastern end (bordering on Turkey). Medium to medium high values emerge also in the NUTS III regions of Peloponnese in the South. Two other clusters of medium rates appear in the central and in the northern part of continental Greece, while a cluster of low-medium rates is located in the eastern part of the mainland, shared between the NUTS II regions Thessalia and D.

[11] All calculations of this section refer to the estimated AROP rates *after housing cost*. The differences in regional AROP rates before and after housing cost range between 2.4 and 6.2% and they show a moderate level of variation across Greece (coefficient of variation: 0.30).

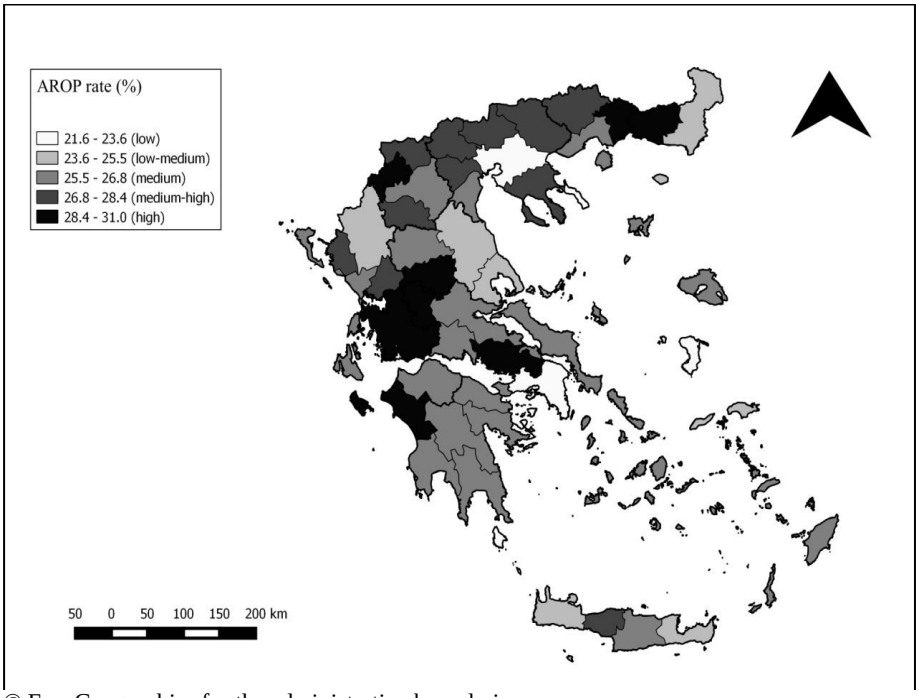
Makedonia. All island regions in the Aegean are characterized by either low-medium or medium values. Last but not least, the two metropolitan NUTS III regions of Attiki and Thessaloniki are on the top of the list, presenting the lowest values. Interestingly enough, they are both surrounded by regions with either medium or medium-high rates.

Map 1. Estimated 2005 AROP rates at NUTS III level, 2001 census data and 2005 SILC data



A comparison of the above picture with the regional AROP rates in 2011 (Model 2) shows that the risk of poverty decreased in 48 out of 51 NUTS III regions. In 26 regions the level of decrease exceeds 10% of the 2005 AROP rate. On the other hand, the evenness of the spatial distribution of the values is confirmed, with an even lower coefficient of variation (of 0.06). There is now only one NUTS III region that can be classified as of high AROP rate (the Region of Xanthi in A. Makedonia-Traki). In most parts of the country the NUTS III regions are clustered together in the way they did in Model 1, with minor differences that mainly have to do with relative improvement or relative decline in specific parts of the previous clusters. Not surprisingly, *no significant differences* are noted in the ranking of the NUTS III regions. The Region of Attiki shows again the lowest rate, while the Region of Thessaloniki falls in the low-medium category, but both metropolitan regions are among the three NUTS III regions that present a slight increase in their AROP rates.

Map 2. Estimated 2011 AROP rates at NUTS III level, anchored at the 2005 median income, 2011 census data and 2011 SILC data

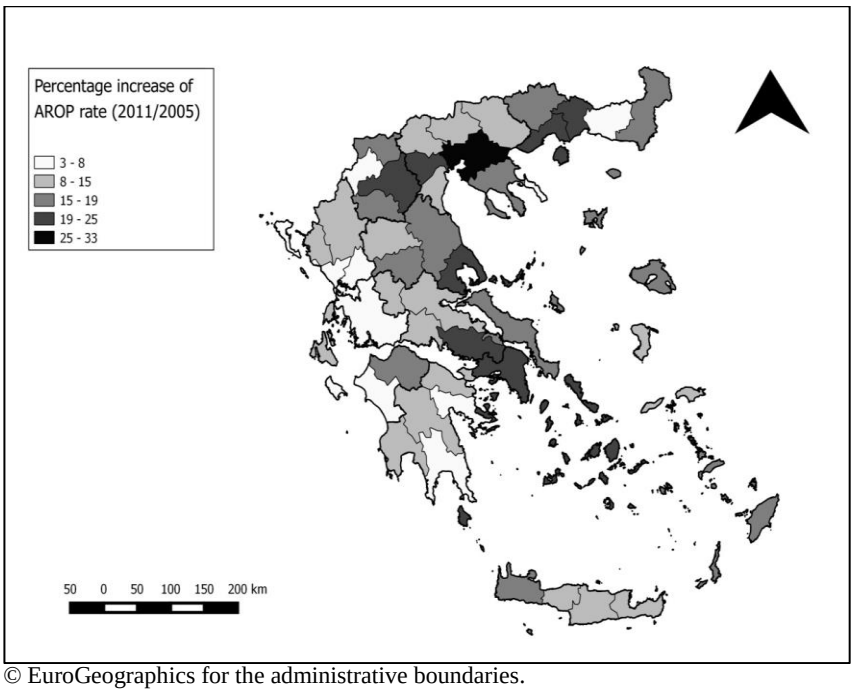


The picture is quite different if one takes a look at the regional AROP rates of 2011 anchored at the median income of 2005 (adjusted for inflation), as an increase of the rate in comparison to the 2005 values is then recorded in every single NUTS III region. The level of increase exceeds 10% in 41 cases and even 20% in 9 cases, while the AROP rates range between 21.5 and 31%. However, despite sharp increases, the spatial pattern of the AROP rates remains again quite stable, exhibiting almost the same clusters of similar performance (Map 2), especially those in the central-western part of the country and at the north border. The two metropolitan regions are again at the top two positions of the hierarchy. Additionally, the coefficient of variation of the regional AROP rates (0.06) is again lower than in Model 1.

On the other hand, the similarity of the spatial distributions in the two models should not mask the varying trends in different NUTS III regions. In fact, the two metropolitan regions show a dramatic increase of their AROP rates (by 25% in Attiki and 33% in Thessaloniki), ranked in the top two positions in the list of AROP rate change. From a broader perspective, the spatial distribution of increase rates seems to produce an inversion of the previous pictures (Map 3). This is an indication that, between the two points in time, the AROP rates increased more in those NUTS III regions that had lower initial values. Indeed, the 2005 AROP rates and the 2005-2011 increase rates have a negative correla-

tion coefficient (Pearson correlation) of -0.77 (significant at the 0.01 level). Accordingly, there is evidence that after the outbreak of the economic crisis the Greek NUTS III regions tended to become even more uniform in terms of the risk of poverty faced by their inhabitants, but this equality is 'achieved' at a higher aggregate level of risk.

Map 3. Percentage change of AROP rates at NUTS III level, 2005-2011



The next question is whether this trend is connected with changes in regional GDP occurring in a period of recession in Greece. Both in 2005 and 2011 a weak negative correlation between the AROP rates and GDP per capita is observed at the NUTS III level, as indicated by Pearson correlation coefficients of -0.29 and -0.28 respectively (both significant at the 0.05 level). This is a limited indication that the AROP rate is lower in regions with higher GDP per capita before as well as during the economic crisis. Nonetheless, there is an equivalent positive correlation between the increase of the AROP rates and the GDP per capita in 2011 (correlation coefficient: 0.31; sig. level: 0.05). This means that the NUTS III regions that experienced higher increase in AROP rates were those that ended up with higher GDP in 2011. From this point of view, it seems that maintaining higher regional GDP in a period of recession is not a safeguard for regions against increasing poverty. This might happen because the maintenance of comparatively higher GDP is accompanied by intra-regional redistribution in the benefit of the non-poor of the region. The extent to which this or other alternative explanations (based for example on regional sectoral structures) are valid is a matter of future research.

6. SUMMARY, CONCLUSIOS AND FUTURE RESARCH

Poverty is a spatially heterogeneous phenomenon in the sense that poverty rates can vary widely across space. Regional differentiations of poverty risk should be taken into serious consideration in policy making and policy implementation, since poverty might have strong local characteristics. Sometimes, targeted policies might be more effective than general interventions. As a result, there is a strong need for sound spatial poverty statistics mainly for policy decision and policy making. In this context, poverty maps might be a useful tool since they can uncover possible geographical patterns neglected by national level analysis. As Crow et al. (2009) suggest, visualization matters in the study of inequality and poverty, since maps might present powerful stories about progress, social change and development.

In this paper a portrait of the Greek NUTS III regions regarding their levels of relative poverty was presented, using a Small Area Estimation technique in order to disaggregate data on poverty that are available at higher geographic levels. In a country with comparatively high national AROP rate (seen from a European perspective), sub-national regional disparities seem to be quite moderate. The significant increase in the national anchored AROP rate in a period of severe recession is reflected in every single NUTS III region. However, this occurs at varying paces, in a way that further reduces regional disparities, obviously at a level inferior to that before the economic crisis. Moreover, it is especially in the vast and relatively prosperous metropolitan regions where the highest increase in AROP rates takes place. The findings of the study are consistent with other previous studies showing increased poverty rates during the recent years (at the national level) (e.g. Matsaganis and Leventi, 2014) as well as showing that the impact of economic crisis is more obvious in metropolitan areas rather than in the periphery (e.g. Peloponnese and Epirus) (e.g. Psycharis et al., 2011; Dagoumas and Kitsios, 2014; Psycharis et al., 2014). This is of great importance in a country characterized by high population concentration.

The presented analysis provides a starting point and further research should be conducted using additional explanatory variables from other data sources, focusing at smaller spatial levels, including alternative poverty indicators, as well as examining a wide variety of related issues (e.g. drivers of regional poverty) that can shed light on regional poverty.

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UNE ANALYSE DE LA PAUVRETÉ RÉGIONALE EN GRÈCE

Résumé *- L'objectif de cet article est de dresser une carte de la pauvreté au niveau des régions NUTS III en Grèce et d'évaluer les effets de la crise actuelle. Le travail s'appuie sur une technique (Small Area Estimation) permettant d'estimer les taux de pauvreté à différents niveaux géographiques.*

Mots-clés - PAUVRETÉ, ANALYSE SPATIALE, REVENU, RÉGION, GRÈCE