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The geographical dimension of income and consumption inequality: Evidence from the Attica Metropolitan Region of Greece

Yannis Psycharis[1], Thomas Georgiadis[1], Panagiotis Nikolopoulos[1]

[1] Panteion University, Athens, Greece

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Abstract. This paper aims at examining interpersonal income and consumption inequality within the Attica Metropolitan Region, which includes Athens, the largest metropolis of Greece. It also aims to make comparisons between Attica and the rest of the country. The analysis is based on income and consumption microdata from Greek Household Budget Surveys (HBS) over the period 2008-2019, encapsulating the period from the commencement of the economic crisis until the year before the outset of the COVID-19 pandemic. Results indicate that income inequalities are systematically higher than consumption inequalities. From a spatial comparative perspective, the results show that the Attica Metropolitan Region exhibits a higher degree of income and consumption inequality relative to the rest of the country. Furthermore, the economic crisis increased income inequality in Athens and in the rest of the country, while consumption expenditure inequality increased in the Athens metropolitan area only. Finally, the distance between socio-economic groups, which stands as a measure of the degree of social polarization, increased during the economic crisis. However, this does not hold true for consumption inequality. Overall, the analysis demonstrates the sensitivity of inequality outcomes to the selection of the welfare indicator (income or consumption), as well as a number of noticeable differences in inequality outcomes between the Metropolitan region of Attica and the rest of the country. The paper unveils facets of inequality which necessitate the implementation of more people and place-targeted policies aimed at more inclusive and balanced welfare conditions in metropolitan regions and across the country.

JEL classification: P25, R58, D31, D63, O15

Key words: income inequality, consumption inequality, intra-regional inequality, urban inequality, Athens, Metropolitan Region of Attica.

1 Introduction

The discussion over the interaction between urbanization and inequality has gradually attracted a growing surge of interest which culminated at the beginning of this century (OECD 2016, 2018a, United Nations 2020). Increasing population density in large metropolitan areas across the globe has triggered a voluminous body of scientific research on the centrifugal/agglomeration factors in relation to the centripetal/dispersion

factors in action as drivers of this process. Poor living conditions and inequality constitute one significant counterbalancing centripetal factor towards agglomeration. The economic crisis exacerbated this trend. Large metropolitan areas (i.e. those with more than five million inhabitants in 1990) experienced the most rapid population growth, outpacing those with less than one million inhabitants (OECD, European Commission 2020). Such developments imply that, in the future, trends in inequality at the national level may depend even more on trends of inequality in densely populated areas for every single country across the globe (United Nations 2020).

The importance of the concentration of population in large urban conurbations and metropolitan areas is widely acknowledged and acclaimed as one of the primary determining factors shaping overall income and wealth inequality. However, there seems to be a degree of relative ambiguity regarding the interlinkages and the direction of causality between concentration and inequality. Following the arguments of the neoclassical approach, free mobility and market size in most agglomerated/urbanized areas of a country could offer a larger spectrum of opportunities to individuals, thus providing a better fit between human capabilities and wage maximization. In effect, this could contribute to higher social mobility and declining inequality. However, other strands in the literature, such as the Keynesian and Rawlsian proponents, claim that the urban arena provides unequal opportunities among individuals and unequal access to opportunities, and thus that the dynamics of inequalities supersede the benefits of better fits in job market. The benefits of agglomeration economies are not shared equally among individuals and across localities, and thus feed social groups and geographical areas disproportionally. Following this trajectory, growing concentration might increase inequality between the most well equipped and competitive individuals compared to those who are less so, as well as those living on the social and geographic margins (Hamnett 1994). Thus, the faster the pace of agglomeration, the higher the degree of interpersonal and intraregional inequality.

The empirical investigation of the relationship between agglomeration and income inequality has been studied extensively in the literature. Using different data, measures, estimation techniques, and levels of geographical aggregation, the majority of empirical studies argue that inequality increases with concentration. A comparative investigation of the level of inequality among 216 OECD metropolitan areas found that larger metropolitan areas demonstrate, on average, higher income inequality (Boulant et al. 2016). Similarly, a study of socioeconomic segregation in 12 European cities concludes that socioeconomic segregation after the turn of the new century has increased (Musterd et al. 2017). Finally, income inequality in US cities has increased, denoting that skills appear to be the stronger driving force in explaining the variation of inequality across American metropolitan areas (Glaeser et al. 2009).

The aim of this paper is to examine income and consumption inequality trends in the Attica Metropolitan Region, which includes Athens, the largest urban concentration in Greece and to make comparisons between Attica and the Rest of the Country (RoC)[1]. This research has some distinctive attributes which could contribute to an enrichment of the scientific literature.

First, this research provides evidence from the Metropolitan Region of Attica which includes Athens, the largest metropolitan area in Greece. Furthermore, inequality trends in Attica are compared with the trend of inequality at the national level as well as that of the rest of the country. This comparative investigation provides a benchmark analysis that makes it possible to introduce the geographical scale of analysis as an essential part of our understanding of inequality at different geographical subsets than the entire country. The geographical scale of the analysis contributes to the analysis of spatiality

[1] According to the 'Kallikratis reform' (Law 3852/2010) the Metropolitan Region of Attica and the Metropolitan Unit of Thessaloniki are established as parts of the administrative structure of the country (Council of Europe 2018). The appointed Metropolitan Region of Attica corresponds to both NUTS-1 and NUTS-2 level classification. However, according to Eurostat, Metropolitan regions are NUTS-3 regions, or a group of NUTS-3 regions, which represent all agglomerations of at least 250,000 inhabitants (Eurostat 2023). Regarding Attica, there are six identified adjacent NUTS-3 Metropolitan Regions, excluding West Attica, while Thessaloniki metropolitan area consists of a single NUTS-3 Region. The population size of Attica Metropolitan Region amounts to 3,792 thousand inhabitants and accounts for the 37% of the population of the country (Census data 2021). Due to the structure of the dataset the article adopts the 'Kallikratis reform' definition of the Attica metropolitan area.

in income inequality.

Second, the estimation of inequality is based on income and consumption expenditure. Inequalities in income do not necessarily coincide with inequalities in consumption, nor do income or consumption inequalities express similar behavior in different geographical subsets. The comparative investigation of income and consumption inequality in different geographical contexts constitutes another novelty of this research attempt.

Third, total inequality has been broken down into two components, the share of total inequality that is attributed to between groups inequality, and the share of inequality that is attributed to within groups inequality. This makes it possible to trace the trends in social polarization in the metropolitan region of Attica *vis-à-vis* the RoC over the study period. This research aims at making a contribution to the literature that concerns the trends of social polarization in cities.

Fourth, the study period is quite interesting since it begins in the first year after the commencement of the economic crisis and terminates the year before the eruption of the COVID-19 pandemic. Greece was under a spotlight for almost the entire study period. Greece was a country that found itself in the 'eye of the hurricane' during the Great Recession. Strict fiscal consolidation measures were applied within the framework of three consecutive Memoranda (2010, 2012, and 2015), which were signed by the Greek governments and the European Commission on behalf of the Eurogroup, the European Central Bank (ECB) and the International Monetary Fund (IMF). Skyrocketing unemployment, salary cuts and tax increases, as well as the capital controls that were imposed, made the case of Greece and the study of the Attica region a 'laboratory' for the study of policy impacts on living conditions, segregation and inequality. These issues could be of interest to a broader audience that extends beyond the specific case study.

This research also has some caveats. The selection of Attica as a separate geographical unit of analysis on the one hand, and the rest of the country on the other, is very restrictive. However, this choice was driven by statistical data availability, as the geographical information that it is available in the Household Budget Survey datasets up to 2015 refers only to the NUTS-1 level. Attica constitutes the only Greek region where the geographical level NUTS-1 coincides with the NUTS-2. Isolating Attica as a study subject makes it possible to examine the spatiality of inequality in a large metropolitan region, given the relative weight that the region of Attica has in the sorting of people and economic activities in the country. Pursuing research on inequality in more disaggregated geographical levels such as municipalities, cities and regions, could be an extension of this work.

Research estimating income inequality and its trends in Greece is overwhelmed with studies at the national level. The investigation of the effect of the economic downturn and the fiscal consolidation on the level and the structure of inequality in Greece has attracted the attention of many researchers over the past decade (inter alia Andriopoulou et al. 2018, Giannitsis, Zografakis 2015, Kaplanoglou, Rapanos 2018, Leventi, Matsaganis 2016, Mitrakos 2014). However, evidence available at the regional level still remains quite limited (Pantazis, Psycharis 2016, Panori, Psycharis 2019, Psycharis, Pantazis 2016), and the same can be claimed for the metropolitan area-focused research on Athens (see Arapoglou et al. 2021, Maloutas, Spyrellis 2019). Within this framework, the present empirical analysis seeks to add value by testing to what extent many of the stylized facts regarding the aspects of inequality in Greece at the national level still hold when the analysis distinguishes the metropolitan region of Attica from the RoC.

The research questions that are posed in this paper can be summarized as follows:

- Does the hypothesis for higher income inequality in Metropolitan regions hold true in the empirical analysis for the Metropolitan Region of Attica vis-à-vis the rest of the country?
- How robust is the emerging picture of inequality when using alternative welfare indicators such as household income vis-à-vis household consumption expenditure inequality?
- What was the effect of the economic crisis on the level and the structure of inequality in the metropolitan region of Attica and how different is the

corresponding picture for the RoC?

The paper is organized as follows. After Section 1, the introduction, Section 2 provides a review of the literature that concerns the spatiality of inequality with a focus on income and consumption inequalities in large metropolitan regions. Section 3 provides clarification regarding the dataset and data sources that are used along with the methods of statistical analysis. Section 4 presents the results which are accompanied with interpretations. Finally, the last section of the paper (Section 5) provides a synopsis of the findings along with a reflection on policy challenges and recommendations.

2 Income inequality and cities – Theoretical Background and Literature Review

Cities and metropolitan areas represent the level of geographical aggregation that the spatiality of inequality has studied the most. This trend is arguably attributable, at least in part, to the urbanization trends that have been witnessed in the global population over the last decades. Urbanization reached a milestone at the turn of the century when it was determined that the majority of the global population lives in cities.

It was also at the turn of the century, with the high and growing urban concentration across the globe, when increasing inequalities in income, wealth, and living conditions regained momentum. Given the prominent role of cities and metropolitan regions in the metropolitan century, the urban context became the prominent terrain for delving into inequality research (OECD 2015a, van Ham et al. 2021).

The revival of interest in income inequality appeared at the turn of the century. In most of the relevant literature, inequality was predominantly examined within the boundaries of the national state. Spatial aspects of inequality had been rare and seen as beyond the disciplines of regional economic analysis. Geographers, and sociologists examined aspects of social construction in urban as well as in rural areas in most cases (Coates et al. 1977, Johnston 1976). However, during the process of urbanization and the evolution of inequalities in urban contexts, scientific research was gradually evolving along with demands for policy action.

A number of studies focus on the role of the diversity of labor skill levels, which is quite evident in metropolitan areas, in explaining the relationship between spatial concentration and income inequality (Glaeser et al. 2009, OECD 2016). Moreover, the socio-economic residential segregation of higher and lower income earners that is often observed in large metropolitan areas is also a factor related to higher income inequality (OECD 2018a). Another set of determining factors of income inequality – although on a broader spatial scale – includes the level of economic development, a country's trade openness, the level of fiscal and political decentralization, the level of linguistic and ethnic segregation (Ezcurra, Rodríguez-Pose 2017), as well as internal conflicts (Kanbur, Venables 2005).

The theoretical background on the association between area size and the level of inequality documents two different and contradictory general perspectives. Firstly, according to the less prominent one, the increasing size of an urban area is considered to create specific advantages that lead to more balanced interpersonal income distribution. According to Castells-Quintana et al. (2020), larger cities are associated with the provision of more opportunities, which could provide benefits for low-income workers. Murray (1969) and Richardson (1973) argue that as the size of an urban area increases, the transformations of certain characteristics of the labor market will decrease income inequality through raising average incomes. There are also claims that in larger urban areas, capital markets are expected to facilitate investment in human capital, which in turn, might reduce inequality (Burns 1976).

However, most of the relevant literature suggests a negative relationship between the size of an urban area and equality in the distribution of income (OECD 2018a). Increasing city size may trigger income inequality either through a change in the occupational and wage structure of the urban labor market; or through a widening of the distribution of labor skills (Nord 1980). Moreover, Haworth et al. (1978) refer to the growth of a city as a cause for monopoly rents to rise, a development that is likely to favor the citizens

asymmetrically, while Henderson (2010) expects the enlargement of the city to potentially affect the distribution of income through change in its industrial structure. Furthermore, according to Behrens, Robert-Nicoud (2014) and Milanovic (2005) the concentration of the more productive firms and sectors in larger cities due to agglomeration economies is a fundamental factor in the greater income inequalities observed therein.

The proposition that the size of the population of a city relates positively to the degree of income inequality is confirmed for a sample of various sized cities in Latin America and the Caribbean, in the period 2009-2010, where the Gini coefficient diminished according to their population size (UN-HABITAT 2014). This also holds true for China (Chen et al. 2018), whereas a positive relationship between the size of cities and wage inequality is established in the United States (Baum-Snow, Pavan 2013). Castells-Quintana (2018) found that increases in the average city size of a country are associated with higher inequality from a certain point onward. Finally, Castells-Quintana et al. (2020) claim that higher inequality is driven by rich and large cities, and furthermore, as large cities grow, it is the inequality among the relatively rich that increases.

Turning to the discussion on whether inequality increases during an economic crisis, the available evidence appears to be unequivocal. Economic crises have been associated with an increase of economic inequality (Bodea et al. 2021, Heathcote et al. 2010). Income inequality tends to increase in recessions, since the bottom of the earnings distribution falls off substantially relative to the median. Even though disparities generally widen during economic crises, it is pointed out that during the recessions at the end of the 2010s, there were EU Member States in which, contrary to what might have been expected, income inequality narrowed (De Beer 2012).

The hypothesis that inequality rises during economic crises, is well supported by the empirical findings of several studies that examined the evolution of the level of inequality since the onset of the economic crisis in Greece. In particular, existing evidence, either from studies that measure income inequality (Andriopoulou et al. 2018, Leventi, Matsaganis 2016, Mitrakos 2014), or from studies that examined consumption expenditure inequality (Kaplanoglou, Rapanos 2018, Kaplanoglou 2022), suggests that inequality increased in Greece during the first years of the economic crisis, while it declined from 2015 onward. The increase in income inequality over the period 2009-2014 is very closely correlated with the sharp increase in unemployment over the same period, and it can be attributable to the decline in the income share of the lowest two income deciles (i.e. poorest 20 percent) as well as of the top (richest) 10 percent (Andriopoulou et al. 2018, Leventi, Matsaganis 2016). On the contrary, examination of consumption expenditure shows that inequality is caused by a great loss in the consumption share of the middle class (the middle 60 percent of the distribution of the consumption expenditure) over the same period (Kaplanoglou, Rapanos 2018, Kaplanoglou 2022). As regards the findings on the structure of inequality in Greece, existing evidence suggests that over 85 percent of the overall inequality in Greece can be attributed primarily to within-group rather than to between-group disparities (Mitrakos 2014, Mitrakos, Tsakloglou 1998, Tsakloglou 1993). The economic crisis appears to have exerted some influence on the structure of inequality according to Andriopoulou et al. (2018), who provide evidence indicating that the proportion of the overall inequality that can be attributed to disparities between socio-economic groups rose during the economic crisis in Greece.

3 Data and Methods

The empirical analysis of the present paper uses microdata of the Household Budget Survey (HBS) for Greece over the period 2008 to 2019, compiled by the Hellenic Statistical Authority (EL.STAT.). From 2008 on, the HBS is carried out by EL.STAT. on an annual basis, providing very detailed information on household consumption expenditure, covering, in addition, a wide range of demographics (including *inter alia* age; gender; household size and composition), residential area (region, population density), as well as a number of socio-economic characteristics (for instance, household income, educational level and activity status, among others). The availability of information on both household consumption expenditure and household income (obtained both from

the same national representative survey – the HBS – offers a unique opportunity to robustly analyze inequality based on both household income and household consumption distribution.

Given the primary focus of the present analysis of the geographical dimension of inequality in the Metropolitan Region of Attica, a dummy variable has been created which is equal to one if the household resides in the Attica region. Otherwise, it is equal to zero. Of course, the RoC category is a rather heterogeneous group. The population of the area of Thessaloniki surpasses one million inhabitants, while the third largest Greek city (Patras) has a population of approximately 200,000 inhabitants. Moreover, the RoC economic activity is neither homogeneous nor static. For example, tourism contributes to a great extent to the GDP of the country, while it is affected by seasonality and it takes place mostly on the islands. Taking these considerations into account, it would be certainly useful to control for the metropolitan area of Thessaloniki, as well as for the islands, when applying the empirical analysis. Nevertheless, this option could not be applied in our analysis, as the geographical information that it is available in the HBS datasets up to 2015 refers to the NUTS-1 level, which includes the following categories: i) Northern Greece; ii) Central Greece; iii) Attica; iv) Crete and the Aegean Islands. Given this limitation, it was not feasible to distinguish the area of Thessaloniki from the broader 'Northern Greece' category – as well as the islands from the broader 'Crete and Aegean Islands'. For these pragmatic reasons, and since the main focus of the present analysis has been to benchmark the outcomes of Attica *vis-à-vis* the rest of the country, we have not created a proxy dummy for Thessaloniki, as it would include not only Thessaloniki, but also other smaller cities with significantly different economic characteristics.

With regard to sample size, the HBS sample for 2008 contains information for 3,460 households, 1,219 of which (i.e. 35.2 percent) are located in the Attica region. In 2014 and 2019 the sample size appears to be even larger (containing 5,888 and 6,180 households respectively; again, almost one-third of them are in the Attica region). Table 1 presents the sample size and a brief picture of characteristics of the HBS sample that has been used for the analysis of inequality for the years 2008, 2014 and 2019.

When dealing with welfare indicators at the household level, it has to be taken into account that household size and demographic composition vary across households. A widely used approach that deals with both size and composition effects is the use of equivalence scales. The equivalence scale used in this application is based on the OECD modified equivalence scale, which assigns a weight of 1.0 for the head of the household, 0.5 for other adults and children over thirteen years of age and 0.3 for other children. Having controlled for differences in household size and composition, the two main welfare indicators for the measurement of inequality have been derived. These are: (i) the equivalent per capita consumption expenditure (defined as the total equivalent household consumption expenditure – including the value of the goods and services that the household bought or received in kind from their own production, excluding the expenditure for rents) and (ii) the equivalent per capita income (defined as the total household equivalent income -including income in kind, but excluding imputed rents). For the measurement of inequality, the present analysis utilizes two inequality indices, namely: (i) the Gini coefficient and (ii) the Theil's T index. These two indices satisfy the standard criteria of mean independence, population size independence, symmetry and the Pigou-Dalton Transfer sensitivity.

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

Theil's T index is part of the family of Generalized Entropy measures (when $a = 1$) and can be estimated as follows:

$$\text{GE}(1) = \frac{1}{n} \sum_{i=1}^{n} \frac{y_i}{\bar{y}} \ln \frac{y_i}{\bar{y}}$$

Theil's T index satisfies further the decomposability axiom, which in turn allows for assessing the contribution to overall inequality of inequality within and between differ-

Table 1: Sample size and sample characteristics of HBS data

Greece: Sample characteristics of HBS data	2008 Attica	2008 RoC	2014 Attica	2014 RoC	2019 Attica	2019 RoC
Sample size						
Number of households	1,219	2,241	1,979	3,909	2,054	4,126
(% of the total sample)	35.2	64.8	33.6	66.4	33.2	66.8
Socio-demographic characteristics						
Household size (# persons)	2.68	2.65	2.51	2.62	2.47	2.54
Household's main source of income (% distribution of all households)						
Wages or salary	50.2	36.5	46.9	29.9	45.2	34.7
Income from self-employment	12.3	20.7	6.5	16.8	9.0	15.6
Property income	1.7	2.2	1.1	1.3	1.5	1.1
Pensions	30.7	35.4	37.7	45.6	38.3	42.1
Social benefits	5.2	5.3	7.9	6.4	6.0	6.6
All households	100.0	100.0	100.0	100.0	100.0	100.0
Activity status of household's head (% distribution of all households)						
Manual worker	21.5	17.6	19.1	12.1	17.8	16.7
Non-manual worker	24.0	14.4	21.6	11.0	23.1	13.9
Self-employed and farmer (or agricultural worker)	14.2	23.1	9.0	19.9	11.7	18.2
Unemployed	1.4	2.0	7.1	4.8	4.9	4.0
Retired	27.3	32.8	32.2	41.3	33.1	37.0
Other inactive	11.7	10.2	11.1	10.9	9.3	10.2
All households	100.0	100.0	100.0	100.0	100.0	100.0

Source: authors' estimates, HBS data

ent sub-groups of the population. Decomposing total inequality by population groups (Bourguignon 1979, Cowell 1980, Litchfield 1999, Shorrocks 1980, 1982, 1984), Theil's T index can be expressed as the sum of the within-group component of inequality and the between-group component of inequality, defined as follows:

$$T = \sum_j \left(\frac{Y_j}{Y}\right) T_j + \sum_j \left(\frac{Y_j}{Y}\right) \ln\left(\frac{Y_j/Y}{N_j/N}\right) \tag{1}$$

where the first term of equation (1) stands for the within-group inequality, while the second term for the between-group inequality (Ferreira et al. 2008, Heshmati 2004, Jenkins 1995). The inequality decomposition technique provides a fruitful way to approach the structure of inequality. To this end, a decomposition technique, as described above, is employed by the present empirical analysis in order to assess the relative importance of the between-group and the within-group component of overall inequality.

4 Results

The starting point of the recession in Greece can be traced back to 2008 when GDP growth turned negative (0.4 percent) for the first time in many years. The recession became worse in the years that followed, especially in 2010, 2011 and 2012 when GDP declined by 5.5, 10.1, and 7.1 percent respectively (OECD 2018b)[2]. Since 2016, there has been a reversal in the macroeconomic environment, showing signs of recovery, which became more noticeable with the positive growth rates of the economy in 2017, 2018 and 2019. In order to match inequality outcomes with the overall macroeconomic environment

[2]According to OECD (2015b), income inequality constitutes an aggravating factor for the GDP growth. Since income inequality is claimed to increase during recessions, this can be perceived as a self-reinforcing downward spiral process.

Table 2: Sample size and sample characteristics of HBS data

HBS, Greece	*Median value (in €)* 2008	2015	2019	*% change* 2008-15	2015-19	2008-19
			Income			
Attica	14000	9360	10800	-33.1	15.4	-22.9
Rest of Country	11333	7800	8488	-31.2	8.8	-25.1
			Expenditure			
Attica	16158	11451	12820	-29.1	12.0	-20.7
Rest of Country	13589	10333	10096	-24.0	-2.3	-25.7

Source: authors' estimates, HBS data

in the analysis that follows we have applied a periodization of the whole period of 2008-2019 that distinguishes between: a) the recession period (defined as the period from 2008-2015) and the recovery period (defined as the period from 2016-2019).

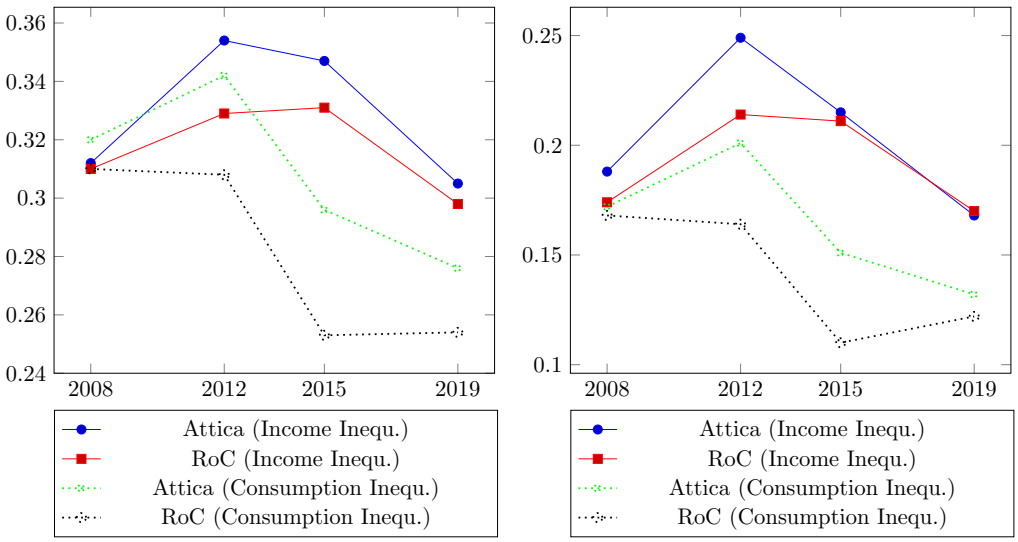
The severity and the depth of the economic crisis in Greece as reflected by several macroeconomic indicators can also be seen in the trends in welfare indicators at the household level (Panori, Psycharis 2018). Trends in household income reveal that the recession (2008-2015) led to a decline in incomes of one third in both Attica and the RoC (Table 2). However, during the recovery period (2016-2019), Attica benefited twice as much compared to the RoC. As a result, Attica's income decreased by 22.9 percent over the period 2008-2019, slightly less than that of the RoC (25.1 percent).

An analogous picture appears when examining changes in household expenditure: over the period 2008-2015, Attica experienced a relatively higher decrease in household expenditure (29.1 percent) compared to the RoC (24 percent). Nevertheless, Attica regained 12 percent over the period 2015-2019, whereas the RoC experienced a further decrease of 2.3 percent. It is also worth mentioning that throughout the recession (2008-2015), the decrease in household expenditure was somewhat lower compared to the corresponding change in household income -possibly due to a dissaving behavior of the households. Overall, in the period 2008-2019 the RoC experienced a 25.7 percent decrease in both household income and expenditure, whereas the corresponding decrease in Attica was lower (20.7 percent) for both welfare indicators.

Commenting on the regional differences, before the crisis Attica was in a significantly better position in terms of the level of household income and expenditure compared to the RoC. During the 2008-2015 recession, income and expenditure decreased slightly more in Attica (compared to the RoC), but over the recovery (2016-2019) increased significantly more in Attica, as compared to the RoC. These trends resulted in higher regional disparities (between Attica and the RoC) in 2019, relative to the 2008 level, as regards the level of household income and expenditure.

The research hypothesis stating that the level of inequality is higher in metropolitan areas compared to the national average appears to be supported by the empirical evidence of the present research for Greece. According to the estimated inequality indices (Gini and Theil's T indices) presented in Figure 1, Attica seems to constantly display a higher level of inequality compared to the RoC. In fact, the emerging spatial differences between Attica and the RoC regarding the incidence of inequality appear to be even more pronounced in the case of consumption inequality, as compared to the corresponding spatial differences in the incidence of income inequality.

Turning to the effect of the crisis on inequality, the emerging picture portrays an increase in the level of inequality during the first years of the economic downturn (from 2008 to 2012), followed by a decrease that was more noticeable from 2015 onwards (i.e. during the recovery period). This "inverted-U" pattern as regards the trends in the level of income inequality over the period 2008-2019 is clearly discernible for both Attica and the RoC, irrespective of the choice of the inequality index. Attica's Gini index of income inequality increased from 0.31 in 2008 to 0.35 in 2012 remaining at this level until 2015, before it falls again in 2019 to its pre-crisis level. An analogous pattern indicating a rise



(a) Gini Index, Greece (b) Theil's T Index, Greece

Source: Authors' estimates based on HBS data

Figure 1: Inequality measures based on per capita income and consumption, Greece

Table 3: NUTS-1 level estimates on inequality measures based on per capita income and consumption, Greece

	Gini Index				Theils' T index			
Greece	2008	2012	2015	2019	2008	2012	2015	2019
			Income Inequality					
Attica	0.312	0.354	0.347	0.305	0.188	0.249	0.215	0.168
RoC	0.310	0.329	0.331	0.298	0.174	0.214	0.211	0.170
Northern Greece	0.317	0.314	0.318	0.291	0.183	0.172	0.180	0.153
Central Greece	0.292	0.328	0.328	0.290	0.149	0.223	0.186	0.155
Aegean Islands & Crete	0.316	0.373	0.362	0.321	0.189	0.334	0.318	0.228
			Consumption Inequality					
Attica	0.320	0.342	0.296	0.276	0.172	0.201	0.151	0.132
RoC	0.310	0.308	0.253	0.254	0.168	0.164	0.110	0.122
Northern Greece	0.318	0.315	0.248	0.260	0.176	0.168	0.104	0.134
Central Greece	0.288	0.284	0.253	0.239	0.143	0.138	0.109	0.100
Aegean Islands & Crete	0.324	0.324	0.265	0.255	0.183	0.189	0.125	0.122

Source: Authors' estimates based on HBS data

of income inequality (although to a lesser extent compared to Attica) during the first years of the recession becomes evident in the case of the RoC – where the Gini index increased from 0.31 in 2008 to 0.33 in 2012 followed by a decrease from 0.33 in 2015 to 0.30 in 2019.

The "inverted-U" pattern in the evolution of the level of inequality throughout the period 2008-2019 also becomes evident when estimating inequality indices based on the distribution of consumption expenditure - albeit in this case only for Attica, but not for the RoC. Interestingly enough, the well-documented evidence implying an adverse effect of the economic crisis on the level of inequality by a number of studies focusing either on income inequality or on consumption inequality at the national level does not appear to be the case for the RoC when consumption inequality is examined. In other words, while the economic crisis appears to have increased income inequality both in Attica and the RoC, a rather differentiated geographical pattern as regards the impact of the crisis on the level of inequality is depicted when measuring household expenditure inequality. On the one hand, inequality increased in Attica household expenditure over the 2008-2012 period, while in the RoC it remained rather stable (and it decreased at a rather remarkable rate of change since 2012). Table 3 benchmarks Attica's outcomes to those of the RoC portraying the trends in the inequality indices at NUTS-1 level as well.

Table 4: Decomposition of inequality based on Theil's T index by household socio-economic status: households with household head in active labor market status

Greece	2008		2012		2015		2019	
Theil's T	Attica	RoC	Attica	RoC	Attica	RoC	Attica	RoC
			Income					
Total	0.204	0.176	0.228	0.225	0.251	0.221	0.204	0.221
Within-group	0.176	0.156	0.177	0.199	0.192	0.199	0.156	0.182
Between-group	0.028	0.019	0.051	0.024	0.059	0.022	0.047	0.038
% of the between-group	13.8%	11.0%	22.3%	10.7%	23.4%	10.0%	23.2%	17.3%
			Expenditure					
Total	0.171	0.156	0.236	0.164	0.171	0.126	0.152	0.140
Within-group	0.137	0.137	0.196	0.146	0.141	0.115	0.126	0.123
Between-group	0.034	0.018	0.040	0.018	0.030	0.011	0.026	0.017
% of the between-group	19.9%	11.7%	16.9%	11.0%	17.8%	8.6%	16.9%	12.4%

Source: Authors' estimates based on HBS data

Having depicted the changes in the level of inequality during the economic crisis, we turn our attention next to an investigation of the changes in the structure of inequality in Attica and the RoC over the same period. Therefore, a decomposition technique is employed to provide estimates of the two components of total inequality: the one that can be explained by the between-group inequality (the between-group component), and the other that can be attributed to the within-group inequality (the within-group component). The sample of the analysis is restricted to households in which the head of the household is active in the labor market (i.e. employed or unemployed, but not inactive), classifying households into four groups: (i) manual worker; (ii) non-manual worker; (iii) self-employed and farmer (or agricultural worker); (iv) unemployed. The decomposition results presented in Table 4 appear to be quite suggestive. While the between-group income inequality accounted for 13.8 percent in Attica in 2008, the corresponding figure for 2012 reached 22.3 percent and remained at this level over the next years. These findings imply that in Attica, the economic crisis not only exerted an influence on increasing the level of income inequality, but it also resulted in structural changes in income inequality. This is in line with the findings of other studies relating to the national level (Andriopoulou et al. 2018). In the RoC, the relative importance of the differences between the defined socio-economic groups in overall inequality appears to be less pronounced compared to Attica; nevertheless, the between-group component of income inequality accounts for 17.3 percent of the overall income inequality in the RoC in 2019 (compared to 11 percent in 2008).

More striking, however, are the estimated coefficients of the decomposition analysis based on the distribution of household consumption expenditure. The emerging picture does not support the proposition that the between-group component of inequality increased during the crisis. On the contrary, both for Attica and for the RoC, the share of the between-group inequality did not exhibit remarkable fluctuations during the economic crisis. This finding suggests that structural changes in household expenditure inequality were much more limited, when compared to the structural changes in income inequality.

The present analysis did not intend, and indeed cannot, extract generalized conclusions for the nature of inequality over different urban spatial structures. Such an undertaking would be very interesting; however, it is beyond the scope of the present analysis (and in terms of data, it would require different resources than those available). Indeed, it was several of Greece's idiosyncrasies (i.e. the depth and the duration of the economic recession; the relatively high pre-crisis inequality and poverty rate outcomes) that justified the special focus of the analysis on Greece. To this end, the rationale of the present analysis is built on a methodology that aimed to capture the special idiosyncrasies of Greece over the past years, rather than to provide a case study that was representative of (and "applicable to") other European countries over the same time period.

5 Conclusions

Focusing on Greece, as a prominent example of a country that has experienced a severe (in terms of depth and duration) economic downturn over most of the decade of the 2010s, and selecting Attica Region as a case study of a metropolitan area, the present paper aimed at testing two research hypotheses. These are: (i) the hypothesis that inequality appears to be higher in metropolitan areas compared to less populated areas, and (ii) the hypothesis that inequality increases during economic crises.

Starting from the trends in the level of income and household expenditure, the empirical findings revealed that both Attica and the RoC have experienced significant declines in both the level of income and consumption expenditure over the period 2008-2015. However, during the recovery period (2016-2019) Attica seems to have benefited more than the RoC, which resulted in higher regional disparities in terms of the level of household income and consumption expenditure (between Attica and RoC) in 2019, compared to the level in 2008.

Attica's income and consumption expenditure stand at a higher level compared to the RoC; nevertheless, the same seems to be the case with regard to the level of inequality, confirming the research hypothesis that metropolitan areas exhibit higher inequality compared to the national average. This finding seems to be quite robust – irrespective of the choice of either the inequality index or the welfare indicator – and it appears to be even more pronounced in the case of the consumption expenditure distribution.

The distribution of income appears to display greater inequality – both in Attica and in the RoC – over the period of the economic downturn, thus confirming the research hypothesis that economic crises are associated with greater inequalities in income distribution. Indeed, the level of income inequality seems to follow an "inverted-U" over the period 2008-2019 documenting an increase over the period 2008-2015 followed by a decrease over the period 2015-2019. However, in the case of the distribution of consumption expenditure, the emerging picture appears to be quite mixed: on the one hand, the "inverted-U" pattern regarding the evolution of the inequality over the period 2008-2019 seems to be confirmed in the case of Attica, but the RoC displayed greater resilience, as consumption expenditure inequality did not increase throughout the economic downturn.

Finally, the crisis appeared to exert an influence on the structure of income inequality – particularly in the case of Attica. This change is mostly reflected in the sharp increase in the relative contribution of the between-group component to the overall income inequality in Attica since the onset of the crisis. When consumption expenditure inequality is examined, the emerging picture of the structure of inequality appears to be quite stable for both Attica and the RoC. As in the case of the changes in the level of inequality, the distribution of household consumption expenditure reveals a more resilient pattern as regards the evolution of the structure of inequality, especially in the RoC. This is possibly a result of a number of parameters ranging from dissaving behavior to the role of self-consumption. Recall that Greece experienced capital controls for quite some time (starting in 2015). During the same period, Value-Added Tax (VAT) increased as well. As pointed out by an anonymous referee, these two factors taken together are likely to have affected the consumption habits of individuals while not necessarily affecting their income level. This might be an explanation behind the finding that for the RoC an "inverted-U" pattern is observed only for the case of income but not for the case of consumption expenditure.

Overall, the present paper aimed at contributing to a growing literature on the effects of the economic crisis on inequality, by seeking added value through two dimensions. First, from a methodological perspective, it tested the robustness of the impact of the economic crisis on inequality by measuring inequality both in terms of income and consumption expenditure. Second, it employed a rather geographical perspective, by focusing on the metropolitan area of Attica. Both these two dimensions have been useful in providing some noteworthy findings, contributing to the existing evidence on the interplay of the economic downturn with inequality in Greece.

In particular, the well documented evidence provided by a number of recent studies that the structure of inequality has changed over the past decade, is not supported by the

present paper when examining inequality based on the consumption expenditure distribution. In turn, this highlights that inequality outcomes during the economic downturn in Greece appear to be quite sensitive to the choice of the welfare indicator. In terms of policy making, this implies that policy recommendations which are based on income inequality might neglect aspects of inequality when the latter is examined in terms of consumption expenditure and vice versa.

The geographical emphasis of the analysis employed demonstrated that inter-regional disparities in the level of income or consumption expenditure have increased recently as the metropolitan area of Attica has gained more during the recovery period (2016-2019) relative to the RoC. At the same time, however, the present analysis provided evidence suggesting that the metropolitan area of Attica exhibited a higher level of inequality compared to the RoC during the economic downturn -and it still does. In turn, this highlights that intra-regional inequalities (especially in large metropolitan areas) have to be addressed as high policy priority issues, a need that became more urgent with the strong effects of the recent COVID-19 health crisis and imposed by the Sustainable Development Goals of the UN 2030 Agenda. In terms of policy recommendations, these findings imply that in addition to the objectives of tackling the existing inter-regional disparities, policy measures of a comprehensive cohesion policy strategy should also include an additional mixture of policy interventions aiming at addressing social polarization within regions, and intraregional inequalities. Additional means-tested (in cash but also in kind) benefits designed by, and provided at, the local administrative level might provide a fruitful supplement to the existing national-wide policy instrument in tackling intra-regional inequality.

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