New insights into inequality: measurement, determinants and other socioeconomic issues

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Resumen

El objetivo de esta tesis es la obtención de evidencia empírica que suponga un avance en el conocimiento de varios aspectos relacionados con la desigualdad en la distribución personal de la renta. El enfoque adoptado, esencialmente empírico, permite realizar una aproximación novedosa a cuestiones tales como la medición y los determinantes de la desigualdad de ingresos, de la riqueza y del consumo. Dicho enfoque también ofrece nuevas evidencias sobre la movilidad de ingresos, segregación espacial y las preferencias redistributivas de la población. Utilizando datos de diversas fuentes secundarias (macro y microdatos), con la aplicación de técnicas econométricas adaptadas en función del objeto de estudio, se obtienen resultados que constituyen una contribución relevante dentro de la literatura sobre la desigualdad. Entre los hallazgos más destacables están la significatividad de los efectos redistributivos de la política monetaria a nivel internacional, el incremento de la desigualdad de ingresos y riqueza en España durante las últimas dos décadas, la relevancia del efecto riqueza sobre las decisiones de consumo de los hogares españoles, el descenso de la movilidad de ingresos, el aumento de la segregación de rentas en las ciudades españolas y el importante papel de las percepciones subjetivas en la demanda de políticas redistributivas.

Resumo

O obxectivo desta tese é a obtención de evidencia empírica que supoña un avance no coñecemento de varios aspectos relacionados coa desigualdade na distribución persoal da renda. O enfoque adoptado, esencialmente empírico, permite realizar unha aproximación nova a cuestións tales como a medición e os determinantes da desigualdade de ingresos, da riqueza e do consumo. O devandito enfoque tamén ofrece novas evidencias sobre a mobilidade de ingresos, a segregación espacial e as preferencias redistributivas da poboación. Utilizando datos de diversas fontes secundarias (macro e microdatos), coa aplicación de técnicas econométricas adaptadas en función do obxecto de estudo, obtéñense resultados que constitúen unha contribución relevante dentro da literatura sobre a desigualdade. Entre os resultados máis destacables están a significatividade dos efectos redistributivos da política monetaria a nivel internacional, o incremento da desigualdade de ingresos e riqueza en España durante as últimas dúas décadas, a relevancia do efecto riqueza sobre as decisións de consumo dos fogares españois, o descenso da mobilidade de ingresos, o aumento da segregación de rendas nas cidades españolas e o importante papel das percepcións subxectivas na demanda de políticas redistributivas.

Abstract

The aim of this thesis is to obtain empirical evidence that provides new insights into various issues related to inequality in personal income distribution. The approach adopted, essentially empirical, allows a novel understanding to issues such as the measurement and determinants of income, wealth and consumption inequality. This approach also offers new evidence on income mobility, spatial segregation and the redistributive preferences of the population. Using data from various secondary sources (macro and microdata), and applying econometric techniques adapted to the object of study, we obtain results that represent a relevant contribution within the literature on inequality. Among the most noteworthy findings, we can point out the significance of the redistributive effects of monetary policy on the international level, the increase in income and wealth inequality in Spain over the last two decades, the relevance of the wealth effect on consumption decisions of Spanish households, the decrease in income mobility, the rise in income segregation in Spanish cities and the important role of subjective perceptions in the demand for redistributive policies.

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Introduction

The study of inequality has gained prominence in the economic debate in recent years. Comprehensive and far-reaching studies have highlighted the relevance of this issue in the past several years and in the coming decades. As a result, in 2013 the then president of the United States, Barack Obama, went so far as to describe it as "the defining challenge of our time" (Obama, 2013).

However, pioneering studies on this topic date back to the mid-twentieth century. Simon Kuznets (1955), through the hypothesis that bears his name, proposed that the relationship between income inequality and economic development takes the form of an inverted U. To come to this conclusion, Kuznets relied on the behavior of income inequality in the United States, the United Kingdom, and Germany during the first half of the twentieth century.

In an attempt to explain this relationship, the author argued that the overall reduction in inequality experienced by those countries in the period under analysis was closely linked to economic development and the transition from a pre-industrial to a fully industrialized economy. In an agrarian economy, inequalities are relatively weak, but as labor begins to relocate to a more productive industrial sector, inequalities between agricultural and industrial workers –and, similarly, between the rural and urban areas– become increasingly pronounced. At the end of this first phase of transition, inequalities peak and, from this point on, start to decline as a result of the shrinking of the primary sector and the growth productive industrial sector in which inequalities are once again weak.

During the second half of the century, the Kuznets curve was the main analytical tool for studying inequality and growth. However, numerous studies carried out during the last few decades brought Kuznets' hypothesis in question, in view of the increase in inequalities in most developed countries since the 1980s.

The trends since that decade can be summarized in three concurrent phenomena that produced a complete reshuffle of the way income is distributed globally (Lakner and Milanovic, 2016; Milanovic, 2016): the significant income growth of the global middle classes –concentrated in East and Southeast Asia, and some areas of sub-Saharan Africa–, the stagnation of household incomes around the 80^{th} and 90^{th} percentiles –which would correspond to the lower and middle classes of developed countries– and the dramatic income growth of the global ultra-rich –essentially located in Europe and North America.

At the same time and following a similar approach to Kuznets, Piketty (2014) was interested in analyzing how the income distribution by percentiles had changed year by year using fiscal data, and going back in time as far as possible. The results of Piketty's research can be synthesized very succinctly in five key ideas (Roine, 2017): (i) the share of total income in the top 10% dropped across countries until the early 1980s, and from then on, although there are major divergences, it increased steadily; (ii) the lion's share of this upturn is due to the increase in the total income captured by the top 1% and not by the 90^{th} to 99^{th} percentiles, which remained roughly stable; (iii) a large part of the decline in inequality that Kuznets portrayed in his studies was due primarily to particular

events such as the Great Depression and the World Wars; (iv) in the Anglo-Saxon countries, this growth is far more pronounced than in continental Europe, returning as a result to inequality levels similar to the Gilded Age; and (v) where there was the largest income increase for the most affluent groups, it is due to income from labour rather than capital.

In the case of Spain, the trends somehow follow the patterns described above for European countries, although with even more moderate increases in the pre-tax incomes of the more well-off (Blanchet *et al.*, 2019). Nonetheless, other synthetic indicators such as the Gini coefficient reveal a slightly more pronounced trend to increase inequality, similar to other developed countries (Solt, 2019).

Naturally, these trends collide head-on with the Kuznets hypothesis and call for new approaches on the many dimensions of this issue. The new availability of data obtained after the compilation work of various initiatives such as the World Inequality Database, the Luxembourg Income Study, the World Income Inequality Database or the Standardized World Income Inequality Database opens the door to further research that lead to substantial advancement in our knowledge of these phenomena, their causes, consequences and political implications.

Why inequality matters: intrinsic and instrumental value

The rise of the concern for mitigating inequality as a core economic policy objective compels us to first ask ourselves why this is such an important variable. And the response is not as immediate a priori as it is with other core objectives such as full employment, price stability or economic growth. Beckerman (2011) distinguishes two essential reasons: the intrinsic value of equality and its instrumental value.

In order to address the intrinsic value of equality we will resort to the theory of justice developed over decades by John Rawls (1971, 1985, 1993, and 2001). In his groundbreaking book *A Theory of Justice* that he later expanded in *Political Liberalism*, Rawls heuristically defends a reconciliation of the principles

of liberty and equality presenting an alternative ethical theory to utilitarianism. The author questions how to make society's institutions, laws and policies "just", and attempts to provide an answer to this question using a series of principles and theoretical tools for the development of a mental experiment that will provide him with the most effective answer.

Heir to the social contract tradition of Locke, Rousseau and Kant, Rawls assumes that the principles of justice that result from agreements between free and rational individuals have universal validity. So that this happens, only impartial starting conditions can guarantee impartial results. In order to illustrate the theoretical situation in which something like this would occur, two key concepts introduced by Rawls come into play: the "original position" and the "veil of ignorance".

In the original position, situated in the experiment "before life", individuals must design the basic laws, institutions and policies of the society in which they will be born, but they must do so behind what Rawls calls the "veil of ignorance", that is, without knowing their own characteristics –gender, ethnicity, class position, social status. Placing the participants of the experiment behind the veil of ignorance prevents them from designing rules and institutions that favor their particular conditions, and therefore, will force them to select impartial and rational rules according to principles of justice.

Thus, the participants in the original position will be guided by two basic principles of justice: First, each individual has a set of basic rights and liberties, opportunities and powers, income and wealth –Rawls refers to them as "primary goods"–, that are compatible with those of the rest of the population. Second, social and economic differences must be associated with positions and offices open to all (Principle of Equality of Opportunity), and must serve the interests of the less privileged members of society (Principle of Difference).

This experiment can easily be extended to income distribution. If a person does not know their place in the distribution beforehand and considering that everyone is risk averse, they will tend to prefer redistributive policies that guarantee a relatively high level of well-being for the least fortunate, since they

could end up there. This maximization of the welfare of the lower classes of the population, known as the maximin criterion, would guarantee fair public policies.

Consequently, even those in the bottommost socioeconomic ranks of society will accept inequality as it will emerge from just principles that guarantee equality of opportunities and the well-being of all. All this makes, according to Rawls' vision, that equality in the terms presented above has an intrinsic value.

Nevertheless, Rawls' theory of justice was not exempt from criticism. One of his main detractors was Robert Nozick, who, a few years after the publication of Rawls' pioneering work, attempted to challenge its basic assumptions in his book *Anarchy, State and Utopia* (1974), widely regarded as one of the fundamental works of libertarianism. The author proposes an entitlement theory following the ideas of John Locke and based on three fundamental principles: (i) the principle of justice in acquisition, which implies that if anybody acquires a holding in accordance with this principle is entitled to that holding; (ii) the principle of justice in transfer, which entails that if a person acquires a holding in accordance with this principle from someone who is entitled to that holding, he/she is then also entitled to it; and (iii) the principle of rectification of injustice, which implies that no one is entitled to a holding except through principles one and two.

To Nozick, the distribution of holdings will be just if everybody is entitled to the ones they own, that is, if they were acquired by legitimate means. However, the distribution can be rectified if their acquisition has been achieved through theft, fraud, enslavement or any other violation of the free and voluntary exchange. The same reasoning could be applied to natural assets. While the distribution of natural abilities is arbitrary from a moral point of view, people are entitled to them and to whatever flows from it. Therefore, if people's holdings flow from their natural assets, they are also entitled to them.

These ideas lead the author to argue that, therefore, the collection of taxes and the implementation of redistributive policies are not fair as long as the taxed income or wealth has been acquired in a legitimate way. In his later work, however, Nozick (1989) tacitly dismissed part of the entitlement theory, arguing that clinging blindly to its principles can generate unfair inequalities, and

defended an inheritance tax to prevent the perpetuation of such inequalities across generations.

However, the criticisms of Rawlsian justice theory do not only come from the field of libertarianism. At the other end of the ideological spectrum, we find the neo-Marxist critique made by Gerald A. Cohen (2009). This author argues that if Rawls' principles apply only to the basic structures of society and not to the personal sphere, the resulting community would be insufficiently egalitarian. As an explanation, Cohen states that the principle of difference allows the most "talented" members of society to demand and receive increasing economic rewards when they boost their productivity. This generates inequalities that detrimental to the least advantaged. Therefore, inequalities appear as inevitable only because the attitudes of talented people make them inevitable. Thus, inequalities are not the product of just rules, but of decisions that economic agents take within the basic structure of society –however, if the most advantaged persons were committed sincerely to egalitarianism and did not act as incentive-based agents, they would offer their full potential without demanding special rewards.

Other criticisms include those of Okin (1989), who points out that, assuming without proving the adequacy of traditional family roles, Rawls ends up ignoring the problems of justice that arise in a gender-structured society, and Sen (2009), who criticized Rawls' experiment for its detachment from reality and excessive emphasis on institutions, underestimating the difficulties of making everyone endorse and adhere to what the basic structure of a society should be.

Although it is extremely difficult to reach a consensus on the intrinsic value of equality, one cannot ignore the fact that the ethical foundations of capitalism were an essential condition for its defense by its early theorists. Adam Smith (2010) in the *Theory of Moral Sentiments* presented the "principle of sympathy" as fundamental to unite society and ensure the well-being of the community. Its gradual disappearance from contemporary economic thought, which places individual motivations as the only relevant feature, leads the capitalist system to an incomplete ethic and a narrow worldview that might have a myriad of repercussions (Arias and Costas, 2016).

So far, the intrinsic value of equality and its extent seems to depend on the eye of the beholder, and can easily be dismissed by its detractors despite its wide ethical and moral implications. However, evidence of its instrumental value –i.e. the fact that economic inequality has negative social, economic and political effects– may be a more convincing justification for the implementation of redistributive policies –especially with the exacerbation of the trends presented in the previous section looming on the horizon.

First, perhaps the most relevant consequence of increasing inequality is that it hampers economic growth. Various studies (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Knowles, 2005) also aroused the interest of international organizations (Ostry *et al.*, 2014; OECD, 2015), coming to the conclusion that the benign effects of inequality on economic growth are only missing in cases of extreme equality. Although researchers are far from reaching an absolute consensus on this issue (Piketty and Saez, 2006), most of the empirical studies seem to indicate that inequality can no longer be seen as a neutral factor with regard to economic growth.

Furthermore, inequality has very relevant effects on social cohesion and the perceived legitimacy of democratic institutions. Alesina and Perotti (1996) point to inequality as a source of political unrest, resulting in lower investment and economic growth. Nobel laureate Stiglitz (2012) has also highlighted the problems of living in dual societies where only a few have access to what Rawls would call primary goods, while a majority barely subsist on a day-to-day basis with mediocre welfare at best. Finally, Reich (2015) conducted an empirical study that shows that a prosperous democracy ultimately depends on citizens' perception of justice about the society where they live. Thus, a society that perceives itself as unjust will be condemned to suffer from constant political upheavals, which, as mentioned earlier, result in less growth and, therefore, less well-being for all.

Nevertheless, arguably the most significant socio-political consequence is the way inequality distorts the functioning of democratic systems. The emergence of significant inequalities can help the super-rich people to exercise economic power over democratic institutions to serve their interests to the detriment of the rest of the population (Gilens and Page, 2014; Lindsay and Teles, 2017).

Obviously, this course of action would contribute to strengthening and perpetuating the privileged position of the wealthy and undermining equal opportunities by turning the democratic system into a plutocracy (Milanovic, 2018).

Another consequence of the dual societies described above is the increase in criminality. Several studies (Kelly, 2000; Fajnzylber *et al*., 2002) note the direct causal relationship between inequality and crime rates within countries and, especially, between countries, in particular regarding violent crime –a behavior that can be traced back to the widening gap between the potential gains from committing a crime and the opportunity cost of being caught and punished.

Finally, one of the variables most closely related to inequality is health. There is a general consensus in that income inequality is causally associated with poorer health (Marmot, 2015; Pickett and Wilkinson, 2015). The well-documented channels through which this may be explained connect income inequality with disinvestment in human capital, erosion of social capital, and worsening of health through stressful social comparisons (Kawachi and Kennedy, 1999).

In short, regardless of the intrinsic value that anybody places on fairness, its instrumental value presented above provides compelling reasons to the question "why inequality matters?" Bearing in mind the importance of the arguments put forward in this section and the global trends pointed out in the previous one, it becomes increasingly apparent that there is a pressing need for a deeper understanding of the different dimensions of this phenomenon, its interconnections with other variables and its potential consequences for democracy and capitalism.

The challenges of measuring inequality

When researching on income inequality –or wealth and consumption inequality, if the case–, it is essential to start the analysis by understanding how this variable could be measured and which dimensions of the phenomenon are

apprehended in each of the available indicators, in order to decide which one to use depending on the needs of each situation.

Inequality measures are usually synthetic indicators –the most popular being the Gini coefficient– that summarize in a single comparable figure how income is distributed in a population. However, there are many other indicators available to researchers to capture the different aspects of this issue. Nonetheless, it is worth bearing in mind that the attempt to summarize a multidimensional reality by using a one-dimensional indicator will necessarily involve a degree of simplification, which can lead to incomplete results (Piketty, 2014).

Considering that throughout this doctoral thesis we have to resort to different inequality indicators, we dedicate Chapter 1 to review the main available indicators to measure poverty and income inequality, examining their properties and suitability for different types of economic analyses, and providing real-world data to illustrate how they work. Although some of these metrics are most frequently used for this purpose, it is crucially important for researchers and policy-makers to take into account alternative methods that can offer Supplementary information in order to better understand these issues at all levels.

The determinants of income inequality: is monetary policy neutral?

The trends of increasing inequality described in the first section sparked researchers' interest in determining their possible causes. Until the late 1990s, the most common explanation was the intertwining of technological change and the education gap. In short, technological change in the ICT (Information and Communication Technologies) sector over the last three decades has substantially increased the productivity of skilled workers, thereby boosting the demand for skilled labor and leading to a rise in the skill premium, which would eventually result in steady economic growth and increasingly unequal economies, both in developed and developing countries.

However, the skill-biased technological change (SBTC) hypothesis proved insufficient to explain the coexistence of these phenomena with the stabilization

of the skill-premium and the slowdown in the incorporation of new technologies in the 1990s, the remarkable growth of inequality among university graduates, or the spectacular income growth of the top 1% (Rodrik, 2015).

The departure from the monolithic SBTC hypothesis as the only reason for the behavior of income inequality gave rise to a plethora of explanations based on a broad spectrum of political, social and cultural changes. Atkinson (2015) identifies, in addition to the aforementioned SBTC hypothesis, factors as diverse as globalization, deregulation and growth of the financial sector, changing pay norms, the decline of trade unions, or the progressive dismantling of redistributive tax and transfer policies.

However, the implementation of unorthodox policies by Central Banks in the aftermath of the Great Recession led many researchers to question about the possible redistributive impact of a variable that until then had been considered neutral: monetary policy. The channels through which monetary authorities can have an effect on the distribution of income and wealth are multiple and can operate in opposite directions, so the net results of a given expansive or contractive policy are a priori unknown (Coibion *et al.*, 2017). Several recent empirical studies reveal the distributive consequences of monetary policies and call for further research to better understand them.

For this reason, Chapter 2 of this doctoral thesis be devoted to the study of monetary policy as a determinant of income inequality. It presents presents an empirical research on how monetary policy can affect income distribution. After describing the channels through which monetary policy may have an impact on income distribution, we perform a panel analysis of 15 EU (European Union) countries covering the period 1995-2014. The results provide evidence of a significant positive relationship between real interest rates and income inequality measured by means of the Gini coefficient. However, this relationship only becomes significant in the medium term. Our findings call for greater attention by central bankers to the redistributive effects of monetary policy.

Also in the second chapter and using two possible proxy variables for monetary policy (the monetary aggregate M3 and the real interest rates), we perform a panel analysis of 62 countries that control their monetary policy for the

period 1996-2015. The results provide again evidence of a significant positive relationship between real interest rates and income inequality measured through the market Gini coefficient and polarization ratios. As in the study for EU-15, this suggests that central bankers should be more conscious of the redistributive consequences of monetary policy.

Beyond income inequality: wealth and consumption

While income inequality has been the focal point of the newly flourishing interest in distributive concerns, it remains only one of three main issues to bear in mind when researching on inequality. Other two variables, consumption and wealth, can be also used as proxies for well-being and have the advantage compared to income of being more stable in time and not as exposed to unexpected shocks. Nevertheless, they have received a somewhat less attention from the researching community, either because of theoretical considerations or practical problems (Glaeser, 2005).

On the one hand, obtaining data on individual or household wealth is plagued by several difficulties: the concealment of wealth in tax havens, the lack of wealth taxes –or, if there are any, their extremely high non-taxable minimum–, the high rate of non-response in surveys, and the inaccuracies of capitalization methods, among others.

Conversely, the collection of data on household consumption expenditure has been standardized and conducted on a regular basis for decades –although obviously it is affected by the problems inherent in surveys. In Spain, the Households Budget Survey (HBS), published annually, provides information that is essential both for estimating for the National Accounts that expenditure, and for updating the Consumer Price Index (CPI) weightings.

In most cases, there are additional technical problems that prevent researchers from knowing how the three variables behave simultaneously for a certain unit of analysis because the data come from three distinct sources with

different samples, definition of variables and/or methodologies that make them almost incomparable and impossible to merge.

Notwithstanding the aforementioned constraints, we argue that in order to have a comprehensive snapshot of economic inequality in Spain we must complete our research with a study that considers these three dimensions. Fortunately, the Bank of Spain, as part of the European Household Finance and Consumption Survey initiative, carries out periodic surveys in which we can have information on our three variables of interest for the same household.

Hence, the third chapter of this doctoral thesis, on the one hand, analyzes the changes in wealth and consumption inequality in Spain during a pronounced boom-and-bust cycle using micro-data from the Spanish Survey of Household Finances (2002-2014), and, on the other hand, estimates the consumption effects of housing and financial wealth using interquartile regression techniques. Our findings suggest that there was an increase in wealth inequality during the period under analysis and, at the same time, a reduction in consumption inequality. In addition, we find a significant positive effect of wealth on consumer expenditure. Disaggregating by asset type, the value of the main residence is the category with the highest estimated effect on consumption, whereas the remaining types of assets, although still positive and generally significant, have much more modest effects on consumption. However, the estimated coefficients and their significance can change substantially depending on the phase of the economic cycle and the position of the household in the income distribution.

Income inequality and social mobility

Another issue that needs to be analyzed in parallel with the changes in income inequality is the evolution of intra- and intergenerational mobility. To explain this relationship, Nobel laureate Milton Friedman (1962) resorted to a mental experiment in which he challenged the reader to determine which of two theoretical societies was more unequal regardless of their current income inequality: one with high levels of mobility where the position of households in

the income distribution may change drastically over the years, or another extremely rigid where households hold the same position in income distribution year-to-year. According to Friedman, the former is a society characterized by dynamic change, social mobility and equal opportunities, whereas the latter is what he describes as a "status society".

Friedman used this example to illustrate the theoretical superiority of competitive free-enterprise capitalism over other forms of economic organization, since, according to him, inequality in this other type of systems tends to be higher and more persistent than in capitalist societies. However, recent comprehensive studies on this subject (OECD, 2018) warn of the possibility of a broken-down "social elevator" in many developed countries. Increasing inequality coupled with declining income mobility would lead us precisely to what Friedman described as a "status society", or to the form that Milanovic (2016) envisages will take capitalism in this century: *"a big casino, with one important exception: those who have won a few rounds (often through being born into the right family) will be given much better odds to keep on winning. Those who have lost a few rounds will see the subsequent odds turn increasingly against them"* (p. 216).

The OECD study makes it clear that inequalities are reproduced not only through inherited wealth, but also through education systems that perpetuate and legitimize them. This inequality of opportunities in terms of access to a certain level of education or occupations is apparent from an early age and hinders children born in low-income households from reaching the upper echelons of the income distribution. Finally, another factor that may influence people's ability to move up in the social ladder is their endowment of social capital: those with a wider network of connections will be able to progress more easily, whereas those without it will be left behind.

However, the somewhat exceptional situation in Spain calls for detailed consideration. In Spain, intergenerational mobility is not particularly low compared to other developed countries. A Spaniard born into a low-income household would need four generations to reach the country's average income. This figure, which a priori can lead to a state of distress, contrasts with the results in other EU countries: for instance, in France and Germany, it would take six

generations; in Italy, Portugal and the United Kingdom, five. Only in the Scandinavian countries, which also have the lowest levels of income inequality, the poor would need a shorter time to reach the average income of their respective country. Furthermore, if we focus on what happens at both ends of the distribution, where income rigidity tends to be more pervasive than in the middle classes, both in the first quartile and in the fourth, intergenerational mobility of income is higher in Spain than OECD's average.

Spain's relatively favorable situation is also reflected in other variables presented by the report: intergenerational earnings elasticity between parents and children, which measures the extent to which a generation's income is determined by that of the previous generation, is one of the lowest in the OECD, behind only the four Scandinavian countries. Moreover, cohort analysis of intergenerational earnings persistence also reveals that the estimated value of this elasticity is significantly lower for people born in the 1970s compared to those born in the 1950s, which indicates a movement towards higher levels of mobility, at least up to this point in time.

However, the shock caused by the prolonged economic crisis that began in 2008 with the bursting of the housing bubble may have had significant negative effects on lifelong mobility, that is, that experienced by an individual throughout his or her life. High levels of structural unemployment, precarious forms of employment (manifested by an increase in the rate of involuntary partial employment and by the overwhelming prevalence of temporary contracts), and a general stagnation of wages during economic recovery may have had a significant impact on this variable.

Nevertheless, according to the European Union Statistics on Income and Living Conditions (EU-SILC), short-term income mobility declined substantially over the last decade. The percentage of households that remain in the same income decile within one, two or three years increased continuously after the onset of the Great Recession, which may be a negative sign regarding the evolution of this variable in Spain in the coming years.

Although numerous studies were conducted on the state of intragenerational income mobility in Spain, many of them covered periods

characterized exclusively by economic growth and prosperity, or might be negatively affected by the inaccuracies the use of survey data entails –especially in the analysis of the top of the income distribution. That is why we dedicate the third chapter of this doctoral thesis to analyze the relationship between income inequality and mobility using fiscal data, and then point out the challenges arising from this analysis.

Chapter 4 aims to analyze the evolution of income inequality and mobility in Spain during the period 1999-2011 by exploiting data from personal income tax returns. Using this type of data provides more accurate measurements, particularly for high-income individuals, and allows widening the methodological challenges of working with a pure panel as opposed to an unbalanced panel. We conclude that there are significant differences in measurement results between these two types of panels –especially when focusing on lowest and lower-middle income individuals. Our results suggest that both income inequality and mobility at the top of the distribution follow a declining trend despite the shock of the economic crisis started at 2008.

The spatial distribution of income

Concerning the aforementioned, it is also relevant to analyze how income is distributed at the spatial level. In a country where, according to official statistics, four out of five Spaniards live in an urban area, it is crucial to be aware of the levels of income segregation present in these communities, as the emergence of extremely segregated cities could have an enormous impact on both inequality and mobility, among many other variables.

As we will explain in more detail in Chapter 4, the spatial segregation of income within cities will mean that those who are randomly born in a poor neighborhood of a certain city will be exposed to worse public services, higher crime rates and, in general, a poorer quality of life. This situation, coupled with the deficiencies of economic, social and cultural capital that are already associated with being born in a low-income household, will mean a double disadvantage for

those who find themselves in such circumstances. Thus, if one of the concerns of policy-makers is to achieve, as far as possible, equality of opportunity as defined earlier, it is of the utmost importance that they favourthe development of mixed-income cities.

However, the unavailability of data at the neighborhood level resulted in this issue being completely unknown for Spanish cities. This shortcoming was recently rectified with the publication by the Spanish Tax Agency of the statistics on Personal Income Tax in the largest cities disaggregated by postal code. Since, to the best of our knowledge, there is no previous research on this issue in Spain, we devote the fifth chapter to conducting a first descriptive analysis of the spatial distribution of income in the most populated Spanish municipalities and comparing it with similar studies carried out in other developed countries.

This chapter examines the spatial distribution of income in 33 Spanish cities based on the analysis of tax returns data divided by postal district during the period 2013-2016. In addition to being the first study of this kind conducted for Spain, the use of data from Personal Income Tax allows us to access a large and particularly accurate sample. Our results suggest that in the aforementioned period there was a rise in income inequality in the main Spanish cities caused by a considerable income increase for already affluent individuals, together with an earnings stagnation for middle and lower classes. These changes were essentially driven by the upturn in non-labor incomes of better-off taxpayers. Moreover, the levels of spatial segregation in Spanish cities, although low in comparison with other developed countries, appears to have grown in the short period under analysis, and this increase was primarily triggered by increasing differences within the districts of the same city.

Preferences for redistribution: perception vs. reality and courses of action

As noted earlier, high levels of inequality erode social cohesion and undermine the legitimacy of institutions. According to the Median Voter Theory (MVT) (Meltzer and Richard, 1981) in democratic societies, socially unacceptable

levels of inequality should be promptly corrected by the implementation of redistributive policies.

Nevertheless, the MVT fails to set forth two concurrent phenomena explained above: the generalized increase in income inequality in recent decades and the scaling-back of redistributive policies. This situation reveals the existence of greater complexities in the determinants of distributive preferences between and within countries.

Thus, we devote the seventh and eighth chapters of this doctoral thesis to trying to identify these determinants. In the seventh chapter, we examine trends in redistributive preferences using a heterogeneous sample of 85 countries for the period 1989-2014, using data from the World Values Survey. After applying estimation methods for panel data, our results point to the country's level of economic development –measured through per capita income– rather than actual or perceived inequality, as the most relevant variable to explain differences in redistribution preferences between countries.

In turn, in the eighth chapter, we seek to determine the main explanatory factors of individual preferences for redistribution in Spain. We use data from the World Values Survey that not only capture potential economic factors but also political preferences, personal beliefs and socio-demographic characteristics. Our estimates, obtained by means of both OLS and ordered logit regressions, reveal that elements regarding relative household income, personal beliefs, socio-demographic characteristics and regional differences are the main determinants of the demand for redistribution. These results, coupled with several longstanding trends that the Spanish society has been experiencing for decades, suggest that there may be an increase in the demand for redistribution in the coming years – which, in any case, may be offset by factors linked to the political ideology of each individual.

Chapter 1: The challenge of measuring poverty and inequality: A comparative analysis of the main indicators

1. Introduction

Poverty and inequality have long been topics of interest in the economic literature, because of the concerns about an equitable distribution of the fruits of economic growth. However, before tackling the analysis of the causes and potential consequences of such phenomena, we have to face the issue of which is the best way to measure them.

Although they are inseparably connected, we should first distinguish between poverty and income inequality. While inequality is a much broader concept, since it focuses on the way income –or wealth or consumption– is distributed in an entire population, poverty focuses on the living conditions of the individuals placed in the lowest end of income distribution, below a threshold called “poverty line”.

But for the measure of these two variables to be useful, it is desirable that they fulfill certain conditions. In this respect, on the one hand, regarding poverty measures, Morduch (2006) mentions the following properties: *scale invariance*, which means that multiplying the income of all individuals in the population by a constant should not change the results of the measurement; *focus*, which implies that the indicator should only be focused on individuals living below a certain level of income –the aforementioned "poverty line"–, so that an improvement or deterioration in the living conditions of those above this level of income should not change the results of the measurement; *monotonicity*, which means that if an individual living below the poverty line loses income, the results of the measurement should worsen; *transfer sensitivity* –also known as *Pigou-Dalton condition*, proposed by Pigou (1912) and Dalton (1920)–, which implies that if there is a transfer of income from a richer household to a poorer one without changing their relative positions within the income distribution or their average income, the poverty measure must fall –and vice versa; and finally, an additional desirable property is that poverty measures can be decomposed according to different criteria, so that we can analyze the poverty level of different subgroups, being the sum of the subgroup indicators equal to the poverty level of the entire population.

On the other hand, as for inequality measures, Haughton and Khandker (2009) point out that it is desirable they have as many of the following properties as possible: *scale invariance* and *transfer sensitivity* (both explained above); *population size independence*, which means that, if the number of individuals in the population is multiplied by a constant for all income levels, the results of the measurement should not change; *symmetry* or *anonymity*, which implies that if two individuals of the population exchange places within the distribution, the results of the measurement should not be altered; and, as additional properties, we could also point out *decomposability*, equivalent to the aforementioned property; *fixed range*, so that the measurement of inequality is performed on a scale varying between two fixed values –ideally 0 and 1–; and *statistical testability*, which means that the researcher should be able to test for the significance of changes in the indicator over time.

Thus, splitting the set of indicators in poverty and inequality measures for reasons above explained, this chapter is organized as follows: first, we review the main poverty measures; next, we study the most important inequality measures, and finally, we present our concluding remarks.

2. Poverty indicators

2.1. Foster-Greer-Thorbecke (FGT) class of measures

Foster, Greer, and Thorbecke (1984) developed a group of indicators in order to assess the living standards of individuals that are below the so-called "poverty line". This threshold can be set by the researchers as a share of the mean or median income of a population –e.g. Eurostat sets it at 60% of the national median equivalized disposable income after social transfers–, or as an arbitrarily selected value –e.g. the World Bank currently sets the "international poverty line" in 1.90 American dollars a day valued at 2011 purchasing power parity.

The general expression of the FGT measures can be written as:

$$P_a = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^a, (a \geq 0) \qquad \textbf{\textit{Eq. 1}}$$

Where N is the number of individuals in the population, G_i is the difference between the poverty line and the actual income of an individual (being $G_i = 0$ for those above the poverty line), z is the poverty line, and a is a constant that represents the indicator sensitivity to poverty –i.e., it can take values from 0 to infinity, and by giving it higher and higher values, we can gradually increase the sensitivity of the indicator to poverty.

There are three cases of the FGT measures that are so widely used that researchers designate them with specific names: P_0 is called "headcount ratio" or

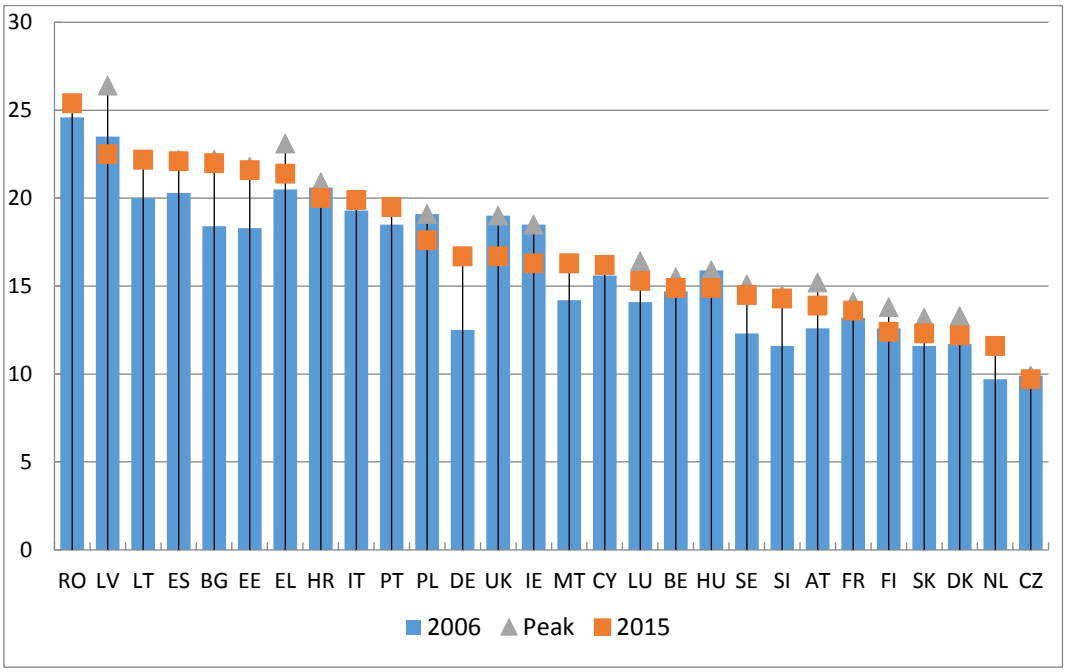
"at-risk-of-poverty rate"; P_1 is known as "poverty gap index" or "PGI"; and P_2 is referred to as "squared poverty gap index", "squared PGI" or "severity index".

The simplest and most popular way to assess the poverty level of a population is the first of these indicators, which measures the share of people with an equivalized disposable income below the poverty line. It can be calculated using the following formula:

$$P_0 = \frac{N_P}{N} \qquad \textit{Eq. 2}$$

Where N is the number of individuals in the population, and N_p is the number of them below the poverty line.

Figure 1. Headcount ratio in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries (named by their respective ISO codes, see Annex 2) appear ranked according to the highest at-risk-poverty rate in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

Using this statistic, the highest levels of poverty in the EU-28 can be seen (Figure 1) in Romania, Latvia, Lithuania, Spain and Bulgaria, where poor households represent more than 20% of the population. At the other end of the scale, we have the Czech Republic, the Netherlands, Denmark, Slovakia and Finland, where this indicator lies somewhere around 12%. It is also worth

mentioning that only nine member states managed to reduce their poverty levels in the last decade.

Although the headcount ratio offers an easy-to-interpret first glance to poverty measurement, it is a simple ratio that does not allow us to quantify the extent to which individuals fall below the poverty line. Thus, it does not change if the living conditions of the poor improve or deteriorate as long as they remain below the poverty line.

In order to address these flaws, the poverty gap index (PGI) allows us to measure how far poor individuals fall below the poverty line, and it can be calculated as:

$$P_1 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right) \qquad \textbf{\textit{Eq. 3}}$$

Where N is the number of individuals in the population, G_i is the difference between the poverty line and the actual income of an individual (being $G_i = 0$ for those above the poverty line), and z is the poverty line.

Also, if we want to increase the "sensitivity to poverty" of our indicator, we can use the squared PGI –also known as "severity index"–, which is calculated by averaging the square of the poverty gap index:

$$P_2 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^2 \qquad \textbf{\textit{Eq. 4}}$$

Where all the elements are just the same as in the case of P_1.

By squaring the G_i/z component of the poverty gap formula, we make the indicator more sensitive to changes in income of individuals far below the poverty line –i.e. distributionally-sensitive.

2.2. Sen and Sen-Shorrocks-Thon (SST) indices

In order to assess more dimensions of poverty with the same indicator, Sen (1976) proposed a new metric that combines the relative number of poor people, their income level, and the income distribution within the group –which may arguably be considered his main contribution in the measurement of poverty. It can be calculated as:

$$P_{SEN} = P_0 \left[1 - (1 - GINI_P)\frac{\bar{x}_p}{z}\right] \qquad \textbf{Eq. 5}$$

Where P_0 is the headcount ratio of the population, $GINI_p$ is the Gini coefficient (see 3.4) among the poor, $\bar{x}_p$ is the average income of the poor, and z is the poverty line.

Shorrocks (1995) presented a modified version of the Sen index, currently known as "Sen-Shorrocks-Thon index" or "SST index", which introduces in the calculation the poverty gap index and the Gini coefficient of the poverty gap ratios for the entire population to better gauge poverty intensity. It can be expressed as:

$$P_{SST} = P_0 P_1^p (1 - \hat{G}_p) \qquad \textbf{Eq. 6}$$

Where P_0 is the headcount ratio of the population, P_1^p is the poverty gap applied only to those below the poverty line, and $\hat{G}_p$ is the Gini coefficient of the poverty gaps of the poor.

These variables allow researchers to track the source of the changes in poverty levels measured by the SST index in three basic dimensions: number of poor people, the depth of their poverty, and income distribution among the poor.

2.3. Watts index

This last indicator, proposed by Watts (1968), was the first distribution-sensitive poverty indicator. It can be calculated using the following formula:

$$W = \frac{1}{N}\sum_{i=1}^{q}[\ln(z) - \ln(x_i)] \qquad \textbf{Eq. 7}$$

Where N is the number of individuals in the population, q is the number of those below the poverty line, z is the poverty line, and x_i is the income level of a certain individual below the poverty line.

By introducing logarithms, Watts makes the indicator more sensitive to changes in the lowest end of the income distribution. This way, the indicator will improve the most when poorer individuals improve their living conditions.

3. Inequality indicators

3.1. Income shares

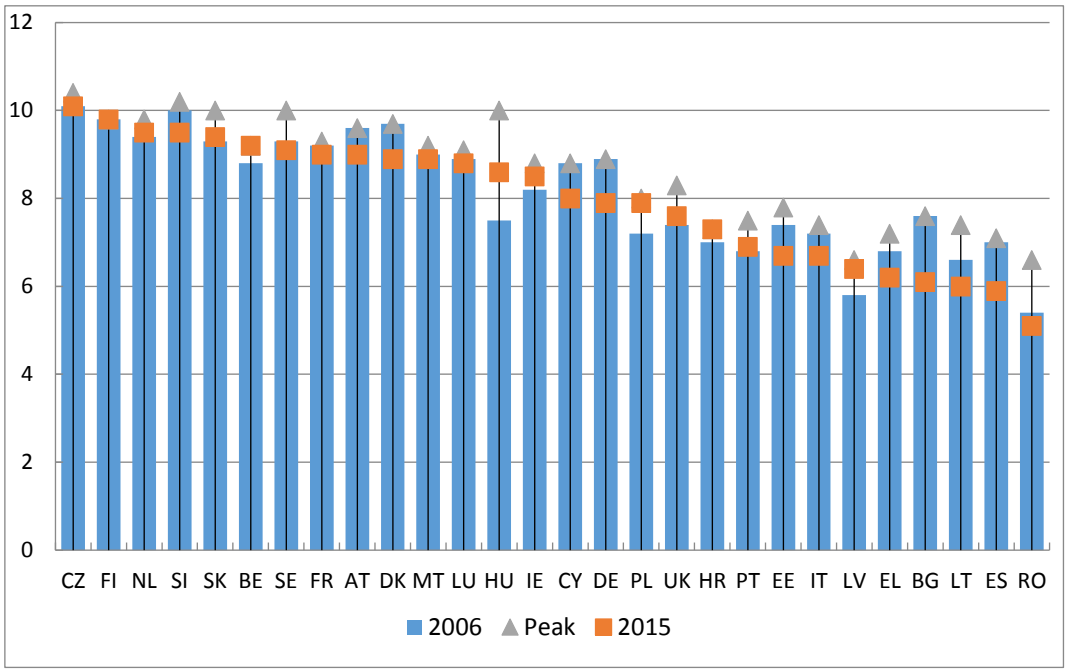
The simplest way to assess how income is distributed in a given population is dividing the observations of our sample in quantiles –e.g., quartiles, quintiles, deciles, percentiles, etc.– and analyzing the evolution of the income share corresponding to each quantile over time.

If the main focus of our analysis is the lowest end of the income distribution, we may choose to evaluate how the income share of the first decile or quintile has evolved over a certain period of time.

For the EU-28 in 2015, the countries where households in the lowest end of the distribution had a greater share of equivalized disposable income were the Czech Republic, Finland, Slovenia, the Netherlands and Slovakia, in which the

income of the poorest 20% almost reached the 10% of the national income (Figure 2). Conversely, in the opposite situation, we can find Romania, Spain, Latvia, Greece and Belgium, where the bottom 20% only amounted to about 6% of the national income. It also should be noted that only in nine out of twenty-eight countries, the income share of the poorest households has increased over the last decade.

Figure 2. Income share by the first two deciles in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries appear ranked according to the highest income share of the poorest 20% in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

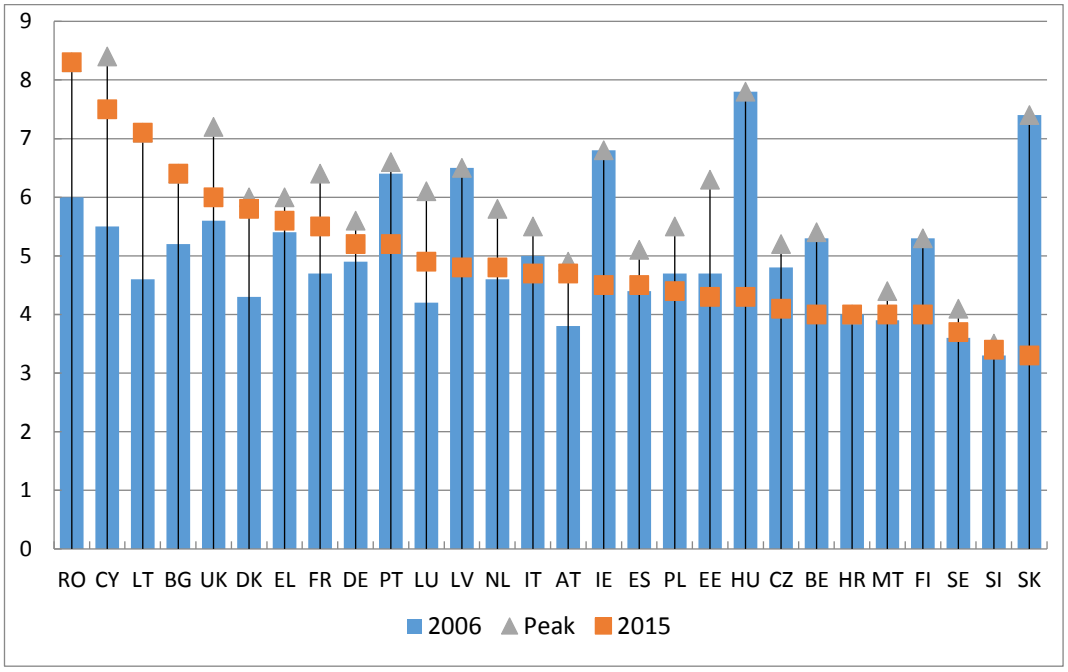
Furthermore, in order to analyze the accumulation of income by the households at the highest end of the distribution, we may also use the income shares to quantify the portion of national income in the hands of these households.

The most widely used segments are the tenth decile and the hundredth decile, but to assess the increasing importance of the "super rich", we may want to focus on increasingly small segments of the top of the distribution –e.g., top 0.5%, top 0.1%, top 0.01%.

As we can see in Figure 3, the EU-28 countries where the top 1% has the larger share of the national income are Romania, Cyprus, Lithuania, Bulgaria and the United Kingdom –whereas Slovakia, Slovenia, Sweden, Malta and Finland are

in the other end of the scale. There is no general trend in this regard among the member states, since sharp falls of the income share suffered by the top 1% in Slovakia, Ireland and Hungary coincided in time with strong increases in countries such as Romania, Cyprus and Latvia.

Figure 3. Income share by the hundredth percentile in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries appear ranked according to the highest income share by the richest 1% in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

3.2. Quantile ratios

With the purpose of assessing together the aforementioned segments of the income distribution, it may be useful quantifying the gap between the poorest and the richest households. For this purpose, we have at our disposal several ratios that are easy to construct and interpret. Nevertheless, we should note that, even though these ratios are widely used, they do not measure inequality properly since they are calculated without taking into account the central segment of the distribution, so they can be considered income polarization indicators.

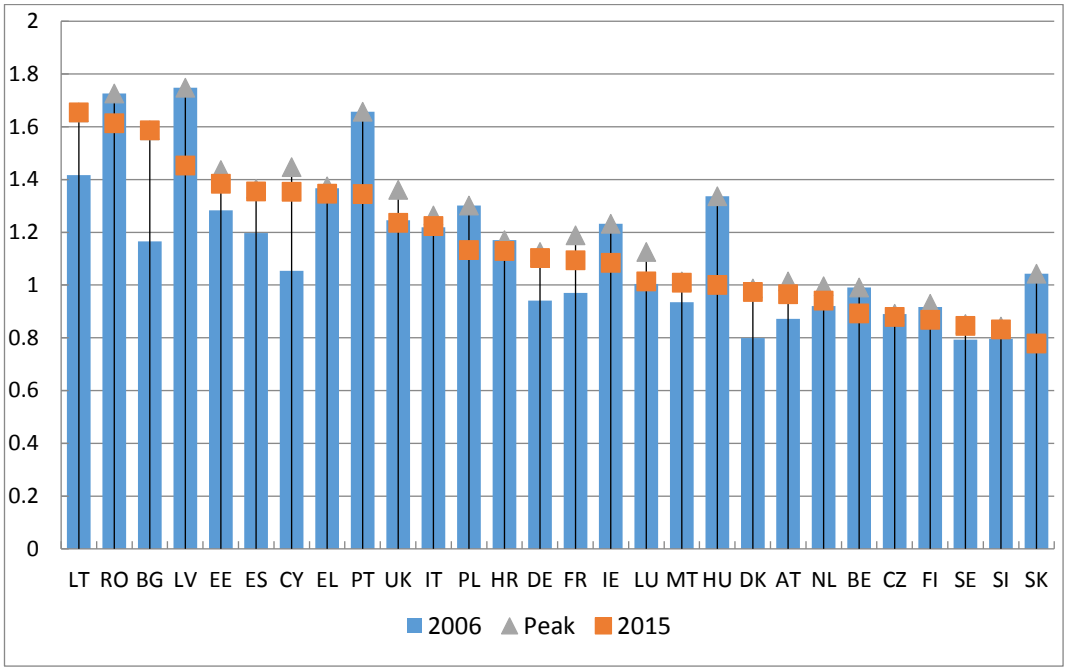
The two most well-known ratios are: (i) the S80/S20 ratio, used by the United Nations Development Programme Human Development Indicators, which is defined as the ratio of the richest 20% of the population's share in gross national income, divided by the poorest 20% of the population's share; and (ii) the Palma ratio, developed by the Chilean economist Gabriel Palma, and defined as the ratio of the richest 10% of the population's share in gross national income, divided by the poorest 40% of the population's share. Palma (2011) proposed using these two particular segments since there is evidence that in most countries the central segment of the income distribution amounts to about 50% of national income while the other 50% is distributed between the top 10% and the bottom 40%. Considering that the way this half of the national income is distributed between these two segments varies greatly among countries and over time, this ratio can be extremely useful to track changes in income polarization throughout a given time interval, or to compare income distribution among countries or regions.

As we can see in Figure 4 and Figure 5, both ratios show similar outcomes since their correlation coefficient for this period is 96.40%. The member states with the highest income polarization are Lithuania, Romania and Bulgaria for both indicators, whereas Slovakia, Slovenia, Czech Republic, Finland and Sweden are the least polarized countries in terms of income.

These results could be complemented with the data presented in Figure 2 and Figure 3 to try to establish whether the source of the changes experimented by these ratios is in the highest or lowest end of the income distribution –or both.

However, there are many other ratios, such as P90/P10, P90/P50 and P50/P10, which can be used to assess the gap between certain segments of a given population. For instance, the P90/P10 that, similarly to the ratios commented before, measures the gap between the highest and lowest ends of the distribution –and, needless to say, it will give results highly correlated with those ratios. Moreover, the P90/P50 ratio is used to appraise the gap between the highest income individuals and the median income of the population, whereas the P50/P10 ratio is employed to gauge the divergence of the poorest households from the median income of their population.

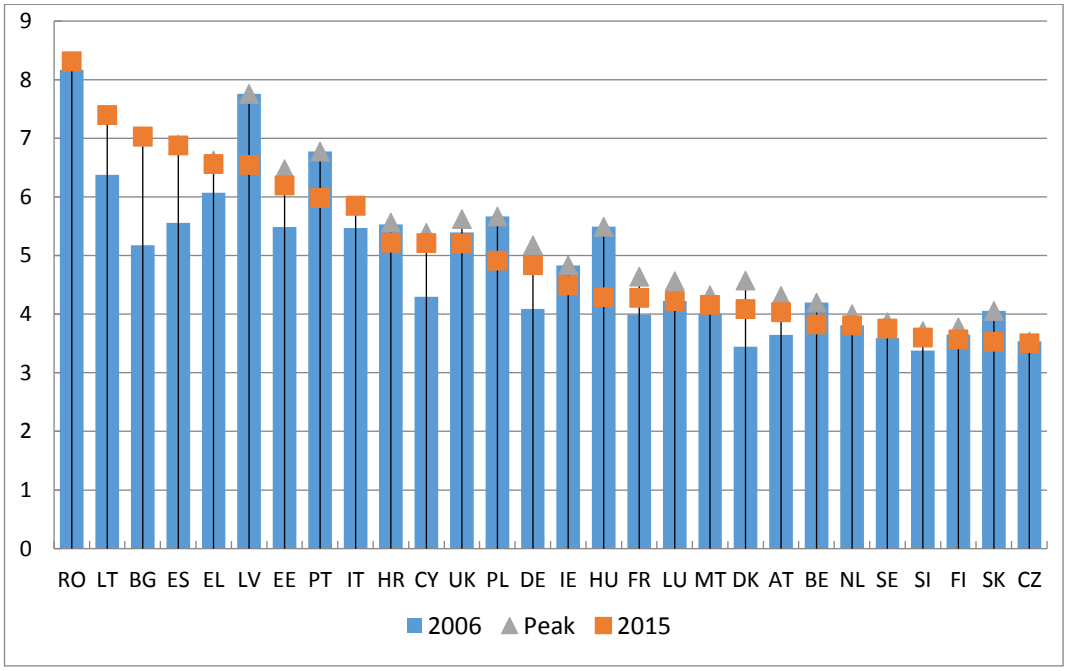
Figure 4. Palma ratio in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries appear ranked according to the highest Palma ratio in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

Figure 5. S80/S20 ratio in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries appear ranked according to the highest S80/S20 ratio in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

3.3. Measures of statistical dispersion: Squared Coefficient of Variation (SCV) and Relative Mean Deviation (RMD)

The following measures are not designed to analyze the level of inequality in a distribution of income; they are indicators used to assess the variability of any set of observations with regard to their average. For this reason, these general statistics, despite not having been designed specifically to analyze the degree of inequality in income distribution, can be used to quantify the dispersion of an income distribution, so that a higher level of dispersion would also mean higher inequality.

First, we have the squared coefficient of variation (SCV), which is a variant of the coefficient of variation, a measure of dispersion that can be used for any data set. It fulfills all the requirements explained in the introduction, except the additive decomposability and the fixed range –it can take values from 0 to infinity. As will be explained later, this indicator is more sensitive to changes at the highest end of the income distribution. For its calculation, the formula is the following:

$$SCV = \left(\frac{\sigma}{\mu}\right)^2 \qquad \textbf{\textit{Eq. 8}}$$

Where σ is the standard deviation and μ is the arithmetic mean.

As a second measure of dispersion, we can use the relative mean deviation (RMD), which was developed by Schultz (1951), and calculates the total percentage of income that should be redistributed so that all individuals in the population receive the average income. Much like the SCV, the RMD does not fulfill the fixed range condition, since it can take values from 0 to a fixed number that depends on our sample size. It can be calculated according to the following formula:

$$RMD = \frac{\frac{1}{N}\sum_{i=1}^{N}|x_i - \bar{x}|}{|\bar{x}|} \qquad \textbf{\textit{Eq. 9}}$$

Where N is the number of individuals in the population, x_i is the income level of a given individual, and $\bar{x}$ is the average income of the population.

3.4. Lorenz curve and Gini coefficient

The Gini coefficient is based on the Lorenz curve, which is a graphical representation of a cumulative distribution function, and is mathematically defined as the cumulative share of total income assumed by cumulative shares of the population.

The Lorenz curve is always represented paired with the line of egalitarian income distribution –that is, the 45-degree line–, and represents an ideal situation where every individual in the population has the same income level. This way, we can easily compare how far the Lorenz curve is from this line of absolute equality.

So, graphically, the Gini coefficient is defined as the ratio of the area between that line and a given Lorenz curve, and the total area under the aforementioned line. In Figure 6, it can be calculated as A/(A+B).

Due to its comparability between regions and through time –regardless of population sizes, exchange rates, price levels, etc.– and its easy-to-interpret results –which always range between 0 ("perfect equality") and 1 ("perfect inequality")–, the Gini coefficient is the most widely used indicator to measure inequality.

Assuming that the Lorenz curve is a finite discrete function, the Gini coefficient can be calculated using the following formula:

$$G = 1 - \sum_{i=1}^{N} (x_i - x_{i-1})(y_i - y_{i-1}) \qquad \textit{Eq. 10}$$

Where x_i is the cumulative share of population, and y_i is the cumulative share of income.

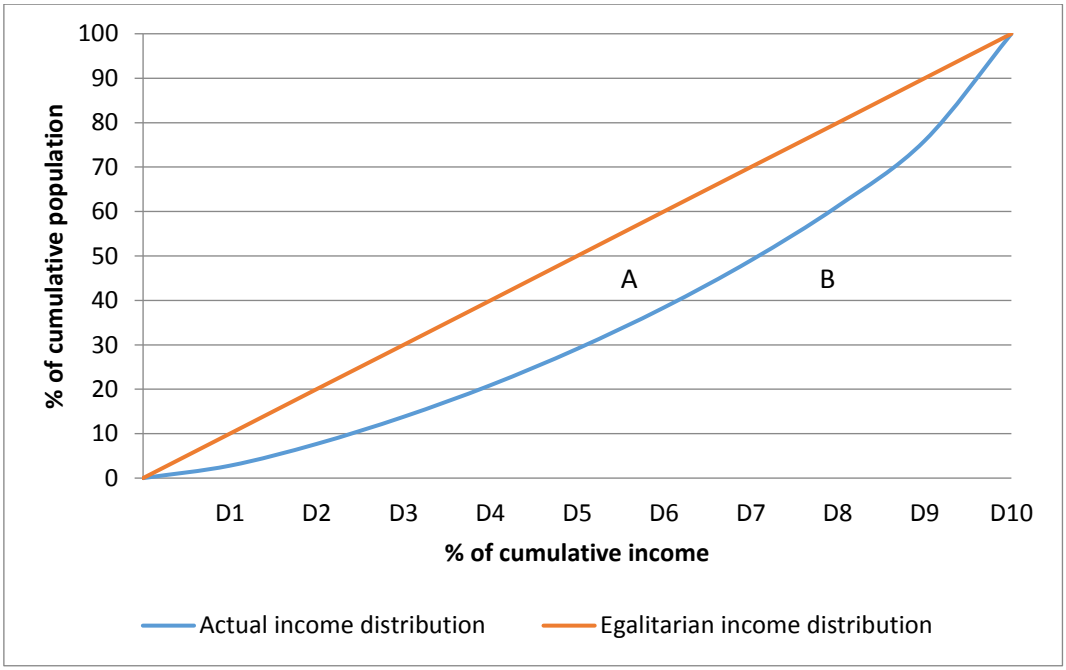
Or, alternatively, if there are N intervals of identical width, it can be expressed as:

$$G = 1 - \frac{1}{N}\sum_{i=1}^{N}(y + y_{i-1}) \qquad \textbf{Eq. 11}$$

Besides, given that the Lorenz curve is a continuous function $L(x)$, we can calculate the Gini coefficient this way:

$$G = 1 - 2\int_{0}^{1} L(x)dx \qquad \textbf{Eq. 12}$$

Figure 6. Lorenz curve for the EU-28 countries, 2015



Source: Own elaboration based on statistics from Eurostat.

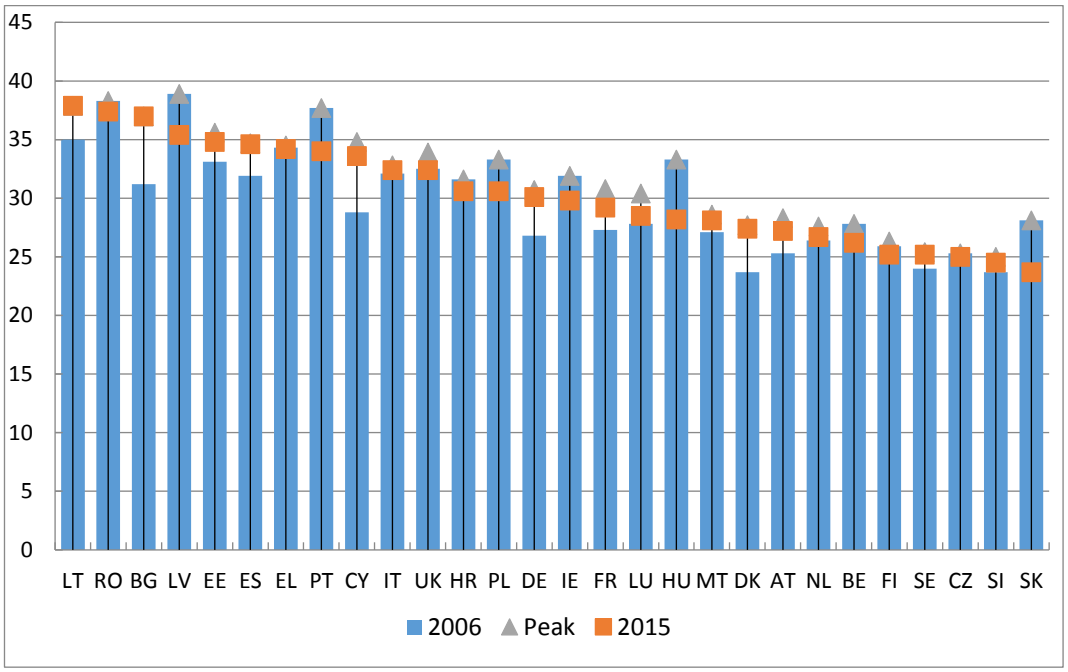
According to the data presented in Figure 7, the most unequal EU-28 countries are, once again, Lithuania, Romania, Bulgaria and Latvia, whereas the most egalitarian are Slovakia, Slovenia, the Czech Republic and Sweden. These results are extremely correlated to the Palma and S80/S20 ratios –with coefficients of correlation of 99.19% and 96.78%, respectively. Nonetheless, the relative increases and decreases (i.e., in terms of percentages) are far less pronounced in the Gini coefficient than in the ratios. This behavior may be related to the fact that the Gini coefficient is more sensitive to changes at the center of the distribution, whereas the ratios focus exclusively on what happens at its ends. This

situation may lead to the researchers more interested in income polarization to use the aforementioned ratios rather than the Gini coefficient as inequality indicators, considering their almost perfect correlation.

Additionally, the Gini coefficient is unable to differentiate between two populations where the area under the Lorenz curve is the same, but the shape of the curve is different –i.e. they have different inequality patterns–, and it is completely unresponsive to structural demographic changes.

Finally, the Gini coefficient is not easily decomposable as the sum of the Gini indices of different subgroups. Nonetheless, many techniques for its decomposition have been proposed over the years (Pyatt, 1976; Lerman and Yitzhaki, 1985; Silber, 1989).

Figure 7. Gini coefficient of equivalized disposable income in the EU-28 countries (2006, 2015, and period peak)



Source: Own elaboration based on statistics from Eurostat.

Notes: (i) Countries appear ranked according to the highest Gini coefficient in 2015; (ii) Croatia's data correspond to 2010 instead of 2006; Romania's data correspond to 2007 instead of 2006.

3.5. Hoover index

This indicator is closely associated to the Gini coefficient because the Lorenz curve is also used for its calculation. It determines the share of income that should be redistributed to attain a hypothetical situation of complete equality –that is why it is also commonly referred as the "Robin Hood index".

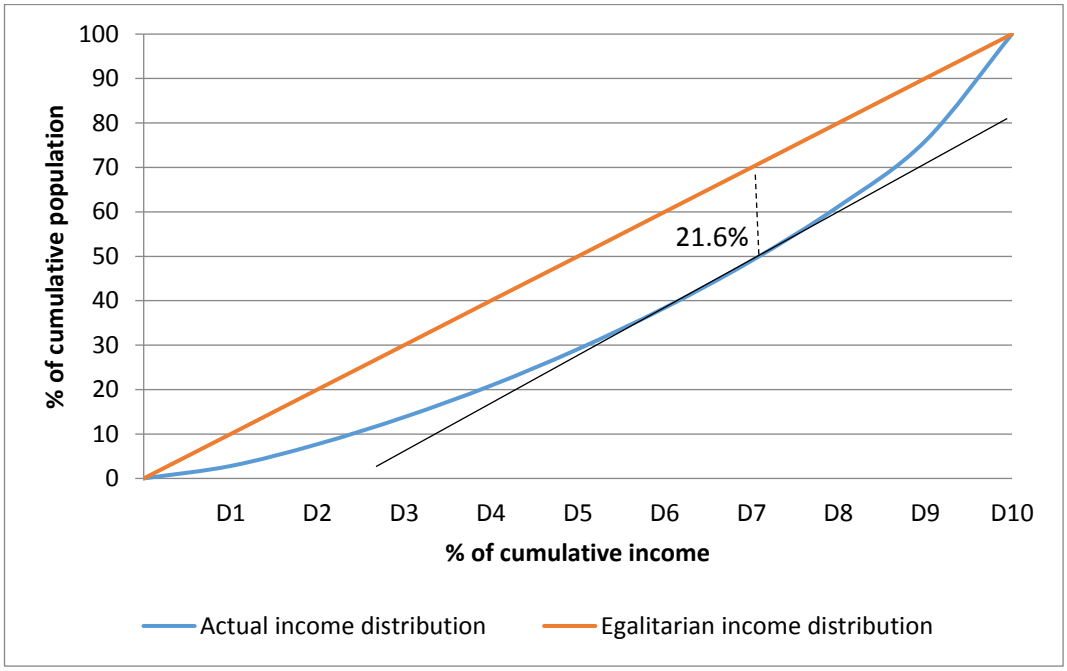
It can be graphically represented as the maximum vertical distance between a given Lorenz curve and the 45-degree line of perfect equality (Figure 8), and its value is obtained by means of the following formula, after dividing the income distribution into quantiles:

$$H = \frac{1}{2}\sum_{i=1}^{N}\left[\frac{E_i}{E_{total}} - \frac{A_i}{A_{total}}\right] \qquad \textit{Eq. 13}$$

Where N is the number of quantiles, A is the width of those quantiles, E_i is the income level of a given quantile, and A_i is the number of individuals in the quantiles.

Although it provides little information about how income is distributed in a population, it can be used to illustrate how far a population is from the egalitarian distribution.

Figure 8. Lorenz curve and Hoover index for the EU-28 countries, 2015



Source: Own elaboration based on statistics from Eurostat.

3.6. Generalized Entropy measures: Theil index and Mean Log Deviation (MLD)

The Theil index and the mean log deviation (MLD) are special cases for the Generalized Entropy index (GE), an indicator originated in information theory, and developed by Henry Theil (1967).

The GE can be calculated using the following formula:

$$GE(a) = \frac{1}{N\alpha(\alpha-1)} \sum_{i=1}^{N} \left[\left(\frac{x_i}{\bar{x}} \right)^{\alpha} - 1 \right], (a \geq 0) \qquad \textit{Eq. 14}$$

Where N is the number of individuals in the population, x_i is the income level of a given individual, $\bar{x}$ is the average income of the population, and α is the weight for distances between incomes in different parts of the income distribution. This last parameter allows the researcher to adjust the index sensitivity to their preferences, since for values below (above) 1 GE is more sensitive to changes in

the lowest (highest) end of the distribution. For $a = 1$, it applies equal weights across the income distribution.

As the poverty indices presented in Section 2, there are three cases of the GE that are so widely used that researchers designate them with specific names: when $\alpha = 0$, the generalized entropy index is the mean log deviation; when $a = 1$, it is the Theil index; and when $a = 2$, it is half the squared coefficient of variation (see 3.3).

Although these indicators can take values from zero to infinity –and therefore, they do not fulfill the fixed range requirement–, they are easily decomposable, allowing both the segmentation of the income distribution according to different criteria, and the disaggregation of total inequality in between and within group components.

The decomposability of these indicators allows us to analyze the evolution of inequality patterns over the reference period using many segmentation criteria provided by the household finances surveys.

The Theil index –also known as "Theil's T"– can be calculated using the following formula:

$$T = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{x_i}{\overline{x}} ln \frac{x_i}{\overline{x}}\right) \qquad \textbf{Eq. 15}$$

Where N is the number of individuals in the population, x_i is the income level of a given individual, and $\overline{x}$ is the average income of the population.

It can be decomposed this way:

$$T = \sum_{i=1}^{m} s_i T_i + \sum_{i=1}^{m} s_i ln \frac{\overline{x_i}}{\overline{x}} \qquad \textbf{Eq. 16}$$

Where m is the number of subgroups, s_i is the share of total income of each subgroup, T_i is the Theil index of each subgroup, $\overline{x_i}$ is the average income of each subgroup, and $\overline{x}$ is the average income of the population.

The first term of the expression above is the weighted sum of the Theil indices calculated for the different subgroups, where the weights are given by

each subgroup's share on total income. This term represents the component of inequality attributed to income differences within the same group.

The second term is the Theil index corresponding to a distribution in which each individual receives the average income of their subgroup. This component then embodies the income inequality between subgroups of the population.

On the other hand, the mean logarithmic deviation (MLD) –also known as "Theil's L"– is the percentage of income difference between a randomly selected individual or household of a certain population and the average income of the population. We can calculate it in this way:

$$MLD = \frac{1}{N}\sum_{i=1}^{N} ln\frac{\overline{x}}{x_i} \qquad \textbf{Eq. 17}$$

Where N is the number of individuals in the population, x_i is the income level of a given individual, and $\overline{x}$ is the average income of the population.

It can be decomposed as the following sum:

$$L = \sum_{i=1}^{m}\frac{n_i}{N}L_i + \frac{n_i}{N}\sum_{i=1}^{m} ln\left(\frac{\overline{x_i}}{\bar{x}}\right) \qquad \textbf{Eq. 18}$$

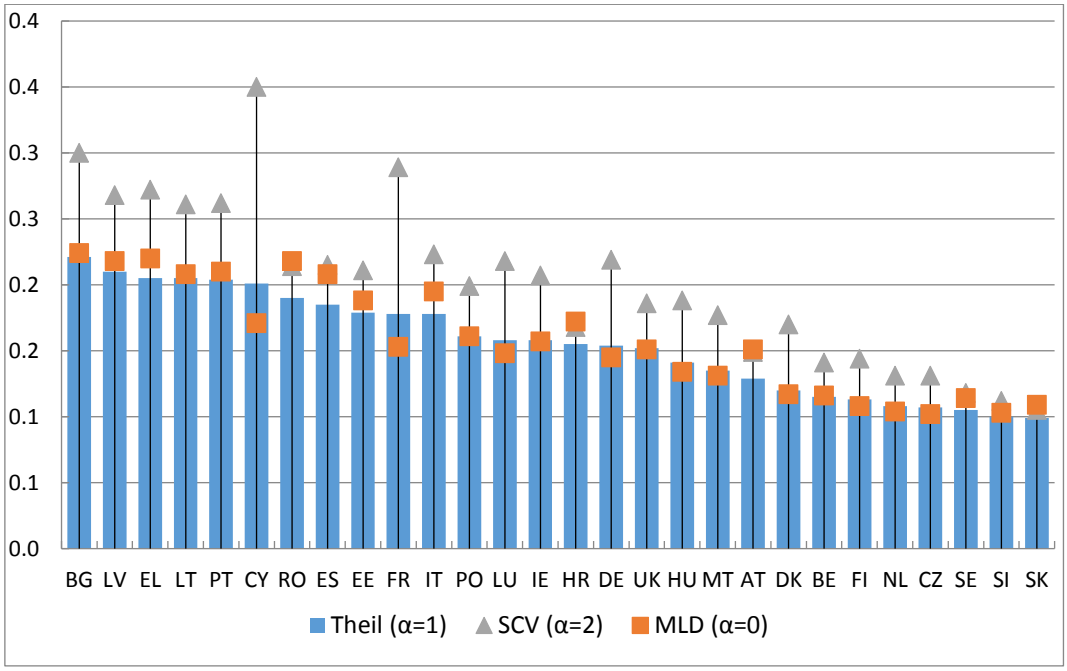
Where N is the number of individuals in the population, m is the number of subgroups, n_i is the number of individuals in each subgroup, L_i is the MLD of each subgroup, $\overline{x_i}$ is the average income of each subgroup, and $\overline{x}$ is the average income of the population.

Similarly to the Theil index, the first term represents the inequality within subgroups, whereas the second represents the inequality between subgroups.

Using the Theil index –i.e. GE(1)–, the most unequal EU-28 countries were Belgium, Latvia, Greece, Lithuania and Portugal (Figure 9). The results are almost identical if we focus on the changes in the lowest end of the income distribution, using the MLD –i.e. GE(0). Nonetheless, using the SCV –i.e. twice the GE(2)–, which focuses on the highest end, we can perceive bigger changes:

countries like France or Cyprus appear for the first time among the most unequal member states.

Figure 9. Generalized entropy measures for the EU-28 countries, 2012



Source: Own elaboration based on statistics from the European Commission.

Note: Countries appear ranked according to the highest Theil index.

All three measures in Figure 9 show high levels of correlation. But, as one might expect, MLD and SCV are the ones less correlated (76.27%), whilst the correlation coefficients of the other two pairs are above 90% –Theil and MLD, 94.92%; Theil and SCV, 91.99% (see Table 27 in Annex 2).

3.7. Atkinson class of measures

Similar to the Generalized Entropy measures, this group of statistics developed by Anthony Atkinson (1970) allows the researcher to calibrate the indicator's sensitivity to inequality by giving values to a theoretical constant ε that measures the "inequality aversion level".

The Atkinson index can be calculated using the following formula:

$$A(\varepsilon) = 1 - \left[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{x_i}{\overline{x}}\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \quad (\varepsilon \geq 0) \qquad \textit{Eq. 19}$$

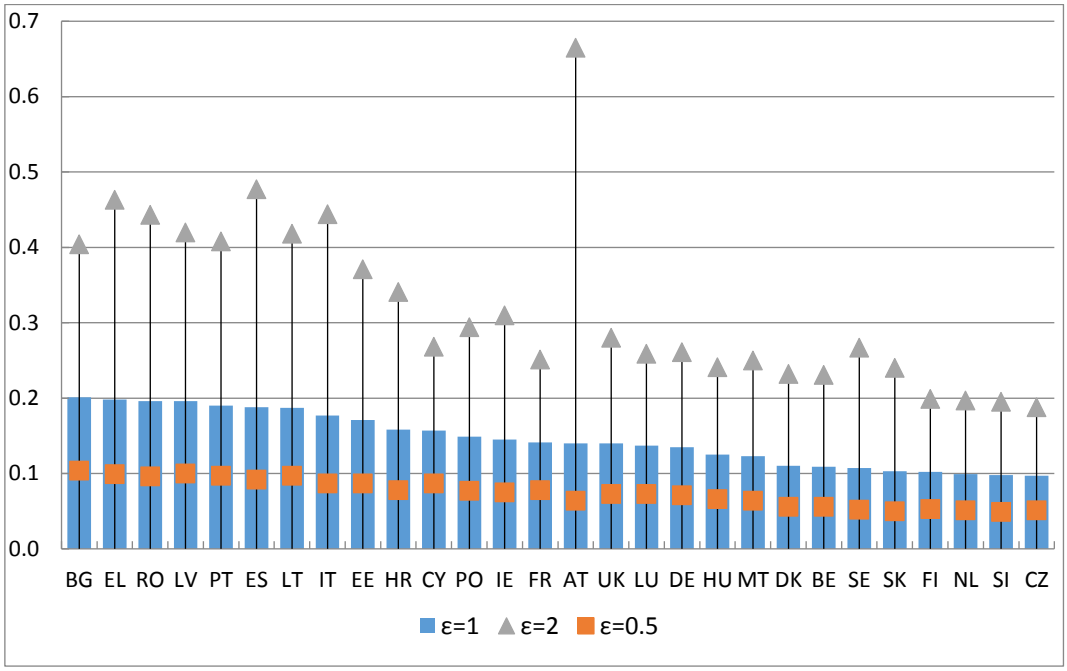
Where N is the number of individuals in the population, x_i is the income level of a given individual, $\overline{x}$ is the average income of the population, and ε is the inequality aversion level –also known as "Atkinson constant".

For increasingly higher values of the constant, the Atkinson index becomes more and more sensitive to changes in the lowest end of the distribution. By doing so, if we calculate the index for different levels of inequality aversion, we can determine if the changes in income inequality in a certain population are being driven more by changes at the top or at the bottom of the distribution.

To understand how it works, we can compare the different results of the index for some values of the constant. As we can see in Figure 10, for a low level inequality aversion ($\varepsilon = 0.5$) the most unequal EU countries are Bulgaria, Latvia, Greece, Portugal and Lithuania, whereas the most egalitarian are Slovenia, Slovakia, the Czech Republic, the Netherlands and Sweden. If we move towards a neutral level of inequality aversion ($\varepsilon = 1$), Lithuania is replaced by Romania as one of the countries with higher inequality, while Finland does the same with Sweden in the other group. Finally, for a high level of inequality aversion ($\varepsilon = 2$), we can see major changes in the first group: Austria, Spain and Italy enter the "most unequal group" –which is also made up of Greece and Romania. In the other end, nevertheless, the Czech Republic, Slovenia, the Netherlands and Finland remain as the most egalitarian member states –the entry of Denmark is the only significant change in this group.

These divergences become even more evident if we calculate the correlation coefficient of the Atkinson index for the three ε values chosen. A(0.5) and A(1) have a 98.64% correlation, whilst A(1) and A(2) show a correlation of 73.32%, and A(0.5) is only 64.94% correlated with A(2) (see Table 27 in Annex 2).

Figure 10. Atkinson indices for the EU-28 countries, 2012



Source: Own elaboration based on statistics from the European Commission.

Note: Countries appear ranked according to the highest Atkinson index (ε=1).

Finally, it should be noted that this indicator is the only measure analyzed in this study that fulfills all the conditions presented in the introduction.

4. Conclusions

The purpose of this chapter was summarizing and reviewing the most widely used poverty and inequality indicators, weighing up their advantages and disadvantages.

As we explained in the introduction, it is a critical issue for researchers and policy-makers to know and use these indicators in order to target, analyze and correct both poverty and inequality.

Since every indicator –or group of indicators– presented in this chapter provides Supplementary information, they should be used in conjunction with others for the purpose of having the best possible overall picture of the circumstances in a certain population.

Researchers should choose the indicators they will use considering their needs and the information that each one can provide. For instance, if we want to focus on the living conditions of the poor, we should choose the FGT class of measures to quantify the number of households below the poverty line and their distance to such threshold; but if we want to know more about the income distribution among the poor we should opt for the SST index, which takes into account this dimension of the problem.

Moreover, if we want to measure the gap between the rich and the poor –or the distance between these groups and the median household–, we should use the quantile ratios since they are the most suitable indicators for measuring income polarization. Additionally, considering their greater variability and their high correlation with the Gini coefficient, we could choose them as proxies of income inequality.

Conversely, if our focus is on income inequality for an entire population, we should use many of the aforementioned measures, but always taking into account the problems they have: although the Gini coefficient is the most widely used indicator to this end due to its simple interpretation and its comparability over time and across countries, we must also bear in mind that it is relatively insensitive to changes in the ends of the distribution, it cannot distinguish inequality patterns and it cannot be decomposed; the Hoover index provides little information about the way income distributes in a population and should be only used as a first glance for this issue; the Generalized Entropy measures allow to adjust its sensibility to poverty and are decomposable –which makes them the ideal choice for unraveling the patterns of inequality according to several criteria–, but they are not easily comparable since they can theoretically take values from zero to infinity; finally, the Atkinson measures suffer none of the drawback listed above, but nevertheless they are relatively little used, so there are scarce data available of them.

Regarding data availability on these issues, it should be noted that there are several databases where we can easily download normalized macro data for research purposes –Eurostat, the World Bank, the United Nations University World Institute for Development Economics Research, the OECD database, the

Luxembourg Income Survey, the World Wealth and Income Database, or the Standardized World Income Inequality Database (Solt, 2009). However, we should also note that these sources only offer time series for selected variables: headcount index, income shares and quantile ratios, and Gini coefficient –leaving aside the rest of indicators commented in this chapter.

Lastly, we must bear in mind that the data available on these subjects have many limitations owing to their sources. Almost every data source on income distribution comes from household surveys that involve issues such as an ever-growing unit and item non-response rate, and an increasingly large measurement error due to less accurate responses provided by the respondents (Meyer *et al*., 2015).

Chapter 2: Monetary policy and income distribution

1. Introduction

According to several reports from the OECD, the gap between the highest and lowest income groups in OECD member countries has been growing steadily for more than three decades, a trend that has accelerated since 2008, after the outbreak of the global financial crisis (OECD, 2009, 2012, 2013; 2014a, b, and c).

While the inequality levels have remained high –with a Gini coefficient close to 0.75– the fall of the East European communist regimes and the explosive growth experienced by China and India led to a readjustment in the way income is distributed globally (Lakner and Milanovic, 2016; Milanovic, 2016).

People around the global median, who are mostly from Asian countries, underwent a very significant increase in their income –although they are still relatively poor according to Western standards. At the same time, the top 1% of

the world, still composed mostly of individuals from developed countries, also achieved significant improvements in their incomes. Conversely, those in the bottom 50% of the income distribution of developed countries experienced a worsening of their relative situation, with their incomes stagnating or even declining.

In order to facilitate policy-making and recommend policy approaches to ease inequality, several studies have focused on the analysis of the main drivers of changes in income distribution: trade openness and economic freedom (Wood, 1995; Feenstra and Hanson, 2001; Meschi and Vivarelli, 2009; Bergh and Nilsson, 2010; Asteriou *et al.*, 2014; Pérez-Moreno and Angulo-Guerrero, 2016); technological change, giving special attention to the impact of information and communication technologies (ICTs), and its relation with the educational level of population (Bound and Johnson, 1992; Katz and Murphy, 1992; Acemoglu, 1998; Krusell *et al.*, 2000; Card and DiNardo, 2002; Van Reenen, 2011; Jaumotte *et al.*; 2013; Morita, 2016); the change of social norms on wage inequality (Piketty and Saez, 2006; Atkinson, 2008; Bakija *et al.*, 2012); the growth of the financial sector (Beck *et al.*, 2007; Jaumotte *et al.*, 2013; Kus, 2013; Lin and Tomaskovic-Devey, 2013; Van Arnum and Naples, 2013; Denk and Cournède, 2015); the loss of the political and social status of trade unions (DiNardo *et al.*, 1996; Acemoglu *et al.*, 2001; Card, 2001; Checchi and García-Peñalosa, 2008; Koske *et al.*, 2012; Farber *et al.*, 2018); the quality of institutions (Chong and Gradstein, 2007; Josifidis *et al.*, 2017; Arestis *et al.*, 2018) and the effect of redistributive policies (Goñi *et al.*, 2011; Bastagli *et al.*, 2012; Joumard *et al.*, 2012).

Similarly, much research has been carried out in order to analyze the effects of inequality on economic growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Barro, 2000; Forbes, 2000; Piketty and Saez, 2006; Pérez-Moreno, 2009), household debt levels (Iacovello, 2008; Barba and Pivetti, 2009; Rajan, 2011; Paz-Pardo and Sánchez-Santos, 2014), socio-political stability and social cohesion (Alesina and Perotti, 1996; Kawachi and Kennedy, 1997; Putnam, 2000; Stiglitz, 2012), crime and violence (Neapolitan, 1999; Daly *et al*., 2001; Fajnzylber *et al*., 2002), or life expectancy (Wilkinson, 1997; Kawachi and Kennedy, 1999; Lynch *et al*., 2000).

However, after the outbreak of the global financial crisis started in 2008, a factor that traditionally had stayed in the background began to attract researchers' attention: monetary policy. Although the channels through which this policy can affect income and wealth distribution may seem less intuitive at first glance than those of the above-mentioned factors, their influence on the evolution of inequality should not be ignored.

Accordingly, some recent studies (Saiki and Frost, 2014; Bivens, 2015; Cloyne and Hürtgen, 2016; Doepke *et al.*, 2015; Domanski *et al.*, 2016; Coibion *et al.*, 2017; Mumtaz and Theophilopoulou, 2017; O'Farrell and Rawdanowicz, 2017; Furceri *et al.*, 2018, Bárcena-Martín *et al.*, 2019) and monetary policy-makers (Coeuré, 2012; Bernanke, 2013; Bullard, 2014; Yellen, 2014; Panetta, 2015; Draghi, 2016; Constâncio, 2017) have emphasized the importance of the effects that monetary policy can have on income and wealth distribution and other related issues. All this evidence highlights the undeniable interest of the study of this matter.

Handing over monetary policy to independent central banks, like most developed economies, requires a better understanding of the effects that their actions may have on income distribution and, in particular, the association between monetary stability and inequality. Therefore, this chapter seeks to provide empirical evidence on the effects of monetary policy on the most widely used inequality indicators for two groups of countries: (i) a large sample of 62 countries that remain in control of their monetary policy, and (ii) the EU-15, where 80% of the countries transferred their monetary policy duties to the European Central Bank. This double study is conducted in order to determine whether the effects captured by previous studies –most of which focused on a single country– can be generalized to cross-country samples.

An outstanding feature of our first panel data study for 62 countries is its sample size and the variety of countries included in the sample, which includes countries from all continents and with very different levels of economic development. Also, unlike papers based on forecasting modelling –e.g. VAR or SVAR models–, our study follows an explanatory approach, including not only monetary variables, but also a series of regressors that may have a meaningful and significant impact on inequality, according to a wide literature.

In addition, some methodological aspects make our research a relevant contribution for the existing literature, particularly the studies that employ panel data. In this sense, we could highlight the following features of our research: (i) the use not only of Gini coefficients, but also of income polarization ratios; (ii) the implementation of dynamic panel modelling that addresses the slowness of changes in inequality indicators and corrects problems such as endogeneity, omitted variables (individual heterogeneity and temporal heterogeneity) and heteroscedasticity; (iii) considering that VAR/SVAR models are very sensitive to misspecifications of the identifying restrictions, the choice of lag length, the number and frequency of included variables, etc., this study could be used as a contrast with previous results obtained by that kind of modeling.

However, this same methodology could not be used for our second case of analysis, given the characteristics of the EU-15 sample. Therefore, we opted for a two-way fixed effects model, whose specifics are explained in detail in the corresponding section.

The chapter is organized as follows. First, we develop a literature review, analyzing, on the one hand, the channels through which monetary policy can have an impact on income distribution and, on the other hand, the findings of previous research on the subject. Next, we deal with the dependent and independent variables included in our first model, the justification of their inclusion and their basic descriptive statistics, we present and justify the econometric methods used, and we also show the results of our analysis. Afterwards, we discuss those results and their implications. Then, the same methodological approach is applied for the second sample under study. Finally, we summarize the conclusions.

2. Literature review

As discussed in the introduction, a great deal of literature has been written on this subject, particularly since the outbreak of the global financial crisis in 2008. The pioneering study by Coibion *et al.* (2017, originally published as a working paper in 2012) proposes a classification of the channels through which

monetary policy may have an impact on income and wealth distribution, as follows:

- *Income composition channel:* the diverse composition of the incomes of the different groups of households according to their source will cause that, if the effects of monetary policy on labor and capital income are not the same, the monetary policies may impinge on income inequality.
- *Financial segmentation channel:* if some agents trade in financial markets more frequently and are more rapidly affected by changes in the money supply, some monetary policies may redistribute wealth for their benefit.
- *Portfolio channel:* it works in the same way as the income composition channel but for the portfolio of real and financial assets held by households. It may affect wealth distribution instead of income distribution.
- *Savings redistribution channel:* an unexpected increase in interest rates or a drop in inflation will benefit savers and harm debtors. Considering that households with higher income levels tend to act as lenders for those at the other end of the distribution, monetary policies that could cause such consequences will increase the gap between both groups.
- *Earnings heterogeneity channel:* labor earnings are the main source of income for most households and this type of income will respond differently to monetary policies depending on the position of each household in the income distribution. The greater pro-cyclicality of employment and wages for low-income households –which are also the most dependent on wages as a source of income– will lead to an unequal transmission of the effects of monetary policy to the different income groups.

However, this list of channels is far from being complete, as there are other possible channels through which monetary policy can have an impact on the distribution of income and wealth (Martín-Fuentes and Pérez-Moreno, 2018).

Hence, the fact that the same monetary policy can cause –through the aforementioned five channels– effects of different magnitude and opposite direction on income, wealth and consumption inequality makes the net impact on

these variables uncertain a priori. In so far as the channels, from a theoretical perspective, do not provide any conclusive prediction, there have been a number of studies that sought to estimate the net distributive effects of monetary policy shocks.

In addition to carrying out a theoretical discussion on the potential transmission channels of monetary policy, Coibion *et al.* (2017) studied the effects of monetary policy shocks on the distribution of income and consumption in the United States since 1980. Their results suggest that contractionary monetary policies systematically increase inequality in labor earnings, total income, consumption and total expenditures.

Bivens (2015) analyzed the effects of the Federal Reserve's monetary policy before and after the onset of the Great Recession. He found that the expansionary policies implemented by the US monetary authority contributed to a sharp reduction in income inequality, while at the same time in the years leading up to the financial crisis, excessively contractionary monetary policy might have contributed to the large rise in income inequality experienced in the country.

Saiki and Frost (2014) focused on the distributional effects of the unorthodox monetary policy implemented by the Bank of Japan since 2008. Their results suggest that its zero interest rate policy and the return of an unconventional monetary policy contributed to increasing income inequality, especially through the portfolio channel.

Mumtaz and Theophilopoulou (2017) carried out a study on the distributive effects of monetary policy in the United Kingdom for the period 1969-2012. They find that contractionary monetary policy shocks led to an inequality increase in both income and consumption. Their evidence also points out that the quantitative easing policy may have had something to do with the increase in inequality during the Great Recession.

O'Farrell and Rawdanowicz (2017), using survey data from the United States, Canada, the Eurozone and the United Kingdom, came to the conclusion that monetary policy effects on income and net wealth inequality via financial channels tend to be small. In terms of wealth inequality, increases in housing prices generally reduce net wealth inequality, while the opposite is true for

increases in stock and bond prices. In turn, regarding the effects on income inequality, they seem to be small, but they may be larger when effects via employment are taken into account.

Finally, the study of Furceri *et al*. (2018) for a panel of 32 advanced and emerging economies between 1990 and 2013 suggests that, on average, contractionary monetary policy shocks contribute to an increase in income inequality, whereas expansionary monetary policy reduces it. However, its effect is asymmetric and depends on the economic cycle.

Therefore, the results of previous empirical research seem to indicate that, in general terms, expansionary monetary policy contributes to reducing income inequality, but also that, nevertheless, this condition may not be met in the presence of unconventional monetary policies. Further research is needed to, on the one hand, estimate more precisely the sign, magnitude and duration of the effects that monetary policy can have on income distribution, and, on the other hand, to determine whether these effects are replicated in most economies.

Considering that the net effects of monetary policy on income distribution are a priori unknown, our research contributes to the existing literature by estimating them for a heterogeneous set of 62 countries that maintain control of their monetary policy, using two possible proxies for this variable. In addition, we aim to estimate how long the effects of a change in monetary policy can be perceived in the distribution of income.

3. Empirical evidence for a panel of 62 countries

3.1. Sample and variables

Starting from a survey of the literature, in this section we present the sample and variables selected for studying the effects of monetary policy on

income inequality. At the end of this section, we include a table with the main descriptive statistics.

The sample consists of an annual data panel for up to 62 countries that have control of their monetary policy (Argentina, Australia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Ecuador, Egypt, Ghana, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Israel, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Malaysia, Mauritius, Mexico, Montenegro, Morocco, Namibia, New Zealand, Nigeria, Norway, Pakistan, Palestine, Panama, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russia, Singapore, South Africa, South Korea, Sri Lanka, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Kingdom, United States, Vietnam, Yugoslavia, and Zambia) during the period 1996-2015.

The countries and the analysis period chosen were conditioned by the availability of data to assemble a panel with as many observations as possible.

As for the dependent variables, we use the Gini coefficient of disposable income (*gini_disp*) and the Gini coefficient of market income before taxes and transfers (*gini_mkt*) as proxies of net and gross income inequality of the economies in the sample, respectively. Despite its limitations (Atkinson, 1970; De Maio, 2007; Palma, 2011; Martín-Legendre, 2018), the Gini coefficient is the most used measure to quantify inequality in a population, since it allows to summarize in a number between 0 and 100 the way a certain variable (income, wealth, consumption, etc.) is distributed among all the members of such population.

These data were retrieved from the Standardized World Income Inequality Database –SWIID (Solt, 2016). In this database, the author compiles data on income inequality, trying both to maximize comparability and to provide a range of countries and years as comprehensive as possible. Since its scope and comparability far exceed those of the alternatives –OECD, World Bank, UN, etc.–, the SWIID appears to be the most appropriate source for cross-national research on income inequality.

Moreover, recognizing the shortcomings of the Gini coefficient in capturing fluctuations in income polarization, we included two additional

explained variables: on the one hand, the Palma ratio (*palma*), which is defined as the ratio of the richest 10% of the population's share of gross national income, divided by the poorest 40% of the population's share; on the other hand, the S80/S20 ratio (*s80s20*), which is defined as the ratio of the richest 20% of the population's share of gross national income, divided by the poorest 20% of the population's share. The data for the calculation of both variables were drawn from the World Bank database, which, however, is much more patchy than that of SWIID, so the sample reduced considerably, making the results not perfectly comparable.

We decided to include these last two measures to correct the relative "insensitivity" of the Gini coefficients to changes at the ends of the distribution, which are the most volatile segments, although it is also worth mentioning that this second set of variables does not adequately measure income inequality –they measure income polarization– since they exclude 50% and 60% of the population in their calculation, respectively.

Regarding the independent variables, we opted to include monetary policy, which is the central focus of our analysis, and a series of control variables that, as mentioned in the introduction, are closely linked to the evolution of inequality: trade openness, growth in the financial sector, educational level of population, technological change, public expenditure policies, as well as the level of unemployment.

To proxy the monetary policy of the countries included in the sample, we considered two alternatives: the money supply, measured by the monetary aggregate M3 as a percentage of GDP (*m3_gdp*) and the real long-term interest rates (*realit*). The World Bank, data source for both variables, defines the monetary aggregate M3 as the sum of currency outside banks, demand deposits other than those of the central government, savings, and foreign currency deposits of resident sectors other than the central government, bank and traveler's checks, and other securities such as certificates of deposit and commercial paper. The real interest rate is defined as the lending interest rate –i.e. the rate charged by banks for loans that meet the short and medium-term financing needs of the private

sector– adjusted for inflation as measured by the GDP deflator, and is calculated from the following expression:

$$Real\ interest\ rate\ =\ (i\ -\ P)\ /\ (1\ +\ P) \qquad \textbf{\textit{Eq. 20}}$$

Where i is the nominal lending interest rate and P is the inflation rate, measured by the GDP deflator.

Real long-term interest rates have been widely used in the literature as a proxy for monetary policy (Fazzari, 1993; Passamani and Tamborini, 2007; Dickens, 2016). This variable, which can be defined either *ex-ante* or *ex-post*, is a relevant indicator to assess the looseness of monetary conditions. On the one hand, the *ex-ante* interest rates try to measure the yield or the expected actual cost over the time-horizon of an active or passive transaction. On the other hand, the *ex-post* interest rates refer to the actual cost or yield finally obtained when the operations have expired. In terms of spending decisions, the *ex-ante* rate is the most relevant, although usually it is not observable. For this reason, the most common approach is to subtract from the nominal interest rate an expected inflation measure over the time-horizon of the instrument, which can be approximated by means of different procedures –moving averages of observed inflation rates, statistical or econometric methods based on the analysis of time series or on multivariate behavioral relations, or analysts' expectations, such as those published by *Consensus Economics* (Blanco and Cabrero, 2005).

Anyway, this last indicator is not without its problems: on the one hand, the possible existence of an illiquidity premium, given their low liquidity, could bias the level of real interest rates upwards; on the other hand, the asymmetric compensation of inflation in these products will tend to introduce a downward bias. In turn, the value and growth rate of the monetary aggregate M3 is considered a relevant variable by central banks to analyze monetary developments and inflation assessment, due to the strong theoretical link among broad money and fundamental variables, such as price levels and output growth.

The increase in international trade over the last decades has allowed companies to incorporate technology more easily in order to save time and labor, or to relocate their activity in regions where production costs are much lower

(Dabla-Norris *et al.*, 2015). This new scenario has contributed to the reduction of inequality among countries, but it has particularly punished the working classes of the industrialized countries, so globalization could be considered as one of the main causes of the increase of income inequality in these countries (Bergh and Nilsson, 2010). Despite this, the net effects of trade liberalization on income distribution are, a priori, unknown considering that the increase of this variable promotes the economic growth, and could contribute to the rise of real wages due to the cheapening of importations (Dabla-Norris *et al.*, 2015). As a proxy for trade openness (*trade*), we use World Bank data, which express this indicator as the ratio of the sum of exports and imports of goods and services in relation to GDP.

Besides, the growth of financial services could have had an impact on the income distribution through several channels. On the one hand, widespread access to financial services may have reduced inequality by favoring a better allocation of resources that allows individuals to plan for the long term, and better adapt to short-term shocks. However, most wealthy people own a high proportion of financial assets, which implies they become much more favored than the rest of population by the growth of the financial sector (Van Arnum and Naples, 2013). In addition, this increase in income inequality could be amplified by the growth in size of the financial sector –an increasingly skill-intensive sector–, widening the gap between skilled and unskilled workers (Philippon and Reshef, 2007). To represent the growing influence of the financial sector (the degree of financialization of the economy) we use two variables, both also taken from the World Bank database:

- Access to financial services (*credit*) is represented by the domestic credit to the private sector as a proportion of GDP. Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, by means of loans, purchases of non-equity securities, and trade credits and other receivable accounts, which establish a claim for repayment.
- The performance of capital markets (*stocks*) is proxied by the total value of shares traded as a percentage of GDP. The calculation is made including the total number of shares traded, both domestic and foreign, multiplied by their respective prices.

As a result of technological change and globalization, the demand of skilled workers have increased remarkably, raising the skill-premium and widening the wage gap between skilled and unskilled workers (Autor et *al.*, 2006). In order to measure the educational attainment of the adult population (*myschool*) and its evolution over time, we used the mean years of schooling. This variable, utilized by the United Nations to obtain the Human Development Index (HDI), is calculated taking into account the average number of years of education received by people aged 25 and over in their lifetime.

Literature suggests that a skill-biased technological change may have contributed to increase the skill-premium in developed countries and, as a result, income inequality (Acemoglu, 1998). The incorporation of new technologies into production processes –accelerated by the progressive elimination of barriers to trade– is complemented by the specialized training acquired by skilled workers, aimed at the performance of non-routine tasks, while it destroys jobs of unskilled workers who carry out repetitive tasks. This process favors the widening of the wage gap between both groups of workers, and, ultimately, is another key factor for explaining the increase in income inequality. Technological progress (*gerd*) is represented by total expenditure –i.e., including both capital and current expenditure– on research and development (R&D) as a percentage of GDP.

In recent years, the gradual renouncement to tax and expenditure redistributive policies aimed at correcting the market income distribution may have played a key role in the increase of the inequality experienced by the countries under analysis (Alesina and Perotti, 1996; Bastagli *et al.*, 2012; Joumard *et al.*, 2012). Although we do not have data for this specific type of policies, we can roughly measure the size of the public sector in each country through total public expenditure as a share of GDP (*govtexp*), which is defined as all cash payments for operating activities of the government in providing goods and services, and it includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends.

The evolution of economic activity and its relation with labor market flexibility –which we measure using the unemployment rate– could have had a clear impact on the increase of the variables used to assess inequality. The

unemployment rate (*unem*) is approximated by the share of people in the labor force that is without work but available for and seeking employment. The data are based on International Labor Organization (ILO) estimates and were harmonized to ensure comparability among countries and over time.

In a sample as heterogeneous as ours, there are countries in which demographic ageing is becoming an increasingly important issue, and it is questionable whether the demographic structure has any significant effect on income distribution. The population aged 65 years and over as a percentage of the total population (*pop65*) counts all residents regardless of their legal status or citizenship who meet this condition, excluding refugees that are not permanently settled in the host country, who are usually considered part of the population of their respective home countries.

GDP growth (*gdpgr*) is calculated as the annual percentage growth rate of gross domestic product at market prices in local currency, at constant prices.

Finally, the growth of the monetary aggregate M3 (*m3growth*) is measured by the annual percentage growth rate of the monetary aggregate in local currency at constant prices, as defined above.

The inclusion of other potentially relevant variables to explain income distribution –such as the unionization rate, the ICT goods and services exports, or the social expenditure– was ruled out because, considering the scarcity of data, it would mean the loss of a significant number of observations in the sample, which would undermine one of the objectives of our analysis.

Table 1 shows the main descriptive statistics of the variables included in our model.

In the econometric models of our analysis, all variables, except those that can take negative values, were transformed to logarithms to facilitate the interpretation of the results.

Table 1. Main descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
gini_disp	626	38.8161	8.7285	21.2000	58.7000
gini_mkt	626	46.7476	6.8258	27.9000	68.5000
palma	319	2.2112	1.3266	0.8240	7.4384
s80s20	319	9.8538	6.7564	3.3365	37.8750
realit	426	6.3330	8.9775	-11.6007	66.1551
m3_gdp	626	79.2672	56.1843	15.0591	362.8582
trade	626	87.6358	77.4088	18.3490	442.6200
credit	626	76.4480	52.9144	5.3651	233.2110
stocks	626	47.9078	90.2141	0.0196	952.6673
myschool	626	9.4511	2.4166	3.0000	13.4000
gerd	626	1.1223	1.0221	0.0054	4.4055
govtexp	504	25.5930	8.9358	8.0780	46.7734
unem	626	7.9529	4.7963	0.4000	27.1000
pop65	626	9.9270	4.7035	1.0245	25.3524
gdpgr	626	3.8412	3.3986	-10.8945	15.2404

Source: Own elaboration.

3.2. Model and results

Our first model can be written as:

$$y_{it} = \beta_{0i} + \beta_1 y_{i,t-1} + \beta_2 year + \beta_3 m3\_gdp_{it} + \beta_4 trade_{it} + \beta_5 credit_{it} + \beta_6 stocks_{it} + \beta_7 myschool_{it} + \beta_8 gerd_{it} + \beta_9 govtexp_{it} + \beta_{10} unem_{it} + \beta_{11} pop65_{it} + e_{it} \quad \textit{Eq. 21}$$

Where *y* is *gini_disp*, *gini_mkt*, *palma* or *s80s20*, consecutively; β_{0i} is the fixed term that captures individual heterogeneity (i.e., individual-specific effects that are constant over time and not directly observed or included in the model); *year* (that is equal to *t*) is the fixed term that catches temporal heterogeneity (i.e., time-specific effects that are common for all the countries), and *e* is the error term.

Bearing in mind that many economic relationships are dynamic in nature, a particular strength of panel data is that they help the researcher to better grasp the dynamics of adjustment. For this purpose, it is strongly recommended to use

dynamic panel data (DPD) econometric methods, since they allow the estimation to account for persistence over time by including lags of the dependent variable and individual effects characterizing the heterogeneity among the individuals (Baltagi, 2005).

Arellano and Bond (1991) developed a GMM (that is, Generalized Method of Moments) procedure that uses first differences of the variables as instruments to produce estimates of the parameters in order to eliminate individual specific effects –and, therefore, any time-invariant independent variable– and any endogeneity caused by the correlation of these individual effects with the other regressors.

Nevertheless, we will use the Blundell-Bond extended system-GMM estimator –first outlined by Arellano and Bover (1995) and then fully developed by Blundell and Bond (1998 and 2000) and Blundell *et al.* (2000)– since the Arellano-Bond approach tends to produce poor estimators for relatively short data series. This method uses lagged differences as instruments for equations in levels along with lagged levels of the dependent variable for equations in first differences.

This estimation method requires performing the Arellano-Bond tests for AR(1) and AR(2) and the difference-in-Hansen tests of exogeneity of instrument subsets to determine if there are autocorrelation and endogeneity problems, respectively. Both tests were passed in 97.22% of our estimates.

Finally, using the most common practice in literature, our estimated parameters are corrected for heteroscedasticity. In addition, taking into account that the extended system-GMM method offers the possibility of performing estimations in one or two steps, we have opted to use the latter, since it is asymptomatically more efficient.

The Pearson correlation coefficient revealed that in no case the variable selected reached a correlation above 60 percent with any other regressor.

The estimates obtained for this first model are shown in Tables 2 and 3. [Li (i = 1, 2) stand for the first and second lag of the respective above-named variable in the table].

Table 2. System-GMM estimates for income inequality using M3 (% of GDP) as monetary policy proxy

	Disposable income (*gini_disp*)				Market income (*gini_mkt*)		
gini_disp				***gini_mkt***			
L1.	0.7809***	0.7738***	0.7637***	***L1.***	0.6606**	0.6638***	0.6780***
m3_gdp				***m3_gdp***			
--.	0.0078	0.0037	0.0030	***--.***	0.0081	0.0024	0.0002
L1.		0.0043	-0.0018	***L1.***		0.0060	0.0017
L2.			0.0062	***L2.***			0.0065
year	0.0052	0.0053***	0.0056**	***year***	0.0071	0.0070	0.0067
trade	-0.0023	-0.0031	-0.0022	***trade***	-0.0044	-0.0044	-0.0042
stocks	0.0036	0.0031	0.0036	***stocks***	0.0014	0.0013	0.0013
gerd	-0.3957	-0.3958	-0.3996	***gerd***	0.0549	0.0112	-0.0098
govtexp	-0.0251	-0.0194	-0.0269				
unem	0.1167**	0.1145**	0.1186**	***unem***	0.2212	0.2203	0.2137
pop65	-0.2385	-0.2482**	-0.2447*	***pop65***	-0.0611	-0.0526	-0.0448
Obs.	504	495	486	**Obs.**	625	615	606
Groups	54	53	53	**Groups**	62	61	61

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 3. System-GMM estimates for income polarization using M3 (% of GDP) as monetary policy proxy

	Palma ratio (*palma*)				S80S20 ratio (*s80s20*)		
palma				***s80s20***			
L1.	0.5503***	0.6102***	0.5293***	***L1.***	0.4883**	0.5467**	0.4658*
m3_gdp				***m3_gdp***			
--.	0.0028*	0.0033	0.0048	***--.***	0.0160**	0.0145	0.0071
L1.		-0.0007	-0.0013	***L1.***		0.0015	0.0071
L2.			0.0002	***L2.***			0.0030
year	0.0008**	0.0006**	0.0008**	***year***	0.0038*	0.0032	0.0042*
trade	-0.0041***	-0.0040**	-0.0047**	***trade***	-0.0225**	-0.0219*	-0.0251*
stocks	-0.0020	-0.0010	-0.0018	***stocks***	-0.0135*	-0.0091	-0.0117
gerd	0.1239	0.0644	0.0716	***gerd***	0.8052	0.4075	0.6190
govtexp	-0.0023	-0.0058	-0.0122	***govtexp***	-0.0317	-0.0197	-0.0442
unem	0.0211	0.0261	0.0327	***unem***	0.1725	0.1595	0.1693
pop65	-0.0639**	-0.0468*	-0.0514	***pop65***	-0.3221*	-0.2528	-0.3086
Obs.	184	182	178	**Obs.**	184	182	178
Groups	24	24	24	**Groups**	24	24	24

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Our first estimates show that an increase in the broad monetary aggregate M3 as a share of the country GDP is not significantly associated with an increase in income inequality measured by the Gini coefficients of disposable and market income. In terms of income polarization, our estimates reveal that the impact of money supply as a percentage of GDP on this variable is virtually non-existent.

The remaining explanatory variables show different levels of significance depending on the explained variable under consideration. Unemployment has a statistically significant and positive effect on the disposable income Gini index, so a rise in unemployment results in an increase in inequality.

Moreover, the ageing of population has an appreciable effect only on the distribution of income after taxes and transfers –both in terms of inequality and polarization. Its negative sign indicates that the higher the proportion of the population over 65, the lower the inequality. This may be due to the relative reduction in income differences between retired people compared to those existing when they were working.

Finally, trade openness is persistently significant to explain changes in income polarization. The negative sign of its coefficient could be explained by the fact that an increase in trade flows as a result of further trade openness, especially in developing countries, leads to a growing demand and higher wages for unskilled workers, thus reducing both ratios that measure income polarization.

However, the circumstance that our first monetary policy variable is a ratio may mask relatively more complex results. The increase in this ratio may not necessarily be due to an expansionary monetary policy (increase in the numerator) but to a contraction in the gross domestic product (reduction in the denominator). In other words, it should be taken into account that the variations of this ratio depend on the growth rate of the two variables that compose it.

To consider this issue, we decided to replace the variable *m3_gdp* by the growth rates of the monetary aggregate M3 (*m3_gr*) and the GDP (*gdpgr*) as regressors in Equation 22. The results for this new specification can be seen in Tables 4 and 5.

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Table 4. System-GMM estimates for income inequality using M3 growth as monetary policy proxy

	Disposable income (*gini_disp*)				Market income (*gini_mkt*)		
gini_disp				***gini_mkt***			
L1.	0.8134***	0.8119***	0.8077***	***L1.***	0.6841***	0.6869***	0.7071***
m3_gr				***m3_gr***			
--.	-0.0022	-0.0020	-0.0027	***--.***	-0.0093	-0.0084	-0.0077
L1.		-0.0003	-0.0006	***L1.***		-0.0053	-0.0049
L2.			-0.0010	***L2.***			-0.0009
year	0.0046**	0.0046***	0.0047***	***year***	0.0069	0.0068	0.0064*
gdpgr	-0.0119	-0.0099	-0.0100	***gdpgr***	0.0009	0.0059	0.0058
trade	-0.0015	-0.0016	-0.0014	***trade***	-0.0028	-0.0023	-0.0024
stocks	0.0030	0.0025	0.0021	***stocks***	0.0033	0.0029	0.0028
gerd	-0.2098	-0.1828	-0.1895*	***gerd***	0.0586	0.0343	0.0178
govtexp	-0.0270	-0.0258*	-0.0282*	***govtexp***			
unem	0.0952**	0.0958***	0.0982***	***unem***	0.1961	0.1922*	0.1804*
pop65	-0.1934**	-0.1880**	-0.1918**	***pop65***	-0.0449	-0.0408	-0.0357
Obs.	495	486	477	**Obs.**	615	606	597
Groups	53	53	53	**Groups**	61	61	61

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 5. System-GMM estimates for income polarization using M3 growth as monetary policy proxy

	Palma ratio (*palma*)				S80S20 ratio (*s80s20*)		
palma				***s80s20***			
L1.	0.5923***	0.5169***	0.6019***	***L1.***	0.4886***	0.5286**	0.4969**
m3_gr				***m3_gr***			
--.	-0.0002	-0.0002	-0.0005	***--.***	-0.0048	-0.0098	-0.0059
L1.		-0.0009	-0.0011	***L1.***		-0.0109*	-0.0066
L2.			-0.0014	***L2.***			-0.0083
year	0.0008**	0.0009**	0.0008*	***year***	0.0044**	0.0040*	0.0042*
gdpgr	-0.0049	-0.0051	-0.0025	***gdpgr***	-0.0216	-0.0080	-0.0372
trade	-0.0037**	-0.0046**	-0.0031**	***trade***	-0.0202*	-0.0213**	-0.0226
stocks	-0.0006	-0.0008	-0.0003	***stocks***	-0.0059	-0.0051	0.0003
gerd	0.1260	0.1114	0.0834	***gerd***	0.7051	0.4864	0.0248
govtexp	-0.0055	-0.0078	-0.0093	***govtexp***	-0.0446	-0.0474	-0.0198
unem	0.0219	0.0314	0.0171	***unem***	0.1895	0.1406	0.1450
pop65	-0.0519*	-0.0548*	-0.0385	***pop65***	-0.3122*	-0.2148	-0.2502
Obs.	182	178	172	**Obs.**	182	178	172
Groups	24	24	24	**Groups**	24	24	24

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Neither of the growth rates is generally relevant to explain the behavior of inequality indicators. In other words, according to this first proxy, monetary policy has no significant effect on income distribution. Nevertheless, it should be noticed that the growth rate of M3 is occasionally significant at 10% to explain changes in the S80/S20 ratio and takes a negative sign. This sign suggests that expansionary monetary policies are likely to reduce polarization in income distribution –although the lack of persistence of this finding throughout successive iterations of the model does not allow drawing solid conclusions in this regard.

In addition, the results presented in Tables 4 and 5 in relation to the control variables are revalidated: unemployment, population ageing and trade openness are the main variables to explain variations in inequality and polarization after taxes and transfers.

However, it is worth noting that in these new estimates, although with relatively weak levels of significance, public expenditure seems to gain some relevance to explain the Gini coefficient of disposable income. The negative sign of the coefficients indicates, as expected, that increases in the size of the public sector lead to reductions in inequality.

Nevertheless, a different approach to explain the effects of monetary policy on income distribution would consider using the real interest rate (*realit*) as a monetary policy variable. This variable is a particularly appropriate indicator of the degree of looseness of monetary conditions in each country, since it allows us to assess how the impulses of monetary policy, measured in the first model using the monetary aggregate M3, are transmitted to the real economy.

The corresponding estimates of this second model (which is expressed as Equation 22, but replacing *m3_gdp* by *realit*) are presented in Tables 6 and 7.

Table 6. System-GMM estimates for income inequality using real interest rate as monetary policy proxy

	Disposable income (*gini_disp*)				Market income (*gini_mkt*)		
gini_disp				***gini_mkt***			
L1.	0.8779***	0.8798***	0.8822***	***L1.***	0.7514***	0.7560***	0.7504***
realit				***realit***			
--.	0.0046	0.0065	0.0069	***--.***	0.0217	0.0205*	0.0162**
L1.		0.0002	-0.0005	***L1.***		0.0050	-0.0030
L2.			0.0009	***L2.***			0.0104
year	0.0029***	0.0028***	0.0027***	***year***	0.0055**	0.0054**	0.0055**
trade	-0.0002	-0.0003	-8E-06	***trade***	-0.0038	-0.0034	-0.0036
stocks	0.0014	0.0015	0.0017	***stocks***	0.0037	0.0034	0.0039
gerd	-0.2395*	-0.2551**	-0.2773*	***gerd***	-0.0632	-0.0407	0.0174
govtexp	-0.0154	-0.0149	-0.0200	***govtexp***			
unem	0.0659**	0.0647***	0.0753***	***unem***	0.1427*	0.1454*	0.1487*
pop65	-0.0936*	-0.0862	-0.0740	***pop65***	-0.0485	-0.0438	-0.0641
Obs.	347	340	334	**Obs.**	446	438	429
Groups	40	40	39	**Groups**	48	48	47

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 7. System-GMM estimates for income polarization using real interest rate as monetary policy proxy

	Palma ratio (*palma*)				S80S20 ratio (*s80s20*)		
palma				***s80s20***			
L1.	0.2387	0.6343	0.5433	***L1.***	0.3789	0.1426	0.4372
realit				***realit***			
--.	0.0219**	0.0106	0.0120**	***--.***	0.0460	0.0948	0.0533
L1.		0.0045	0.0017	***L1.***		0.0919	0.0006
L2.			0.0047	***L2.***			0.0315**
year	0.0015***	0.0007	0.0009	***year***	0.0063***	0.0070	0.0061*
trade	-0.0076*	-0.0048	-0.0052	***trade***	-0.0354	-0.0365	-0.0373
stocks	-0.0007	0.0003	0.0020	***stocks***	-0.0188	-0.0067	-0.0271
gerd	0.2785	0.0685	-0.0211	***gerd***	2.9991	1.1663	3.3486
govtexp	-0.0026	-0.0074	-0.0058	***govtexp***	-0.0755	-0.0507	-0.1048
unem	0.0319	0.0057	0.0183	***unem***	0.1955	0.0999	-0.0063
pop65	-0.1262**	-0.0385	-0.0571	***pop65***	-0.5181	-0.4672	-0.3418
Obs.	101	99	97	**Obs.**	101	99	97
Groups	15	15	15	**Groups**	15	15	15

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Neither the real long-term interest rate nor its two lags are significant to explain the behavior of the disposable income inequality indicator, whereas other variables such as technological change, unemployment rate or population ageing are relevant. Conversely, changes in real interest rates are significant in relation to the market Gini in the same year they take place. This finding is another evidence of the fact that expansionary monetary policies contribute to the reduction of inequalities in income distribution.

However, as regards polarization indicators, the monetary policy variable is consistently significant for the first time in our analysis. Both the variable in levels (*realit*) and its second lag are significant at 5% –always with a positive sign– to explain changes in both ratios. In other words, as Draghi (2016) explains, a drop in real interest rates –which could have negative redistributive effects, for example through asset prices– results in a reduction in inequality in the short and medium term. This can be attributed to the fact that looser monetary conditions lead to a stronger aggregate demand, a rapid reduction in unemployment and price stability in the medium term, all of which contribute to a reduction in inequality.

As for the control variables, besides those that were already significant in the two previous models (unemployment, ageing and trade openness), there are several others that have noticeable levels of significance. For example, public spending, which was already showing signs of its importance in Tables 4 and 5, reveals to be a relevant variable in reducing income polarization –although the robustness of the results is far from being convincing.

Finally, technological change has a modest but significant effect on post-tax inequality and polarization. Its negative sign is a somewhat puzzling result since technological change is generally associated in the literature with more unequal income distributions since it favors certain abilities by increasing the demand for skilled labor, widening the income gap between skilled and unskilled workers.

In addition, the high significance and positive sign of the estimated coefficient of the first lag of each explained variable that is repeated in practically all iterations of the model implies that the present values of the dependent variable are strongly correlated with the past ones –i.e. there is a dynamic that indicates an

"inertia" in the temporal evolution of income inequality and polarization in this case.

On the other hand, the time variable (*year*) is statistically significant with a positive sign for all estimates that consider the distribution of income after taxes. This finding shows the existence of common economic cycles that affect the countries included in the sample and that paved the way for an increase in income inequality after taxes. This result is particularly robust for the Gini coefficient of disposable income, slightly weaker but still relevant for the ratios, and practically non-existent for the market Gini coefficient, which suggests that changes in the income distribution derived from common economic cycles resulted in an increase in income inequality after taxes and had a mildly smaller impact on income polarization.

4. Empirical evidence for the EU-15

4.1. Sample and variables

In this section we present the variables selected for studying the effects of monetary policy on income inequality for a second sample that comprises the EU-15 countries. At the end of this section, we include a table (Table 8) with the main descriptive statistics, as well as the data sources.

As for the dependent variables, we use again the Gini coefficient of equalized disposable income (*gini_disp*) and the Gini coefficient of equalized disposable income before social transfers (including pensions) (*gini_mkt*) as a proxy of net income inequality and market income inequality, respectively. However, as mentioned in the previous section, the measure of inequality is nonetheless a very complex task, which means there is no single indicator that can cover all the inequality dimensions.

Consequently, in order to make the results as consistent as possible and to ensure more sensitivity to changes at the ends of the distribution, two additional dependent variables were included in the model: the Palma ratio (*palma*), and the S80/S20 ratio (*s80s20*), both of which are defined in the previous section. We were impelled to their inclusion, as explained before, due to the relative "insensitivity" of the Gini coefficients to changes at the ends of the distribution, the most volatile segments.

Regarding the independent variables, we considered appropriate to include the following ones, which are discussed below: monetary policy, growth of financial sector, trade openness, technological change, redistributive policies, tertiary education, sectoral structure of employment, trade union influence –and the lack of thereof–, aging of the population, and structural unemployment –these last three explanatory variables do not appear in previous models to explain the behavior of income inequality; the justification for their inclusion is detailed afterwards. We were able to include a larger set of control variables, reflecting the broader availability of data for the countries in this second sample.

To proxy monetary policy, we use again the real interest rate. However, considering that monetary policy impulses are transmitted with a certain delay to the real economy and, ultimately, the income distribution, we include both the variable in levels (*yrir*) and its first lag (*l1_yrir*). It should be noted that, after the introduction of the euro in 1999, twelve out of fifteen countries included in the sample transferred their sovereignty in monetary policy matters to the European Central Bank –making the use of monetary aggregates as an explained variable not applicable in this case. But in spite of the common monetary policy implemented by the ECB, the real interest rates of each Eurozone country evolved differently as a result of the unequal inflation levels faced by every country.

As for explanatory control variables, we have included in this second empirical inquiry a set of variables that was already included in the previous section (trade openness, growth of the financial sector, technological change, educational attainment, redistributive fiscal policies, and ageing of the population) and new variables that will allow us to expand our insights into the determinants

of inequality (sectoral structure of employment, influence of trade unions, and strucutral unemployment).

Some variables have been proxied differently in this second study compared to the one carried out in the previous section. Excluding trade openness (*trade*) and population ageing (*pop65*), which maintain their previous definition, the new definitions of the variables are those presented below.

As explained earlier, the growth of financial services could have had an impact on the income distribution through several channels. On the one hand, widespread access to financial services may have reduced inequality by favoring a better allocation of resources that allows individuals to plan for the long term, and better adapt to short-term shocks. However, most wealthy people own a high proportion of financial assets, which implies they become much more favored than the rest of the population by the growth of the financial sector (Van Arnum and Naples, 2013). In addition, this increase in income inequality could be amplified by the growth in size of the financial sector –an increasingly skill-intensive sector–, widening the gap between skilled and unskilled workers (Philippon and Reshef, 2007).

As a proxy for the access to financial services –or "financial deepening"– we use the domestic credit to the private sector measured as a share of gross domestic product (*credit*) (Dabla-Norris *et al.*, 2015). While as a proxy for the behavior of the capital markets, we use share price indices, calculated from the prices of common shares of companies traded on national or foreign stock exchanges (*shareprices*).

Moreover, literature suggests that a skill-biased technological change may have contributed to increase the skill-premium in developed countries and, as a result, income inequality (Acemoglu, 1998). The incorporation of new technologies into production processes –accelerated by the progressive elimination of barriers to trade– is complemented by the specialized training acquired by skilled workers, aimed at the performance of non-routine tasks, while it destroys jobs of unskilled workers who carry out repetitive tasks. This process favors the widening of the wage gap between both groups of workers, and,

ultimately, is another key factor for explaining the increase in income inequality. As a proxy for long-term technological change, we use total factor productivity (*tfp*).

As a result of technological change and globalization, the demand of skilled workers have increased remarkably, raising the skill-premium and widening the wage gap between skilled and unskilled workers (Autor *et al*., 2006). Nevertheless, the fact that the relative size of both groups and the income distribution within them can change over time makes the net effects of changes that educational attainment has on inequality unknown a priori. In order to approximate this variable, we took into account the UNESCO International Standard Classification of Education (ISCED), which decomposes the level of educational attainment into nine categories, from 0 (Pre-primary education), to 8 (Doctorate or equivalent). Following the aforementioned classification, we use as a proxy for this variable population aged 15–64 with tertiary educational attainment (levels 5-8) as a share of total population aged 15-64 (*univ*).

In this case we do have specific data on social spending by the EU-15 member states. In recent years, the gradual abandonment of tax and expenditure redistributive policies aimed at correcting the market income distribution may have played a key role in the increase of the inequality experienced by the countries under analysis (Alesina and Perotti, 1996; Bastagli *et al.*, 2012; Joumard *et al*., 2012). As a proxy for this variable, we use total social expenditure as a share of gross domestic product (*socx*).

Regarding the sectoral structure of employment, we seek to approximate the level of prevalence of the service sector over the industry sector in terms of employment, in order to measure the effect that the tertiarization of the European economy may have had on income inequality –considering the primary sector contribution to the economy of the countries under analysis is negligible. As a proxy for this variable, we use the difference between employment in services and employment in industry, both expressed as a share of total employment (*dif_serind*).

Furthermore, the loss of political influence by trade unions, which for decades helped to counteract the income accumulation of the higher-income groups, may have had a direct impact on inequality, contributing to its increase (DiNardo *et al*., 1996; Acemoglu *et al*., 2001; Card, 2001). Two variables can be used as proxies for this process: the workers' level of union protection in a given country, and the lack of thereof. Respectively: trade union density (*union*), which corresponds to the ratio of wage and salary earners who are trade union members, regarding the total number of wage and salary earners, and (ii) self-employment as a percentage of total employment (*selfemp*). In relation to this, self-employed workers are those workers who, working on their own account or with one or a few partners or in cooperative, hold the type of jobs defined as "self-employment jobs", i.e. jobs where the remuneration directly depends on the profits derived from the goods and services produced. Self-employed workers include four sub-categories: employers, own-account workers, members of cooperatives, and contributing family workers.

Finally, the risk of exclusion from the labor market suffered by many citizens who have been unemployed for long periods could have had a clear impact on the increase of the variables used to measure inequality. In addition, it would be interesting to compare southern and northern countries, where long-term unemployment is a problem of varying magnitude. As a proxy for this variable, which does not appear in the literature consulted as a factor that could explain the behavior of income inequality, we use the long-term unemployment rate as a share of total unemployment (*ltunem_u*).

Thus, the sample consists of an unbalanced panel of annual data for the EU-15 countries throughout the period 1995-2014. The EU-15 is the group of member countries of the European Union prior to the accession of ten candidate countries on 1 May 2004, and is comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

The countries and the period of analysis chosen are due to data availability for constructing a panel with the highest number of observations.

After discussing all the variables included in our model, we include their main descriptive statistics in Table 8.

Table 8. Main descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
gini_disp	271	29.1704	3.8483	20.0	38.1
gini_mkt	168	49.1291	3.8555	43.2	61.6
palma	258	1.0833	.20739	.73076	1.6927
s80s20	272	4.6198	1.0221	2.9	7.4
yrir	299	1.2052	1.8171	-3.3629	6.8648
trade	300	96.9492	63.8998	37.1078	374.1478
credit	273	99.4304	37.8581	28.8760	202.1896
shareprices	296	102.2412	43.3882	27.4644	297.8090
tfp	300	98.3432	4.9556	78.3942	111.8734
univ	291	22.0793	7.2097	6	39.6
socx	300	24.3623	4.0292	13.1300	31.9526
dif_serind	300	44.6246	10.6425	16.0000	74.8999
union	286	37.6110	20.9830	7.5476	83.1381
selfemp	300	16.6103	8.0754	6.5	46.1
pop65	300	16,3512	2,2745	10,5193	22,0141
ltunem_u	295	37,5993	13,5375	9,5	73,5

Source: Own elaboration.

4.2. Model and results

The Blundell-Bond method used in the previous section is the approach that, in principle, would seem optimal for the purposes of our research, as it corresponds to a dynamic panel model and allows us to address the problem of endogeneity derived from three causes: omitted variables (fixed effects associated with individuals), simultaneity (possibility that not only the explanatory variables influence the dependent variable, but also, at the same time, the latter, in turn, has an impact on them) and dynamic endogeneity (derived from the inclusion of a lag of the dependent variable as a regressor).

However, this method is not applicable to our analysis of the EU-15, as it requires panels of the type "large N, small T", when the EU panel is of the type "small N, small T" (N = number of subjects, in this case countries; T = number of

periods; N is considered to be large if greater than 20, and T is large if greater than 30).

Taking into account the two previous points, in order to control the possible effects of factors not captured by the explanatory variables of our econometric model, and face possible endogeneity problems, in the case of the EU-15 analysis we chose to use then a two-way fixed effects model, which solves the first question. Once the estimate was made, we applied the Wooldridge (2010) exogeneity test, to make sure that the second problem we pointed out was not present and, in short, that the estimates of the two-way fixed effects model were valid.

Our model can be written as follows:

$\ln\_gini\_dis_{it}$ [or, alternatively, $\ln\_gini\_mkt_{it}$, $\ln\_palma_{it}$, $\ln\_s80s20_{it}$]=

$$\beta_{0i} + \beta_{1t} + \beta_2 l1\_yrir_{it} + \beta_3 credit_{it} + \beta_4 ln\_shareprices_{it} + \beta_5 trade_{it} + \beta_6 ln\_tfp_{it} + \beta_7 d1\_univ_{it} + \beta_8 socx_{it} + \beta_9 dif\_serind_{it} + \beta_{10} union_{it} + \beta_{11} selfemp_{it} + \beta_{12} d1\_pop65_{it} + \beta_{13} ltunem\_u_{it} + e_{it} \quad \textbf{Eq. 22}$$

$$i = 1, 2, \dots, 15;\ t = 1, 2, \dots, 20.$$

In this model, we use a two-way fixed effects model, where country dummy variables (β_{0i}) collect the implicit differences between economies, and time dummy variables (β_{1t}) pick up the impact of shocks that are common to all the countries in the sample.

It should be noted that, since none of the dependent variables passed the normality test, we transformed them by taking natural logarithms. We also transformed *shareprices* and *tfp* by taking natural logarithms since both variables were originally indices, hindering the interpretation of the results. Finally, *univ* and *pop65* turned out to have a problem of non-stationarity –individual unit roots and common unit root, respectively– that was corrected by taking first differences of the original variables.

The normality and stationarity of the data were verified by means of the tests of Shapiro-Wilk, and Levin, Lin & Chu, and ADF Fisher, respectively.

The data panel poses two problems that had to be corrected before estimating the model: autocorrelation and heteroskedasticity, detected by means of the Wooldridge test and the Breusch and Pagan Lagrangian multiplier test, respectively. We also applied the Pesaran, Friedman and Frees tests, resulting in contemporaneous correlation, i.e. cross-sectional dependence.

All these problems can be corrected simultaneously using the Panel-Corrected Standard Errors (PCSE), which is a more accurate method than Feasible Generalized Least Squares (FGLS) (Beck and Katz, 1995; for more details on both methods, see e.g. Greene, 2012). This method is adequate for linear cross-sectional time series models where the parameters are estimated by either OLS or Prais–Winsten regression (Prais and Winsten, 1954), which was the approach used here. We assume that (i) there is first-order autocorrelation AR(1) within the panels, (ii) the coefficient of the AR(1) process is panel-specific, and (iii) the disturbances are panel-level heteroskedastic only, with no contemporaneous correlation across panels.

The Pearson correlation coefficient revealed that in no case the variable selected reached a correlation above 60 percent –except for *ltunem_u* and *selfemp*, which have a correlation coefficient of 0.6180.

The estimates obtained are shown in Tables 9 and 10. Country and time fixed effects were significant for all the cases.

Table 9. Pooled OLS estimation results

	ln_gini_disp	ln_gini_mkt	ln_palma	ln_s80s20
yrir	-0.0057	-0.0002	-0.0072	-0.0050
l1_yrir	0.0013	0.0025	-0.0024	-0.0052
credit	0.0012***	0.0005***	0.0017***	0.0020***
ln_shareprices	-0.0196	0.0304	-0.0582**	-0.0852***
trade	-0.0001	-0.0004***	-0.0001	-0.0002
ln_tfp	0.1976	-0.5777**	0.3580*	0.5173***
d1_univ	0.0024	0.0062	0.0048	0.0008
socx	-0.0073***	-	-0.0092***	-0.0090***
dif_serind	-0.0006	0.0022***	-0.0018*	-0.0011
union	-0.0021***	0.0003	-0.0027***	-0.0027***
selfemp	0.0067***	-0.0017*	0.0105***	0.0142***
d1_pop65	-0.0787**	0.0179	-0.1621***	-0.1564***
ltunem_u	0.0020***	0.0036***	0.0029***	0.0028***
Obs.	203	149	191	204

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 10. Two-way fixed effects estimation results

	ln_gini_disp	ln_gini_mkt	ln_palma	ln_s80s20
yrir	0.0007	0.0031	-0.0004	0.0018
l1_yrir	0.0071***	0.0081***	0.0117***	0.0051
credit	0.0005**	0.0003	-0.0001	0.0006*
ln_shareprices	0.0488***	0.0175	0.0335	0.0488**
trade	-0.0011***	-0.0010***	-0.0020***	-0.0014***
ln_tfp	-0.1627	-0.2907	-0.3718**	-0.2915
d1_univ	-0.0028*	-0.0012	-0.0022	-0.0036
socx	-0.0163***	-	-0.0188***	-0.0263***
dif_serind	0.0037**	0.0048***	0.0046*	0.0079***
union	0.0002	-0.0151***	-0.0034	0.0033
selfemp	0.0112***	0.0071*	0.0180***	0.0122***
d1_pop65	-0.0184	-0.0196	-0.0714	0.0342
ltunem_u	0.0011	0.0017**	0.0011	0.0009
Obs.	203	149	191	204

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

The results obtained reveal that, first, the variable used as a proxy for monetary policy –namely, the real interest (*yrir*)– is not significant to explain any of the dependent variables selected. Nevertheless, it is extremely significant (p-value > 0.01) to explain three of the dependent variables when we include it with a one-year lag (*l1_yrir*). We can also note that it ceases to be significant if we incorporate lags longer than one year: *l2_yrir, l3_yrir*, etc.

The relationship between real interest rates and income inequality is significant regardless of the indicator used to measure inequality –with the exception of S80/S20 ratio. In this latter case, the sign of the coefficient is also positive but not significant. In order to interpret this result, it should be taken into account that this indicator is a quantile ratio measuring the gap between the rich and the poor, that is, it measures the distance between the ends of the distribution. Therefore, this indicator could suffer from a problem of lack of generality when measuring the evolution of inequality, given that only the income received by the top and bottom income quintiles is considered in its calculation. This evidence would be consistent with the idea that the effects of monetary policy may not manifest themselves in the difference between the first and last quintile, that display particular behaviors derived from their extreme position in the income distribution, but in other sections of income distribution.

To explain these results, we may infer again that the macroeconomic effects caused by low interest rates –a stronger aggregate demand, a faster fall in unemployment and medium-term price stability– have positive distributional effects over the medium term. While the potential negative effects in short-term inequality (less than a year), caused by the noticeable impacts of expansionary monetary policy on financial asset prices, are not significant to explain the evolution of any income inequality indicator. In the end, our results reinforce a recent speech delivered by Mario Draghi (2016) where he pointed out that "*over the medium-term, it is unambiguous that monetary policy has positive distributional effects through macroeconomic channels"* (p. 8).

Second, regarding the growth of the financial sector, both variables included to analyze the effects of such growth are significant to explain the increase of income inequality measured as *ln_gini_disp*, while the other three dependent variables show a consistent sign but different levels of significance. In cases where these variables are significant, their sign is also consistent with the results presented in the literature consulted, and this could be explained as follows: on the one hand, financial deepening (*credit*) contributes to increase income inequality, according to the most common explanation, which would be more suitable for developing countries where domestic credit is largely concentrated on big companies and rich households, while the rest of the

population is financially excluded. However, for the countries analyzed (EU-15), it seems that there is not a clear explanation for these results. On the other hand, as regards the behavior of capital markets (*ln_shareprices*), considering that most of financial wealth is concentrated on high income households, the substantial increases experienced by stock indices during the period of analysis have caused the stockholders to progressively separate from the rest of the population in terms of income and wealth.

Third, the trade openness variable (*trade*) is significant to explain all the selected dependent variables. Considering that the effect of the level of trade openness on income distribution is a priori unknown –in accordance with what was explained in Section 2–, the fact that this variable has a negative sign does not contradict previous empirical evidence.

Regarding technological change, the variable *ln_tfp* is not significant to explain the behavior of the two Gini indices, nor the S80/S20 ratio. This could mean that technological change affects households at the ends of the income distribution, while it has no demonstrable impact on those at the center of it. Unlike previous literature, the effect of technological change on income inequality has a negative sign in our case of analysis. In order to explain this sign, it may be necessary to take into account that *tfp* can be disaggregated into "growth into technological progress" and "changes in technical efficiency", so it is possible that technological progress contributes to increasing inequality, but this increase becomes neutralized by the changes in technical efficiency.

As for educational gap, the first difference of *univ* is only significant to explain the behavior of *gini_disp* –with a negative sign. Perhaps, this is due to the speed of the broadening of the gap between skilled and unskilled workers.

With regard to redistributive fiscal policies, the variable *socx* is –along with *trade* –the only variable significant at the 99% confidence level for all the dependent variables. Therefore, its contribution to reduce income inequality seems unquestionable.

As regards the sectoral structure of employment, the variable *dif_serind* is significant to explain the behavior of all the dependent variables, although with

different significance levels. Its sign is positive in all cases, which would mean that a greater tertiarization of these economies contributes to the deterioration of their income distributions. The worst working conditions characteristic of the service sector (more temporary contracts, lower wages...) compared to the industrial sector may be behind this adverse effect.

In relation to the influence of trade unions, on the one hand, the variable *union* is not significant to explain the behavior of any of the dependent variables, except for *ln_gini_mkt*. In this case, its effect on income distribution has a negative sign, which fits perfectly with the literature consulted –a greater level of unionization implies lower income inequality. Accordingly, the sharp fall in the unionization rate experienced by thirteen of the fifteen countries in the sample –the only two where the unionization grew are Belgium and Spain– would be irrelevant to explain the generalized increase in net income inequality. On the other hand, the self-employment variable (*selfemp*) is significant to explain the behavior of *ln_gini_disp* and the two ratios –although it cannot be used to explain *ln_gini_mkt*. In the cases where it is significant, it has a positive sign, which seems to confirm its usefulness to approximate the lack of trade union protection. If so, the interpretation would be consistent with that of *union*: lower levels of unionization reduce the bargaining power of workers, and ultimately lead to an increase in income inequality. It should be noted that the rate of self-employment fell in all countries over the analyzed period –except for Germany, the Netherlands and the United Kingdom.

Concerning the possible influence of demographic aging of the European population, the variable *d1_pop65* is not significant to explain the behavior of any of the selected dependent variables.

The structural unemployment variable (*ltunem_u*) is only significant to describe the performance of the Gini coefficient before transfers. Although these results are reasonable –a higher percentage of long-term unemployment implies greater market income inequality, but it does not have a significant impact on net income inequality because of the damping effect of the public transfers programs–, we cannot make comparisons about further interpretations, since in

the literature there is no precedent of the inclusion of this variable in models used to explain income distribution.

Finally, it is important to note that in the results obtained for the pooled OLS estimation (Table 9), it can be observed that our monetary policy variable (*l1_yrir*) is not significant to explain the behavior of any of the selected dependent variables. But once we change to the two-way fixed effects method, they become extremely significant –it should also be noted that, according to the results of the F-test, we can reject the null hypothesis that all the dummy variables are jointly not significant, and therefore, we can conclude that it is preferable to use the two-way fixed effects estimation method instead of a pooled OLS regression.

The joint significance of the dummy variables indicates there may be country-specific idiosyncratic variables that have a significant impact on income distribution and were not selected as independent variable. These results suggest that there are country and year-specific omitted variables that make our monetary policy variable not significant in a pooled OLS estimation, and that once these omitted variables are collected in the dummies, our monetary policy variable becomes highly significant.

5. Conclusions

In this chapter, we studied the relationship between monetary policy and individual income inequality and polarization for a sample of up to 62 countries over the period 1996-2015, and sample for the EU-15 countries throughout the period 1995-2014. As a result of our analysis, new evidence has been provided on the short and medium-term effects of monetary policy considering several inequality indicators (Gini coefficient, Palma ratio, S80/S20 ratio) and distinguishing short and medium term effects.

On the one hand, an expansive or contractionary monetary policy that implies a change in the ratio M3-GDP is not significant to explain the evolution of the selected inequality and polarization indicators. In addition, according to our

results, the growth rate of that monetary aggregate is not relevant to explain changes in income distribution. However, on the other hand, using the real long-term interest rate as a proxy variable for monetary policy, our estimates suggest that the changes in monetary conditions induced by measures adopted by central banks do have a significant effect on income polarization, but not on income inequality.

Our results suggest that monetary policy decisions adopted by the central banks of the countries analyzed in both samples have had a significant influence on income distribution. Hence, our findings support the view of some central bankers arguing that over the medium term, it is unambiguous that monetary policy has positive distributional effects through macroeconomic channels.

More specifically, an expansionary monetary policy that succeeds in reducing real interest rates will help to mitigate income inequality and polarization during between one and two years after the adoption of the measure. Therefore, our conclusions support the view of some central bankers that, in the medium term, monetary policy has positive distributive effects.

As for the rest of the explanatory variables, our results generally agree with existing literature. The key variables that are consistently significant to explain the behavior of disposable income distribution are unemployment, population ageing, government spending (especially, social expenditure), the loss of influence of trade unions, structural unemployment or trade openness. However, depending on the case of study, there are grounds for believing that other variables such as financialization or technological change may also have relevant effects.

The empirical evidence provided by the present study provides an argument in favor of the idea that central bankers should not overlook the unintended redistributive consequences of their policies.

Particularly, authors such as De Haan and Eijffinger (2017) argue that the assumption that monetary policy has little or no redistributive consequences is crucial for claims favorable to central bank independence. In this sense, it is worth noting that if apart from price stability, central banks assume further tasks such as

financial stability and, additionally, the unconventional monetary policies adopted by the major central banks since 2008 are far more redistributive than traditional monetary policy, the rationale of the independence of central banks should be revisited.

However, a closer attention to inequality does not mean that monetary authorities should target income equality more explicitly or eventually change their mandates. Indeed, admitting these consequences (most of them unintended) could improve the accountability, reputation, credibility, and, ultimately, the legitimacy of independent central bankers in the eyes of citizens.

Finally, it is noteworthy that the empirical research on the relationship between monetary policy and inequality suffers from a serious problem of data limitations. Particularly, further research is needed in this area with a view to analyzing directly the effects of monetary policy on specific groups of population. Such a detailed and comprehensive study would require using disaggregated data at household level in order to build a microdata panel for a given country.

Chapter 3: Wealth and consumption inequality: An interquantile analysis using Spanish micro data

1. Introduction

The collapse in both output and household consumption that took place in Spain in the wake of the last global economic crisis was so deep and persistent that, according to OECD data, pre-crisis levels had not yet been recovered by 2016. Throughout the five years that the recession lasted, GDP per capita fell by 10.6% and private consumption expenditure per capita shrank by 15.2%, breaking with a growth trend that dated back to the early 1990s.

At the same time, in the period between the first quarter of 2002 and the third quarter of 2007, real house prices increased by 81.7% while share prices rose by 107.8% in the same period. From that quarter onwards, there were falls in both variables that continued for several years.

There is a wide range of research work on the macroeconomic implications of wealth fluctuations such as those experienced by Spanish households over the last two decades. Both the immense magnitude of the Spanish boom-and-bust cycle and the high rate of homeownership –around 80%– make it particularly appropriate to analyze how wealth revaluation and devaluation may have affected private consumption.

To estimate the impact of these changes we will use the micro data from the Encuesta Financiera de las Familias (*Survey of Household Finances*) (henceforth, EFF). This survey provides wealth and consumption data for a representative sample of households, which ensures the reliability of the results, as well as a set of demographic variables, which allows controlling for other factors (e.g., age, household size or educational level) that might be relevant to explain household consumption.

However, given that the estimated elasticities for a dataset as broad and heterogeneous as the one provided by the EFF may vary depending on the position of a certain household in the distribution, we decided to perform interquartile regressions to determine the extent of the differences (if any) in the estimated coefficients.

Despite the plentiful literature regarding the causal relationship between exogenous changes in households' wealth and their consumption behavior, to our best knowledge, there is only one major study that attempts to explore the wealth effect for the Spanish economy using microdata (Bover, 2004). Considering the time elapsed since the publication of this study and the vast amount of new data available nowadays, it seems appropriate to obtain new estimates in order to yield results on this matter for a longer and particularly turbulent period of time.

This chapter is organized as follows. First, we undertake a brief literature review on the relationship between wealth and consumption, and the recent evidence using macro and micro data. Next, we analyze the techniques available to study the wealth distribution and justify the selection of the EFF to perform our analysis; we also comment the main characteristics of this data source and how it defines our variables of interest. Then, we present a descriptive analysis regarding wealth and consumption in order to examine the changes that have occurred in the

way these variables are distributed in the period studied. Afterwards, we explain the econometric techniques used for the estimation and present the model. Next, we show the main results derived from the econometric analysis and their implications. Finally, we summarize the conclusions.

2. Literature review

There is a vast amount of literature on the link between personal wealth and consumption, starting with the seminal work of Modigliani, Ando and Brumberg and their life-cycle hypothesis (Modigliani and Brumberg, 1954 and 1979; Ando and Modigliani, 1963).

The life-cycle hypothesis (LCH) posits that individuals plan their consumption and savings over their life-cycle with the intention of optimizing their consumption throughout their lives. To achieve this, they accumulate wealth during their working years and make use of it after their retirement. Assuming this rational planning behavior is widespread, the LCH implies that there is a short-term linear relationship between consumption and income and wealth.

Since then, the flow of economic literature on this issue has been relentless (Sousa, 2009). And in recent years, this issue has been extensively addressed making cross-country comparisons such as the following.

Barrell and Davies (2007) estimated the impact of financial liberalization on consumption in seven OECD countries to find a significant behavioral change, involving a drop in short-run income elasticities and an increase in short-run wealth.

Slacalek (2009) investigated the effect of wealth on consumption in a dataset with financial and housing wealth from sixteen countries. Among the author's results we find the strong relationship between consumption and wealth in countries with developed mortgage markets, the greater effect of financial wealth on consumption compared to real wealth, and the substantial increase in housing wealth due to the ease of access to credit experienced in recent decades.

In turn, Sousa (2009) estimates wealth in the euro area as a whole. In addition to being statistically significant, the author points out that the housing wealth effect is practically nil, while in the long-term consumption is very responsive to changes in financial wealth.

Barrell *et al*. (2015) compare the estimated wealth effects of Italy and the United Kingdom for a period that includes the Great Recession. While in both countries the changes in wealth are significant to explain changes in consumption, the effect of the components is considerably different for these two countries: housing wealth is increasingly important in the United Kingdom, whereas in Italy, conversely, financial wealth is more and more relevant.

Among the articles that, just like ourselves, make estimates for a single country using survey microdata we find Lehnert (2004), who assessed the consumption elasticity of house price changes in the United States by age quintiles, and concluded that they were generally significant, albeit with considerable differences between these groups; Grant and Peltonen (2005), who estimated the housing and financial wealth effects for Italian households, and found both to be quite significant but with varying degrees of intensity; Bostic *et al.* (2009), who obtained relatively large wealth effects for American households; and Browning *et al.* (2013), who estimated housing wealth effects for Denmark and found little evidence of it.

As several of the previous studies point out, households' consumption behavior could be also affected not only by the value of their wealth stock, but also by its composition, i.e. the type of assets they hold and their liquidity. Among the transmission channels that share real and financial wealth we find the realized wealth effect –if asset prices rise and households sell them, they would be able to boost consumption–, the unrealized wealth effect –even if they do not sell the assets, households discount the increase in price and may consume more–, and the liquidity constraints effect –an increase in asset prices reduces the credit constraints of households by increasing the value of what they can offer as collateral for a loan (Ludwig and Sløk, 2002).

Nevertheless, the marginal propensity to consume of both real and financial wealth may differ for several reasons. On the one hand, sometimes

increases in households' wealth may be perceived as uncertain or temporary, so they will have a different impact on consumption. On the other hand, there may be fiscal incentives to prevent certain types of assets from being used to finance current expenses. In addition, the accumulation of some specific assets may be perceived as a means –for example, to secure housing–, whereas the accumulation of others may be considered as an end in itself. Furthermore, the precision with which capital gains can be measured is also important, and varies greatly depending on the type of asset: while changes in financial asset prices can be retrieved instantly at any time, this is not the case for housing prices, since their relative illiquidity make their capital gains more inaccurate and uncertain. Finally, there are psychological reasons that may lead households to perceive some assets as short-term and cashable, and others as long-term investments (Ludwig and Sløk 2003; Case *et al*., 2005).

In the light of all these considerations and to the best of our knowledge, there is only one major study that estimates the wealth effect for the Spanish economy by means of micro data (Bover, 2005). In this paper, elasticities are estimated using EFF data to assess the effects of several wealth categories on consumption. Her results suggest that the marginal propensity to consume of housing wealth is equal to 0.015. Nonetheless, it must be taken into account that the author relies exclusively on data from the first wave of the survey since it was the only one available at the time.

Conversely, another recent study (Anghel *et al.*, 2018) examines exhaustively the evolution of income, wealth and consumption inequality in Spain using, among other sources, EFF data. However, the authors do not discuss the connection between the changes in wealth and consumption inequality, which leaves the door open for a more in-depth analysis.

Therefore, the contribution of this chapter is threefold: first, an estimation of the relationship between wealth and consumption in Spain using micro-data, a technique that has been relatively unexplored until now; also, the disaggregation of the effects of real and financial wealth to dig deeper into the link between wealth and consumption over a period of major economic changes; and, finally, through a quartile regression, an analysis of how the previous estimates might change depending on the position of a household in the distribution.

3. Data sources and definition of variables

3.1. Assessment and selection of the data source

The data source is one the first issues to be addressed when doing research work on the effect of household wealth on consumption. The measurement of both wealth variables is imprecise and is deeply affected by the data source.

However, whilst only household surveys are available to estimate the consumption distribution, wealth can be measured using a variety of techniques. Davies and Shorrocks (2000) point out four possible methods for estimating the wealth distribution: household surveys of assets and liabilities, wealth and estate tax records, estate multiplier estimates, and investment income data.

Surveys that collect information on assets and liabilities held by households can be used to determine how income is distributed in a population. However, it should be noted that, given the skewness of wealth distribution, the estimates will be necessarily affected by sample error regardless of their size. Besides, the non-sampling errors are also relevant: the non-response rate, either for the entire survey or for a particular question, is higher in the case of the most affluent households, and the misreporting of both assets and debts may have a significant impact on the quality of the results.

Although in Spain there is a tax on personal wealth (*Impuesto sobre el Patrimonio*), there are several important aspects that make it unsuitable to estimate the wealth distribution on the basis of tax data: its high non-taxable minimum (between €400,000 and €700,000), the considerable regional differences caused by the transfer of this tax to the autonomous communities, the high levels of tax avoidance (particularly for the wealthiest individuals), and the fact that some assets, such as durable consumer goods, are missing, while others –such as land– are severely undervalued, all of which make this data source incomplete and inaccurate.

Moreover, regarding the estate tax records (*Impuesto de Sucesiones y Donaciones*), in addition to problems similar to those above-mentioned for property tax (i.e., high non-taxable minimum, regional differences, data inaccuracy, etc.), the non-random nature of mortality in terms of age, gender, or income level implies we cannot consider any sample of taxpayers representative of the total population. Consequently, the methodological complications of using estate multiplier techniques and the relatively poor quality of the results obtained render it an impractical way of estimating the wealth distribution.

Finally, the investment income method (also known as capitalization method) estimates the value of the assets held by an individual using the income from those assets reported in his/her income tax return. However, the existence of assets that do not generate income flows to their holder (such as the main residence, a secondary non-rented dwelling, works of art, etc.), and the inherent difficulty of estimating the value of any asset from the income it generates make us discard this method to make an estimate of the wealth distribution in Spain.

Considering all of the above and the goals of our research, we opted to use a household survey to estimate the wealth and consumption distribution. In order to do so, we will employ data from the aforementioned EFF, which is a survey conducted every three years by the Bank of Spain since 2002. The EFF is the only survey included in the National Statistics Plan in which information on both wealth and consumption is available for the same household. Furthermore, the EFF provides a representative sample using stratification techniques and oversampling by wealth, ensuring the inclusion of both a sufficient number of households with a large net worth and a wide variety of assets. In addition, the EFF includes a series of socio-demographic variables (household size, educational level, age, employment status, gender, marital status, etc.) that will allow us to enrich the analysis.

Starting from the data included in each wave of the EFF (from 2002 to 2014) we could construct a panel dataset that would let us track a group of households for a maximum of four waves due to the rotating nature of the panel. However, this would mean such a large-scale loss of observations (households that are not included in all waves) that the sample would not be representative and, therefore, we could not make inferences with regard to the population. Thus,

in order to preserve the possibilities offered by these samples, we decided to work with the data of each of the EFF waves separately.

Finally, it must be noted that there may be some differences among the results obtained using EFF data and those derived from other sources such as the World Inequality Database (WID), because, for instance, the EFF refers to households whereas the WID refers to individuals, and, what's more, whereas the EFF calculates variables from household survey data, the WID uses secondary data sources (published papers).

3.2. Definition of variables

All the variables that will be used here are defined according to the Bank of Spain criteria in the preparation of the EFF.

Thus, total household income is defined as the sum of the pre-tax income of all household members. In the cases of missing data for any of these components, a direct imputation of this total income was carried out (Bover, 2004).

Gross household wealth is equal to the sum of the values of the real and financial assets of all members of the household; by subtracting from this sum the total debt of these members, we obtain the net wealth. Although it is reasonable to assume that consumption patterns are essentially driven by each by each household's available income net of income taxes than by its gross income, we have been forced to use this variable to proxy household income due to the unavailability of data regarding the amounts paid in taxes by household unit.

Total household consumption is defined as the sum of expenditure on non-durable (food, electricity, water, leisure, etc.) and durable (vehicles, furniture, home electrical appliances, etc.) consumption.

With regard to the sociodemographic variables of households, we will use the status of the main residence (mortgaged ownership, debt-free ownership, other), number of household members (from one to five or more), number of adult

household members working (from none to three or more) and the following data of the household head: age (16-34, 35-44, 45-54, 55-64, 65-74, 75 or older), working status (employee, self-employed, retired, other type of economic inactivity or unemployed), educational level (primary, secondary or university education), gender, and marital status [single, married, domestic partnership, separated, divorced, widow(er)].

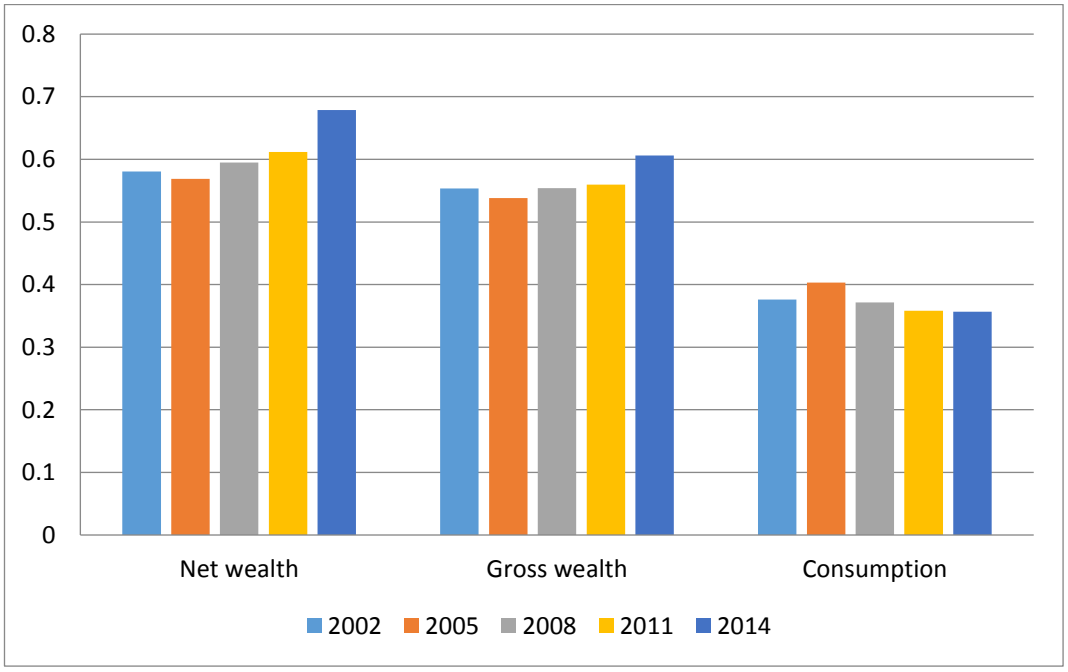
In order to take into account the changes in purchasing power over time, all the amounts of monetary variables have been converted to 2014 euros.

4. Descriptive analysis

Before starting to make estimates about the relationship between wealth and consumption, we will discuss several key empirical facts drawn from the successive waves of the EFF –considering that all the measures and figures in this chapter are calculated using the weight assigned by the survey to each household.

In Figure 11, we can take a first look at the evolution of the Gini indices for wealth and consumption.

Figure 11. Gini indices for gross and net wealth, and consumption, 2002-2014

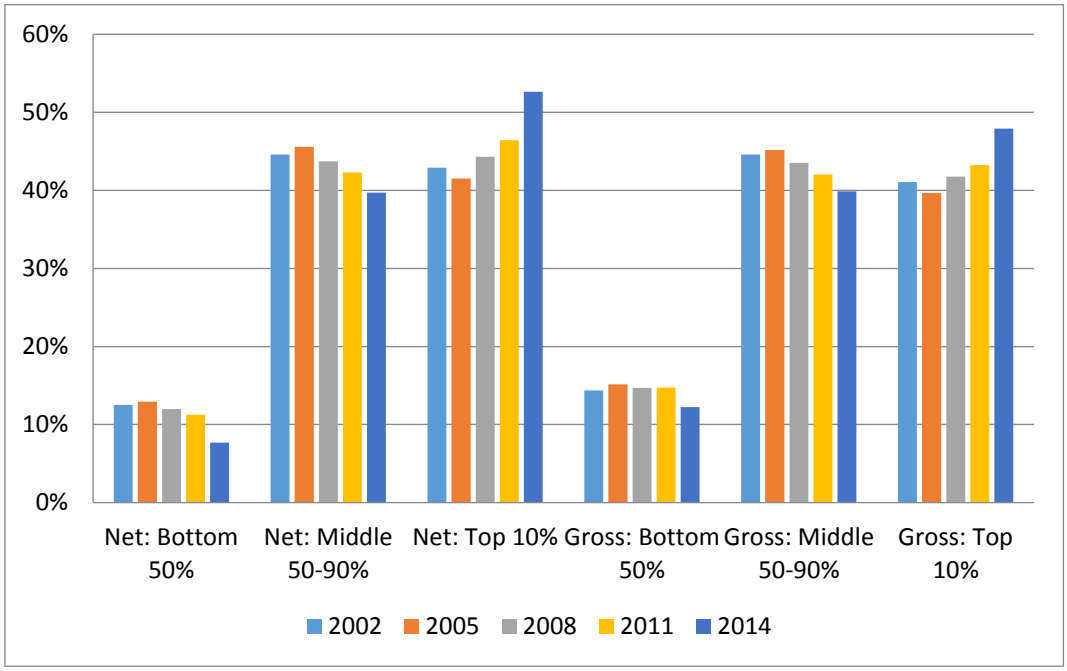


Source: Own elaboration.

The increase in wealth inequality –both gross and net– was matched by a drop in consumption inequality. These diverging trends would serve to catch a first glimpse of the changes in the relationship between wealth and consumption during the period analyzed here.

To delve deeper into the changes in the Gini indices of wealth and consumption, we can split the wealth distribution into groups. This way, in Figure 12, we can see a scenario with very clear trends: households at the top of the distribution increased their share of gross and net wealth, while the middle and lower classes generally experienced a reduction. In addition, this decline in the share of total wealth is greater as we move downward in distribution, to such an extent that households in the first quintile registered negative net wealth for the first time in 2014.

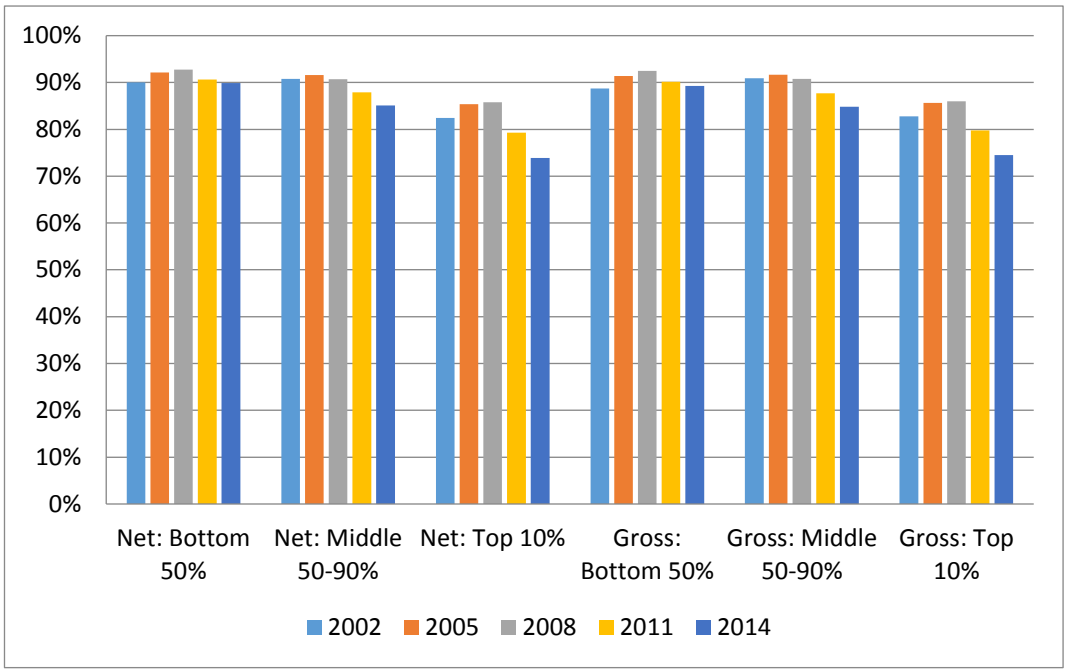
Figure 12. Net and gross wealth shares by groups, 2002-2014



Source: Own elaboration.

In terms of composition, real wealth is by far the most important way Spanish households have to preserve their wealth. Nevertheless, starting from the third wave of the EFF, which coincided with the onset of the last economic crisis, financial wealth has become increasingly important for the middle class and, especially, for better-off households (Figure 13).

Figure 13. Proportion of household wealth held in real assets by net and gross wealth groups, 2002-2014

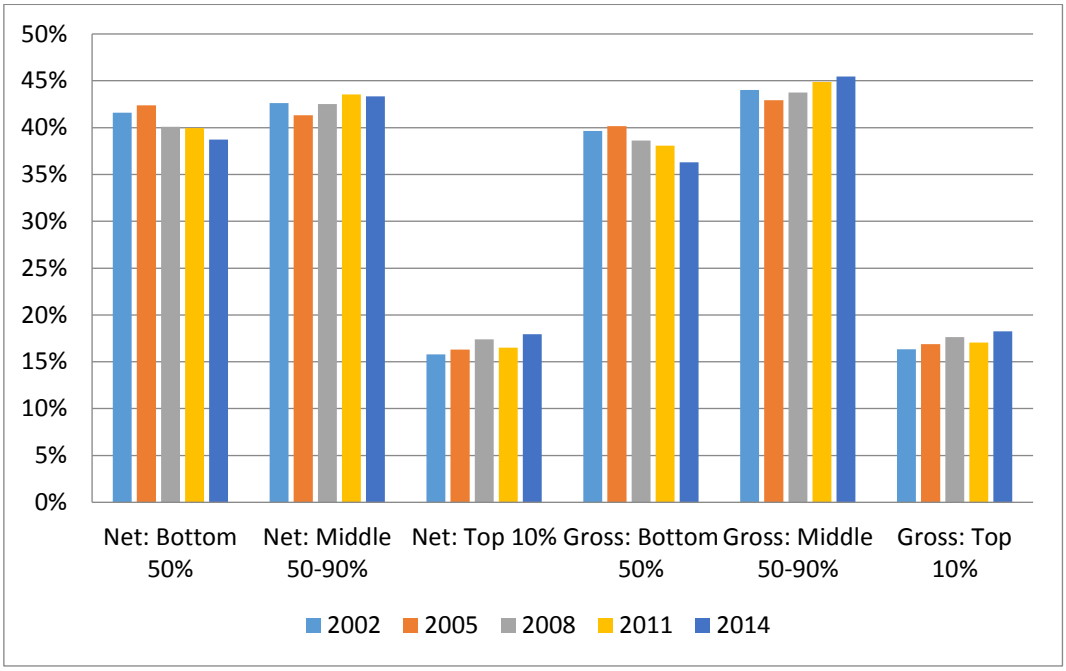


Source: Own elaboration.

Keeping the same breakdown by net and gross wealth quintiles, we can analyze how consumption behaved in order to determine the potential cause for the fall in consumption inequality observed in the Gini index (for more details of the demographic characteristics of households by net wealth quintiles, see Table 28 in Annex 3).

Although there was a general drop in consumption between the first and last waves, it was noticeably more significant for households at the bottom half of the distribution. As a result, given their relatively smaller consumption drop, households in the middle class and at the top of the wealth distribution increased their share in total consumption (Figure 14).

Figure 14. Total consumption share by net and gross wealth groups, 2002-2014



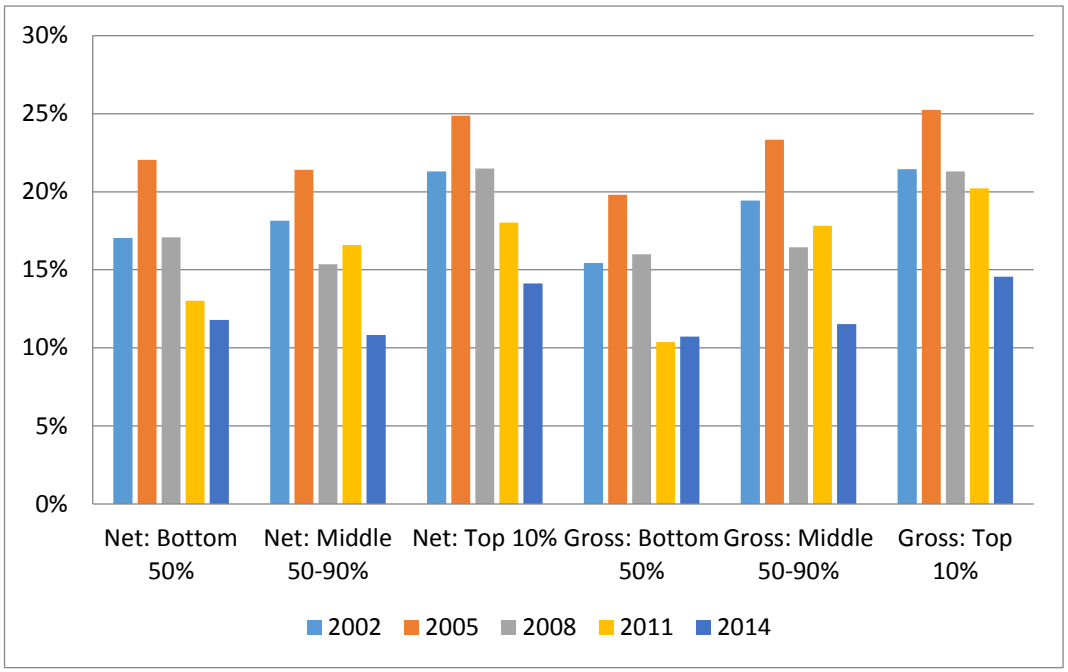
Source: Own elaboration.

This sharper fall in consumption for lower class households can be related to the fact that the increasing risk of unemployment that arises during crises compels low-income households to reduce their consumption expenditure since they were unable to save money enough to smooth fluctuations in consumption (Amromin *et al.*, 2017).

The recomposition of consumption that took place during the years under analysis can also be noticed in the type of households' consumption depending on their wealth. According to the definitions of durable and non-durable consumption given in the previous section, there were several notable changes.

First, there was a common trend for all households whereby the proportion of durable consumption in total consumption peaked during the pre-crisis years and then fell steadily with each subsequent wave of the survey. Also, as depicted in Figure 15, the magnitude of the collapse in durable consumption was almost the same for all households, regardless of their level of wealth. In short, households are spending less and less on durable goods, both in absolute terms and as a proportion of total consumption.

Figure 15. Proportion of household consumption of durable goods by net and gross wealth groups, 2002-2014



Source: Own elaboration.

5. Methodology

To explain the relationship between consumption and wealth, we could start with a simple log linear function where wealth is the explanatory variable of interest, and household income and a set of socio-demographic variables are included as control variables.

Therefore, a first function would be as follows:

$$log(consump) = f[log(income), log(netwealth), V] \qquad \textbf{Eq. 23}$$

Where *consump* stands for the sum of expenditure on durable and non-durable goods, *income* the total income of the household, *netwealth* its net wealth, and *V* is the set of socio-demographic variables (included as dummies) explained in Section 3.

Although some of the sociodemographic variables could have been included as continuous variables in the model, they were incorporated as dummies

in order to take into account possible non-linear relationships with the explained variable (Lynch, 2003). Also, considering that net wealth can take negative values, which causes problems for its transformation into logarithms, it is convenient to disaggregate it into gross wealth (*grwealth*) and total debt stock (*penddebt*). The former function will now convert into this one:

$$log(consump) = f[log(income), log(grwealth), log(penddebt), V] \quad \textbf{Eq. 24}$$

In order to capture the possible disparate effects of real and financial wealth on household consumption, we decided to change the Equation 24 to include them separately.

Furthermore, considering the crucial importance of housing wealth for Spanish households and the fluctuations experienced by the real estate market during the period analyzed, it seems that this variable should have very significant effects on household consumption decisions. For this reason, we decided to also separate the value of the main residence (owned for around 80% of households) (*mainresid*) and the rest of the real assets (*restrealwealth*), which may have a lower value or be owned by a smaller percentage of households.

Therefore, Equation 24 transforms into:

$$\begin{aligned} log(consump) \\ &= \beta_0 + \beta_1 log(income) + \beta_2 log(mainresid) \\ &+ \beta_3 log(restrealwealth) + \beta_4 log(finwealth) \\ &+ \beta_5 log(penddebt) + V \end{aligned} \quad \textbf{Eq. 25}$$

Where *finwealth* stands for financial wealth.

Similarly, since the composition of total income may vary significantly throughout the distribution affecting consumer behavior, we decomposed the total income into labor (*labor*), capital (*capital*) and other income, such unemployment benefits, welfare transfers, etc (*oth_income*).

With all these adjustments, the fourth iteration of the model would be as follows:

$$\begin{aligned} log(consump) \\ &= \beta_0 + \beta_1 log(labor) + \beta_2 log(capital) \\ &+ \beta_3 log(oth\_income) + \beta_4 log(mainresid) \\ &+ \beta_5 log(oth\_realassets) + \beta_6 log(curracc) \\ &+ \beta_7 log(oth\_finassets) + \beta_8 log(penddebt) + V \end{aligned} \qquad \textit{Eq. 26}$$

To estimate the model from Equation 25, we decided to use a robust (i.e., heteroscedasticity-corrected) OLS model for each cross-section. Also, we performed interquantile regressions in order to obtain a more comprehensive picture of the relationship between wealth and consumption.

Quantile regression methods are used to model the relationship among a series of independent variables and specific percentiles of the dependent variable. Thus, whereas in a traditional linear regression the coefficients represent the impact on the dependent variable produced by a change in the corresponding independent variable, a quantile regression coefficient estimates the variation in a specific quantile of the explained variable produced by a modification in the corresponding regressor (Koenker and Hallock, 2001).

Quantile regression allows comparing how the dependent variable might be more or less affected by each explanatory variable depending on the specific percentile of the dependent variable we want to focus on. This feature is particularly useful considering that it is not unreasonable to think that the relationship between wealth and consumption might change significantly depending on the relative position of a household in the distribution.

Therefore, another key advantage of this methodology over OLS estimations is its robustness in the presence of non-normal errors and outliers in the variable under analysis. This feature provides a deeper understanding of the data and gives the researcher the possibility to account for the impact of a certain regressor on the distribution of the dependent variable, and not just its mean.

6. Results

Table 11 shows the estimated results of Equation 3 for each cross-section, once corrected for some heteroscedasticity problems by means of a robust OLS estimator. The socio-demographic variables are included in all estimations although not shown in the table.

Table 11. Total consumption robust OLS estimates, 2002-2014

	2002	2005	2008	2011	2014
Income ***[log(income)]***	0.1143***	0.0288	0.1060***	0.1201***	0.1922***
Main residence ***[log(mainresid)]***	0.1055***	0.1187***	0.1698***	0.1141***	0.1022***
Other real wealth ***[log(restrealwealth)]***	0.0030	0.0089***	0.0084***	0.0089***	0.0052**
Financial wealth ***[log(finwealth)]***	0.0449***	0.0378***	0.0179***	0.0253***	0.0292***
Outstanding debt ***[log(penddebt)]***	0.0212***	0.0288***	0.0106***	0.0014	0.0099***
Obs.	5143	5962	6197	6085	6117
R-squared	0.4550	0.4345	0.4865	0.4758	0.5292

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

The results reveal that all wealth variables are generally significant to explain changes in consumption and that, although in all cases they share a positive sign, their influence on the explained variable has different magnitude.

The relationship between consumption and the value of the main residence resembles the behavior of house prices in Spain explained in the Introduction: the elasticity with respect to consumption expenditure grew by 70% between 2002 and 2008, and plummeted during the following two waves, returning to a level very close to the estimate of the first wave.

On the other hand, the remaining real assets in the hands of households (second dwellings, stores and offices, industrial warehouses, land, plots, etc.) have a significant and stable effect on consumption, although of residual importance –in all cases, a 1% change in the value of these assets would result in a change of less than 0.01% in household consumption.

Financial assets have a far more subdued impact than the value of the main residence. As can be seen in Table 11, the evolution of the estimated coefficients reflects a behavior opposite to the main category of real assets, with a decline in the estimated elasticities until 2008 and an increase thereafter.

Table 12. Total consumption robust OLS estimates (household income divided into three categories), 2002-2014

	2002	2005	2008	2011	2014
Labor income ***[log(labor)]***	0.0249***	0.0150***	0.0213***	0.0201***	0.0253***
Capital income ***[log(capital)]***	0.0039	0.0147***	0.0103***	0.0149***	0.0073*
Other income ***[log(oth_income]***	0.0096***	0.0065	0.0099***	0.0022	0.0035
Main residence ***[log(mainresid)]***	0.1261***	0.1208***	0.1933***	0.1299***	0.1237***
Other real wealth ***[log(restrealwealth)]***	0.0038*	0.0089***	0.0086***	0.0070***	0.0059**
Current account ***[log(curracc)]***	0.0354***	0.0219***	0.0202***	0.0265***	0.0312***
Other Financial wealth ***[log(oth_finwealth)]***	0.0149***	0.0079***	-0.0011	0.0069***	0.0121***
Outstanding debt ***[log(penddebt)]***	0.0223***	0.0289***	0.0129***	0.0047	0.0136***
Obs.	5143	5962	6197	6085	6117
R-squared	0.4443	0.4398	0.4728	0.4612	0.4863

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

As regards the control variables, the estimated elasticity of consumer spending relative to household income and outstanding debt are generally significant and positive. Nevertheless, during the period under analysis there are large variations in the estimated effects that a change in these two variables may have on consumption: for instance, in 2005, income is not significant to explain changes in consumption and, since then, the sensitivity of consumption to alterations in income increases with each successive wave of the EFF; in turn, the magnitude of the effect the outstanding household debt has on consumption is relatively limited and decreasing in relevance over time.

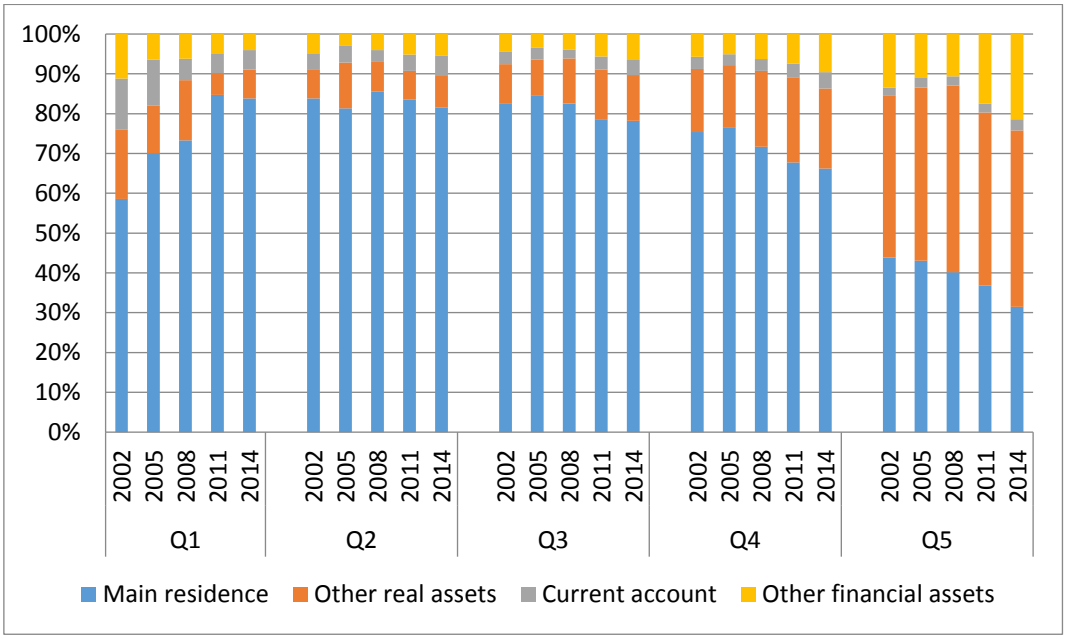
As shown in Table 12, the estimated elasticity of consumer spending relative to labor income follows a pattern different to that described for the first model –with considerably smaller estimated elasticities and a pattern of ups-and-downs that reaches its peak in 2014. The elasticity of capital income, on the other

hand, shows a much more erratic trend, although with levels always below those of labor income. Lastly, the remaining household earnings have an even lower estimated elasticity, which is not statistically significant in three of the five cross-sections.

Finally, the dummy variables, also included in the model as control variables to improve the goodness of the fit and to isolate the effect of our variables of interest, are jointly significant in all cases.

Anyway, the interpretation of the results should be made bearing in mind the wealth composition by quintiles. Figure 16 shows that although real wealth always accounts for most of total wealth, its distribution is very different depending on the quintile in which each household is placed. The cases of real assets excluding the main residence and financial assets excluding current account savings are particularly remarkable, since they reveal an ever-increasing proportion of the wealth of the most affluent households.

Figure 16. Wealth composition by net wealth quintiles, 2002-2014



Source: Own elaboration.

To analyze how these estimates vary throughout the distribution, we present in Table 13 the estimates of Equation 25 for each cross-section using interquantile regression techniques for the 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}, and 99^{th} percentiles.

Table 13. Total consumption interquantile regression estimates, 2002-2014

		2002	2005	2008	2011	2014
10th percentile	Income	0.1868***	0.1242***	0.2029***	0.2494***	0.3616***
	Main residence	0.0868***	0.0642***	0.1184***	0.0712***	0.0300***
	Other real wealth	0.0045**	0.0027***	0.0040***	0.0087***	0.0052***
	Financial wealth	0.0338***	0.0273***	0.0193***	0.0149***	0.0212***
	Outstanding debt	0.0119***	0.0206***	-0.0006	-0.0084***	0.0014
	Obs.	5143	5962	6197	6085	6117
	ρ	0.6975	0.6695	0.6925	0.6952	0.7413
25th percentile	Income	0.1852***	0.0790***	0.1712***	0.2436***	0.3295***
	Main residence	0.0803***	0.1215***	0.1757***	0.0572***	0.0638***
	Other real wealth	0.0039**	0.0068***	0.0044***	0.0056***	0.0040***
	Financial wealth	0.0408***	0.0330***	0.0161***	0.0156***	0.0173***
	Outstanding debt	0.0138***	0.0222***	0.0035***	-0.0047***	0.0064***
	Obs.	5143	5962	6197	6085	6117
	ρ	0.7047	0.6840	0.7057	0.7095	0.7479
50th percentile	Income	0.1533***	0.0378***	0.1222***	0.1934***	0.3325***
	Main residence	0.0920***	0.1216***	0.1959***	0.0889***	0.0685***
	Other real wealth	0.0052***	0.0077***	0.0077***	0.0063***	0.0034***
	Financial wealth	0.0328***	0.0365***	0.0176***	0.0194***	0.0155***
	Outstanding debt	0.0190***	0.0300***	0.0065***	0.0019***	0.0076***
	Obs.	5143	5962	6197	6085	6117
	ρ	0.6999	0.6798	0.7102	0.7270	0.7525
75th percentile	Income	0.1197***	0.0388***	0.1069***	0.1325***	0.2314***
	Main residence	0.1035***	0.1509***	0.1690***	0.1109***	0.0895***
	Other real wealth	0.0024***	0.0097***	0.0098***	0.0041***	0.0041***
	Financial wealth	0.0345***	0.0331***	0.0118***	0.0263***	0.0222***
	Outstanding debt	0.0298***	0.0348***	0.0181***	0.0070***	0.0147***
	Obs.	5143	5962	6197	6085	6117
	ρ	0.6933	0.6734	0.6977	0.7269	0.7685
90th percentile	Income	0.0846***	0.0329***	0.0829***	0.0924***	0.1250***
	Main residence	0.1161***	0.1357***	0.2014***	0.1173***	0.1048***
	Other real wealth	0.0003***	0.0107***	0.0130***	0.0111***	0.0064***
	Financial wealth	0.0506***	0.0331***	0.0132***	0.0312***	0.0356***
	Outstanding debt	0.0256***	0.0354***	0.0226***	0.0170***	0.0172***
	Obs.	5143	5962	6197	6085	6117
	ρ	0.6875	0.6618	0.6896	0.7126	0.7603
99th percentile	Income	0.0685***	0.0019***	0.0901***	0.0497***	0.0850***
	Main residence	0.1646***	0.1264***	0.1808***	0.0983***	0.2276***
	Other real wealth	-0.0024	0.0300***	0.0191***	0.0302***	0.0088***
	Financial wealth	0.0698***	0.0339***	0.0221***	0.0601***	0.0322***
	Outstanding debt	0.0232***	0.0392***	0.0159***	0.0149***	0.0137***
	Obs.	5143	5962	6197	6085	6117
	ρ	0.6406	0.6199	0.6571	0.6888	0.7287

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

The estimated elasticities of the value of the main residence for the different positions in the consumption distribution follow a pattern similar to that described for the results in Table 11, with an increase during the years of economic growth and a subsequent downturn after the onset of the crisis. At the same time, in each consumption group and for each cross-section, the estimated elasticity of this type of asset grows dramatically as we approach the top end of the distribution.

Nonetheless, the scale of these changes is significantly different across groups: the central groups of the distribution are the ones that increased most the estimated elasticity of the main residence on consumption during the critical years of the Spanish housing bubble. However, after its collapse, the subsequent decline was felt most strongly in households at the lower end of the distribution, which resulted in reductions in the estimated coefficients that led them well below those at the beginning of the period.

These results could be useful to explain the drop in consumption share that households at the bottom 50% experienced during the crisis. These households are increasingly dependent on their income and less on their wealth to determine their consumption preferences, which, together with the loss of income resulting from the crisis –these households are more affected by unemployment and lower wages– could cause a proportionally more severe drop in their consumption than in the case of the remaining households.

In relation to the rest of the real wealth, there is a similar pattern of rise-and-fall in the estimated coefficients for all households except those placed in the tails of the distribution. Nonetheless, the value of these coefficients suggests that the influence that this type of assets may have on consumption is generally testimonial. Notwithstanding, it is important to note that for households at the very top, the coefficients can take values higher than 0.01.

Finally, the effect of the wealth held in financial assets –which includes checking accounts, fixed deposit accounts, bonds, shares, etc.– has a significant but much smaller impact than the most relevant category of real wealth –the main residence.

The evolution of the estimated coefficients reveals many differentiated behaviors depending on the position of a household in the consumption distribution: almost all households, except those at the very top, experienced a U-shaped trend, which becomes increasingly pronounced as we move upward in the distribution.

Overall, financial wealth seems to have lost influence on the consumption decisions of Spanish households while real wealth –and, particularly, main housing– gained ground, probably as a result of the real estate price bubble. This process reversed with the onset of the crisis, although for the last EFF wave the values estimated at the beginning of the period under analysis have not recovered completely yet.

As a final point regarding financial wealth, the differences in the estimated coefficients among households in different positions of the distribution appear to be much smaller than in the case of the two real wealth categories. Thus, a change that equally affects the financial wealth of all Spanish households would produce relatively similar changes in terms of household consumption.

As for the two control variables introduced in the model, several issues need to be addressed. First, we should highlight the increasing influence of household income when explaining consumption behavior, a trend common to all groups. Second, the estimated coefficients of income elasticity on consumption decrease as we move upward in the consumption distribution and diverge steadily with each new survey wave. All this implies that Spanish households –and particularly those at the bottom half of the distribution– are increasingly reliant on their income to determine their consumption preferences.

In turn, the stock of outstanding household debt plays an increasingly irrelevant role in determining consumption expenditure, especially for households at the top of the distribution. For the rest, its relevance seems to have regained somewhat, although taking values well below those registered during the real estate bubble, when credit conditions were notably softer.

7. Conclusions

Our findings suggest that there was an increase in wealth inequality (both gross and net) during the period 2002-2014 and, at the same time, a reduction in consumption inequality. While households at the top of the distribution account for an increasing share of total wealth, the distribution of consumption is less and less unequal. Nevertheless, on closer examination, it is possible to observe that, although the Gini index indicates that consumption is distributed less and less unequally, this is due to the relative rapprochement of the middleclass and the top 10%, while the lower classes consume less and less in both absolute and relative terms.

Regarding our estimates, there is a significant positive effect of wealth on consumer expenditure. Disaggregating by categories, the primary source of real wealth of Spanish households, namely the main residence, has a considerable effect on consumption, with values ranging from 0.1 to 0.17 for the estimate obtained by means of a robust OLS estimator. Its estimated elasticity during the central years of the 2000s was higher than that of household income. In addition, the changes in the estimated elasticity of the value of the main residence on consumption follow a behavior pattern that seems to mirror the Spanish housing price index –increasing until 2008 and falling thereafter–, which could be associated with the prevalence of housing ownership in Spanish families.

By applying the interquartile regression, a similar trend can be seen, although the increases in elasticity are more noticeable in the middle class whereas the decreases stand out at the bottom 50%. The relative loss of ground from wealth to income, whose elasticity to consumption is higher with each new wave of the survey, means that households in the first half of the distribution plan their consumption almost exclusively on the basis of their declining and unstable income, resulting in lower consumption expenditure.

Meanwhile, the estimated coefficients for the effects of all financial assets in the hands of Spanish households reveal a reverse trend to that observed in the

main category of real assets, although they are always much lower in absolute terms. And the effects of the other wealth categories (real assets except main residence, checking accounts, and other financial assets), although generally significant, seem to have a much weaker impact on the consumption expenditure of Spanish households, never reaching levels above 0.02, even for the most affluent groups.

Ultimately, our analysis reveals the existence of a very significant wealth effect for the value of the main residence and a modest one for the remaining real and financial assets. Notwithstanding, this effect is becoming weaker as we approach the present day and move downwards in the distribution, losing nowadays practically all relevance in the definition of preferences to household income.

Nevertheless, further research is needed using a sample with a constant set of households that would allow the researcher to obtain long-term estimates for the marginal propensities to consume of each category of income, wealth, and debt.

Chapter 4: Measuring income inequality and mobility in Spain: Addressing some methodological challenges

1. Introduction

Income inequality has increased steadily in the OECD countries during the last three decades (OECD, 2009, 2012, 2013; 2014a, b, and c). This increase has become one of the most discussed topics in the recent economic literature. Many authors have thoroughly analyzed income inequality, shedding light on the roots, evolution, and consequences of this phenomenon (Krueger, 2012; Jaumotte *et al.*, 2013; Dabla-Norris *et al*., 2015).

However, an issue less discussed although closely linked to income inequality is income mobility. A higher inter- and intra-generational income mobility is generally regarded as socially desirable since, on the one hand, it implies greater equality of opportunities and independence of origins, and, on the other hand, it helps to ease the long-term negative impact of income inequality. In

other words, whereas the rise in inequality is a crucial problem for policy-makers, its combination with different levels of income mobility gives a capital relevancy to the study of this phenomenon.

A lot of research on the subject of intra-generational income mobility was conducted in the USA (Auten and Gee, 2009; Gottschalk and Moffitt, 2009; Bradbury, 2011; Hungerford, 1993 and 2011), the United Kingdom (Jarvis and Jenkins, 1995 and 1998), Sweden (Björklund, 1993; Gustafsson, 1994) or France (Buchinsky *et al.*, 2003). Besides, over the years, several studies comparing income mobility among some countries have been carried out: the USA and Germany (Burkhauser and Poupore, 1997; Maasoumi and Trede, 2001; Gottschalk and Spolaore, 2002; Van Kerm, 2004; Jenkins and Van Kerm, 2006); the USA and Sweden, Norway, and Denmark (Aaberge *et al*., 2002); Canada, the USA, the United Kingdom and Germany (Chen, 2009); and different sets of EU countries (Gangl, 2005; Ayala and Sastre, 2008; Gregg and Vittori, 2008; Van Kerm and Pi Alperin, 2013).

To the best of our knowledge, there are other four papers in the literature aimed at measuring income mobility for Spain: Cantó (2000), Ayala and Onrubia (2001), Ayala and Sastre (2005), and Bárcena and Moro (2013), who use quarterly data from the Spanish Household Panel Survey for the period 1985-1992, annual tax returns data for the period 1982-1994, annual data from the European Community Household Panel for the period 1994-1998, and annual data from the Survey on Living Conditions for the period 2003-2009, respectively.

Thus, the main objective of this chapter is to analyze the trends in income inequality and mobility in Spain. In our case, the interest in addressing a further study of income mobility in Spain lies in the possibility of analyzing it during a period of time (1999-2011) that includes an extremely pronounced boom-and-bust cycle. This situation may have caused a major disruption both in the way income has distributed in this country, and the way individuals have changed their positions in the income distribution during this period. In addition, the use of fiscal data allows us, on the one hand, to avoid the problems of inaccuracy and non-response associated with data from surveys, and, on the other hand, to work with a much larger sample size.

However, both the use of fiscal data and the situation of the Spanish economy –particularly, regarding the evolution of unemployment– force us to focus on methodological aspects, since individuals below the non-taxable minimum may not be included in the sample as they are not legally required to submit their tax returns.

Most studies on the dynamics of income distribution employing fiscal data use pure panels, where all individuals remain in the sample throughout the analysis period (Cantó, 2000; Ayala and Onrubia, 2001; Aaberge *et al.*, 2002; Auten and Gee, 2007 and 2009; Splinter *et al.*, 2009). Nevertheless, using this type of panel for such an economically turbulent period may cause people included in the pure panel –whose permanence depends especially on their employment status– not to be representative of the taxpayers as a whole and, therefore, the results obtained would not be useful for extrapolation: they would be a simple still photograph of a segment of the population with very specific characteristics at a given time.

So to avoid the aforementioned potential problems of sample representativeness, in order to test the robustness of the results obtained for the pure panel, we decided to add an unbalanced panel to our analysis, which includes all the individuals who had filed income tax returns in a particular year, regardless of what they did during the rest of the period under analysis. A comparison between the results of these two samples allows us to determine the extent to which income inequality and mobility measures may vary depending on the sample chosen. In addition, we will use different inequality indicators that focus on different segments of income distribution in order to ensure that the findings are rich and varied.

Hence, the second objective of this chapter is testing the reliability of the results using two different samples, a methodology which is conspicuous by its almost absence in the research carried out so far, and gives an extra value to our study. By comparing the results of the pure and unbalanced panel, we will be able to see the extent to which measures of income inequality and mobility can change depending on the sample chosen.

This chapter is organized as follows. First, we explain how we built our database and the main methodological challenges we faced. Next, we present the indicators we used to measure income inequality and mobility, and the information provided by each one. Afterwards, we discuss the main results of our analysis. Finally, we summarize the conclusions.

2. Data and sources

Ideally, in order to measure income inequality and mobility ensuring the statistical representativeness of the results obtained, it would be necessary to work with a sample where all the income levels were adequately represented, regardless of whether individuals made the income tax return or not. However, neither fiscal nor survey data allow this possibility.

Working with tax returns has many advantages in comparison with interview-based surveys, such as the number of individuals included in the sample, which grants high statistical significance –particularly for the case of high income individuals, who tend to be underrepresented in surveys–, the reliability and regularity of the data collected, or the opportunity to follow an individual change throughout a long period of time.

The aforesaid notwithstanding, it should be also noted that the sample accruing from fiscal data does not offer complete information about people with an income below the personal exemption level, who will not be adequately represented in the panel. As a result, the income of individuals in the lowest end of the distribution is probably measured with a much higher sampling error than the rest.

The data panel used in this study is based on a random sample of the individuals that filed the annual personal income tax return, and covers the period 1999-2011.

The raw data come from the Fiscal Studies Institute (*Instituto de Estudios Fiscales*, IEF), which applies a stratified random sampling method (Pérez *et al*., 2016). It is noteworthy that the panel does not include data from the two

autonomous communities of chartered regime, i.e. the Basque Country and Navarre, which, coincidentally, are two of the three communities with the highest per capita income. Their charters grant these two communities specific competences not recognized in the rest of autonomous communities –which are known as communities of common regime–, most notably, fiscal autonomy.

The variable used as a proxy for individuals' earnings is the tax base of the Spanish personal income tax –IRPF, *Impuesto sobre la Renta de las Personas Físicas*–, which is composed of net labor income, net real estate income, net investment income, net income from self-employment, and capital gains and losses.

Our unit of analysis is the individual, in the light of the considerable changes a household may suffer in its composition over time –births, deaths, emancipations, marriages, divorces–, which would involve important practical difficulties considering the nature of the data used.

To construct our panel, we started by merging the database of each fiscal year using the identification code assigned to each taxpayer for this purpose. Next, we created the aforementioned monetary variables using the table of equivalences provided by Pérez *et al*. (2016). Finally, we corrected several missing data problems regarding the date of birth and gender, which affected to 10.2% and 1.8% of individuals in the sample, respectively.

At this point of the process, our database consisted of 6,431,174 tax returns made by 924,753 unique taxpayers. In our next step, we proceeded to remove 4,613 duplicated observations –those with more than one observation for each taxpayer and year– so that we could convert our database into a data panel.

Even though the tax base can take negative values, we opted to study exclusively individuals who had a positive tax base in every period, so we removed 328,060 non-positive observations.

Moreover, in order to reduce the effect of possibly spurious outliers that could distort the measures of income distribution and mobility, we trimmed 1% of the observations at each end of the distribution (Cowell *et al*., 1999), removing a total of 120,170 observations.

At this stage of the process, we had 877,282 unique taxpayers and 5,888,331 tax returns –94.76% and 92.29% in relation to the starting database, respectively.

Finally, in order to construct a pure panel, which is the method most commonly used in similar studies, we removed all the individuals that were not included in the sample throughout the whole period under review, ending with a sample of 189,016 single taxpayers and 2,457,208 tax returns.

Nevertheless, this restricted panel, considering the ups and downs of the Spanish economy during the period analyzed, would severely underrepresent individuals who enter and leave the sample due to changes in their employment status, or would not represent at all those who began to earn income, whatever its nature, after 1999. Thus, only people who successfully managed to maintain a sufficient income to be required to file income tax returns in each year of the sample would be adequately represented.

Table 14. Comparative composition of the pure panel and the data lost to create it

	Lost data				Pure panel			
	Av. Age	% Labor	% Men	Av. income	Av. Age	% Labor	% Men	Av. income
1999	45.09	82.50%	65.33%	17,050.11 €	43.63	87.59%	70.38%	19,470.90 €
2000	45.54	83.19%	64.86%	17,279.24 €	45.00	87.79%	70.36%	20,666.55 €
2001	45.75	83.51%	64.05%	18,410.58 €	46.14	87.91%	70.40%	22,701.16 €
2002	45.87	84.34%	63.36%	18,702.15 €	47.27	88.07%	70.49%	23,690.35 €
2003	45.76	83.67%	62.71%	18,970.56 €	48.40	82.73%	71.02%	24,959.59 €
2004	46.07	85.42%	63.93%	20,081.30 €	49.66	85.52%	73.01%	26,748.18 €
2005	46.30	85.95%	63.10%	21,152.54 €	50.76	86.31%	73.16%	28,480.53 €
2006	46.47	86.34%	62.03%	22,844.90 €	51.84	87.41%	73.22%	31,297.35 €
2007	46.65	86.23%	60.28%	23,387.76 €	52.97	88.16%	72.69%	32,752.65 €
2008	47.03	86.54%	59.56%	23,744.14 €	53.97	88.55%	72.97%	33,764.47 €
2009	47.81	86.89%	59.26%	23,534.64 €	55.06	89.12%	73.23%	33,246.37 €
2010	48.98	87.19%	58.47%	23,156.80 €	56.22	90.15%	73.24%	32,021.78 €
2011	49.41	87.20%	58.05%	23,017.93 €	57.22	90.23%	73.30%	31,922.99 €

Source: Own elaboration.

As Table 14 shows, the data lost in the transition from an unbalanced panel to a pure one contribute to artificially increasing the average age of taxpayers, the proportion of people whose main source of income is labor, the ratio of men to women, and, finally, the individual average income for each year.

Considering this problem and for comparison purposes, we decided to add a second sample to our analysis, which we will call "unbalanced panel", including all the tax returns filed in the original sample, except duplicates and outliers. This way, the sample will consist of all valid income pairs in the dataset for each pair of years, similar to the method used by Jenkins and Van Kerm (2006).

3. Methodology

3.1. Income inequality

In order to assess the evolution of inequality during the period analyzed, we could use some of the many metrics designed for this purpose, each of them offering a different approach depending on the segment of the income distribution they focus on. Together with the Gini coefficient and the income shares by quintiles, which is the most common indicator for income inequality, we will also use the generalized entropy –henceforth GE– index and the Atkinson class of measures.

The details and characteristics of all these indicators are thoroughly analyzed in Chapter 1.

3.2. Income mobility

As mentioned before, the ideal database for measuring income mobility would include individuals from all income levels, regardless their obligation to file income tax returns, and also cross-sectional weights adjusted to the strata to which they belong.

As compared with income inequality measures, whose utilization has been standardized by the research community for decades, the measurement of income mobility is subject to restrictions linked to the very nature of the concept. Hence, we decided to use the Hart index, the immobility ratio and the Shorrocks index –three increasingly sophisticated measures.

As a *time-dependence mobility* index, we could use the Pearson correlation coefficient, which measures the linear correlation between the individual income in two income distributions x and y –the higher the correlation, the less income mobility. Even so, we decided to employ a more specific measure developed by Hart (1976) using the correlation coefficient:

$$H(x, y) = 1 - \rho(\ln x, \ln y) \qquad \textbf{Eq. 27}$$

Where ρ is the correlation coefficient between the natural logarithms of the income level of the same individual in the distributions x and y. It can take values from 0 to 1, where 0 indicates no income mobility and 1 implies absolute income mobility.

Though useful as a starting point for an analysis on income mobility, this indicator is not able to determine whether a distribution in which incomes are initially unequal, and then become equal, is highly mobile or completely immobile (Shorrocks, 1993).

As a second approach for measuring income mobility, we used the so-called 'immobility ratio', to assess the proportion of people that stayed in the same income quintile from one year to another (*positional mobility*). This relatively straightforward measurement instrument can take values between 0 (absolute mobility) and 1 (absolute immobility). This way, we only account for variations in income that are significant enough to cause a change of quintile.

As we were also interested in addressing the relationship between inequality and mobility, we used a measure developed by Shorrocks (1978), which quantifies the pace at which inequality is reduced throughout the period considered as a result of the income mobility effect (*mobility as an equalizer of longer term incomes*).

The Shorrocks index can be calculated as:

$$M = 1 - \frac{I[Y(T)]}{\sum_{k=1}^{k=T} w_k I(Y^k)} \qquad \textit{Eq. 28}$$

Where $I[Y(T)]$ is an inequality measure chosen by the researcher referred to T-averaged incomes, w_k is the proportion of aggregate T-averaged income perceived in the period *k*, and $I(Y^k)$ is the same inequality measure in period *k* incomes. This measure can take values between 0, which means no equalization of income over time, and 1, which implies an absolute equalization of income during the period analyzed.

Since this indicator can be constructed by using different inequality measures –GE measures, Gini coefficient or Atkinson class of measures–, there will be some differences in the estimation of the Shorrocks index, due to the different weights assigned by each inequality indicator to changes in income from different parts of the distribution.

For our calculations, we used Stata tools for income inequality and mobility analysis developed by Jenkins (1999) and Van Kerm (2002).

4. Results discussion

4.1. Income inequality

Using the GE measures, which increase their sensitivity to changes at the top of the distribution for higher values of the alpha constant, we can focus on the changes in this particular segment.

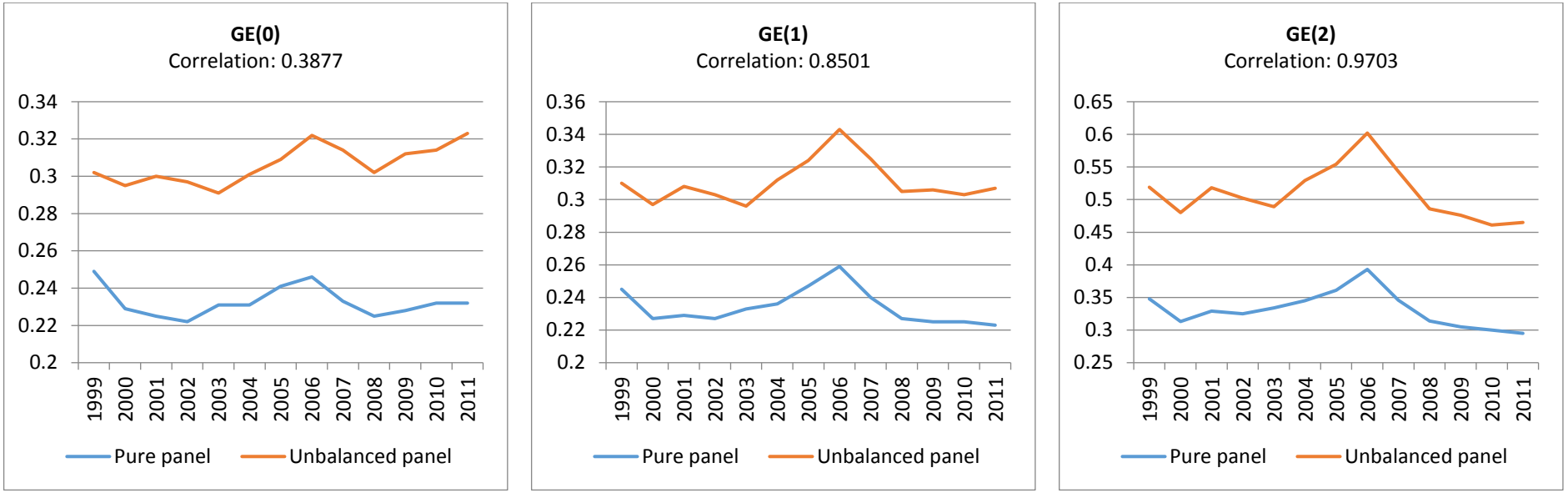
As we can see in Figure 17, income inequality focusing on the highest end of the income distribution decreased mildly in the first years of the period. Afterwards, according to all three GE measures, it started to grow until the outbreak of the crisis, when they reached its peak –the increase in inequality that

takes place in the central years of the period is more pronounced for higher values of the alpha constant, which leads us to believe that this increase was more noticeable for individuals at the top of the distribution. This trend reversed during the crisis and lasted until the end of the series; during this interval of time, the GE(2) experienced a 25% drop to reach its minimum in the last years.

Regarding the other generalized entropy measures, both experienced more subtle changes, regardless of the sample chosen, but their path is similar to the one of GE(2). It should be noticed that the correlation of the results of both panels for GE(0) is particularly low, which reveals that choosing the pure or the unbalanced panel is not irrelevant, this decision affects to the results, in this case if we focus on the lowest end of income distribution.

So, despite the ups-and-downs experienced by the higher income segment, we can state that inequality in this group remained the same or even decreased during the years analyzed.

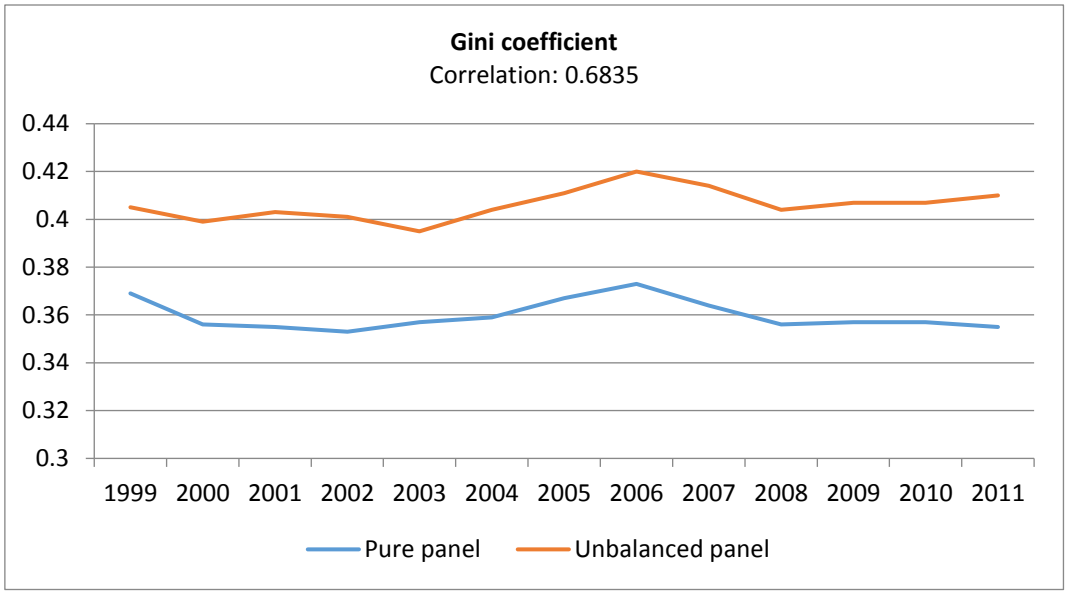
Figure 17. Generalized entropy measures for different values of alpha (pure and unbalanced panels), 1999-2011



Source: Own elaboration.

In order to focus on the individuals around the median, we use the Gini coefficient. Figure 18 shows that until the crisis, this indicator paints a picture similar to the GE measures, but with less pronounced changes. However, in the post-crisis years, the results start behaving in a relatively different way, causing the correlation between the Gini indices calculated for both panels to fall below 0.7, when before 2006 it was well above 0.8.

Figure 18. Gini coefficient (pure and unbalanced panels), 1999-2011

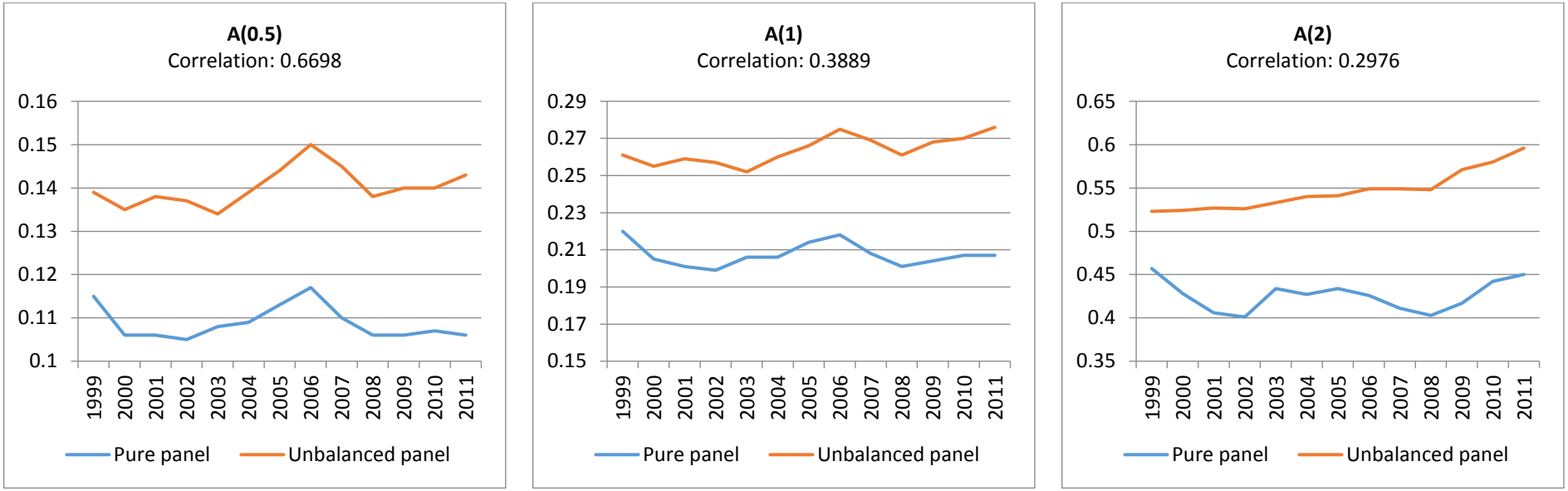


Source: Own elaboration.

Lastly, when the emphasis of our analysis is placed on the individuals at the bottom of the income distribution, the Atkinson class of measures is suitable. In this case, the changes reflected by the data are noticeably different, particularly during the crisis and post-crisis years (Figure 19).

During the first five years of the series, both A(0.5) and A(1) experienced a slight decrease, and the higher the value of the inequality aversion constant –measured by the epsilon constant–, the bigger this fall, while the behavior of A(2) is quite peculiar: the results obtained using the pure panel are similar to those observed for the other epsilon values, but the results for the unbalanced panel are outstandingly different, reflecting a steady increase in income inequality in the lower end of the distribution.

Figure 19. Atkinson measures for different values of epsilon (pure and unbalanced panels), 1999-2011



Source: Own elaboration.

However, in the mid-2000, both A(0.5) and A(1) describe a growing path for both panels, while the results of A(2) do not show a common trend. Despite these differences between samples, we can state that the lower segment seems to be decoupling from the rest of the distribution in terms of inequality trends since the indicators focused on this segment display trends that are increasingly divergent from the rest. Furthermore, the divergences in the results depending on the sample chosen seem to be bigger if we focus on the lower part of the income distribution, since the correlations are increasingly smaller for higher epsilon values.

Finally, if we want to establish how a certain segment of the distribution evolved in relation to another, we should resort to the percentile ratios –such as P90/P10, P90/P50, P50/P10, or S80/S20. However, we ran into inconsistency of the results between both samples –reflected in extremely low correlation coefficients–, which makes the interpretations we can make about them relatively limited, since in several cases the same indicator may show opposite tendencies depending on whether we choose either the pure or the unbalanced panel.

To sum up, the evolution of the Gini coefficient suggests that income inequality decreased in Spain until 2002, year in which it started to grow until 2006, when it started to drop again. The GE measures show a similar pattern, but it becomes less smooth every time we increase the alpha constant. Atkinson indices, in turn, give a picture similar to the Gini coefficient for lower levels of the epsilon constant, but if we increase this constant, we could identify a growing divergence in trends at the bottom of the distribution. This could suggest that changes for high-income individuals were more pronounced than in the distribution as a whole. As far as low incomes are concerned, we cannot state anything conclusive, since the results of the Atkinson index for both panels are quite different.

If we analyze the correlations between all these indices, distinguishing between those calculated with either the pure or the unbalanced panel, we can see similar trends: during the period 1999-2002, the correlation between indicators was extremely high –except for A(2)–, and inequality decreased slightly. Afterwards, there is a period of widespread growth in inequality between 2003

and 2006, which was replicated with varying degrees of intensity in all indices of both samples, including A(2).

Lastly, after the outbreak of the global economic and financial crisis and the Spanish real estate bubble, the performance of the indicators ceased to show relatively homogeneous trends, which was evidenced by a reduction of the correlations between the indices calculated for both samples to levels well below those previously seen –around 0.9-0.95. Interestingly, during this period and for both samples, the correlation of A(2) with the other indicators became practically zero or negative, which may be another sign of the divergence in the trends of lower income people after the crisis.

4.2. Income mobility

We start our analysis by using Hart indices, described in the previous section. As shown in Figure 20, these indices increased at a steady pace until the outbreak of the crisis, when they started to fall until the end of the series. In addition, it is particularly interesting to note that the correlation between the indices calculated with the pure and the unbalanced panel is only high for the fifth quintile, i.e. the group of individuals with the highest income level. Also, income mobility in this segment is markedly lower than the rest of the distribution.

Although both ends of the distribution present correlation levels ranging from 0.05 to 0.6, the three central quintiles show clearly higher income mobility than the ones at the tails of the distribution. This situation confirms that the upper and, to a lesser extent, lower classes, have significantly less mobility than middle-class individuals.

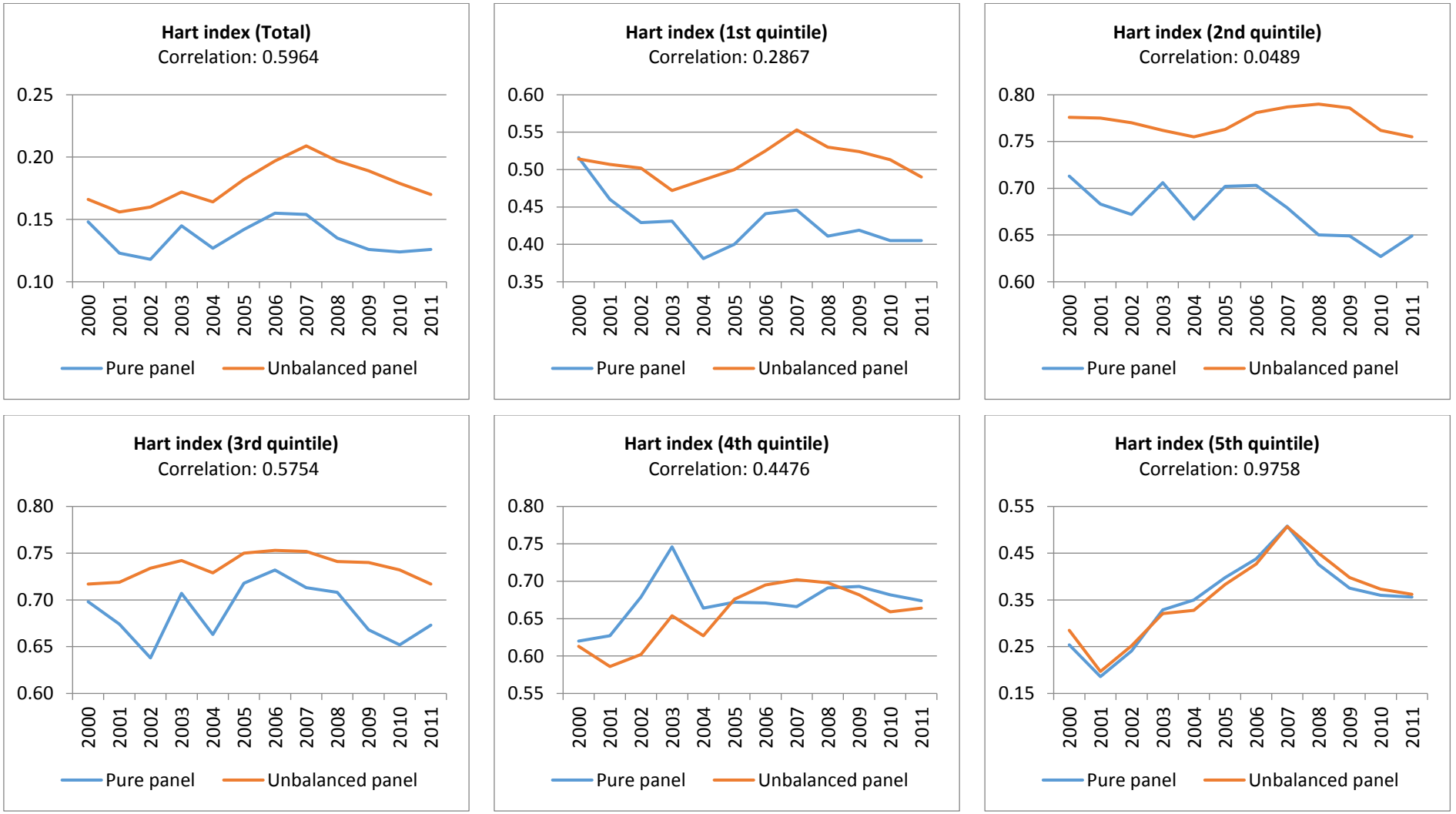
Secondly, we measure income mobility using the immobility ratio –in other words, the proportion of people who stayed in the same income quintile from one year to another.

In Figure 21, we can identify a first period of declining mobility during the first years of the total series, and a second one in the years following the outbreak

of the crisis. However, it is worth mentioning that, independently of the sample chosen, the last year of the series is the one with the highest immobility ratio, i.e., the lowest level of income mobility.

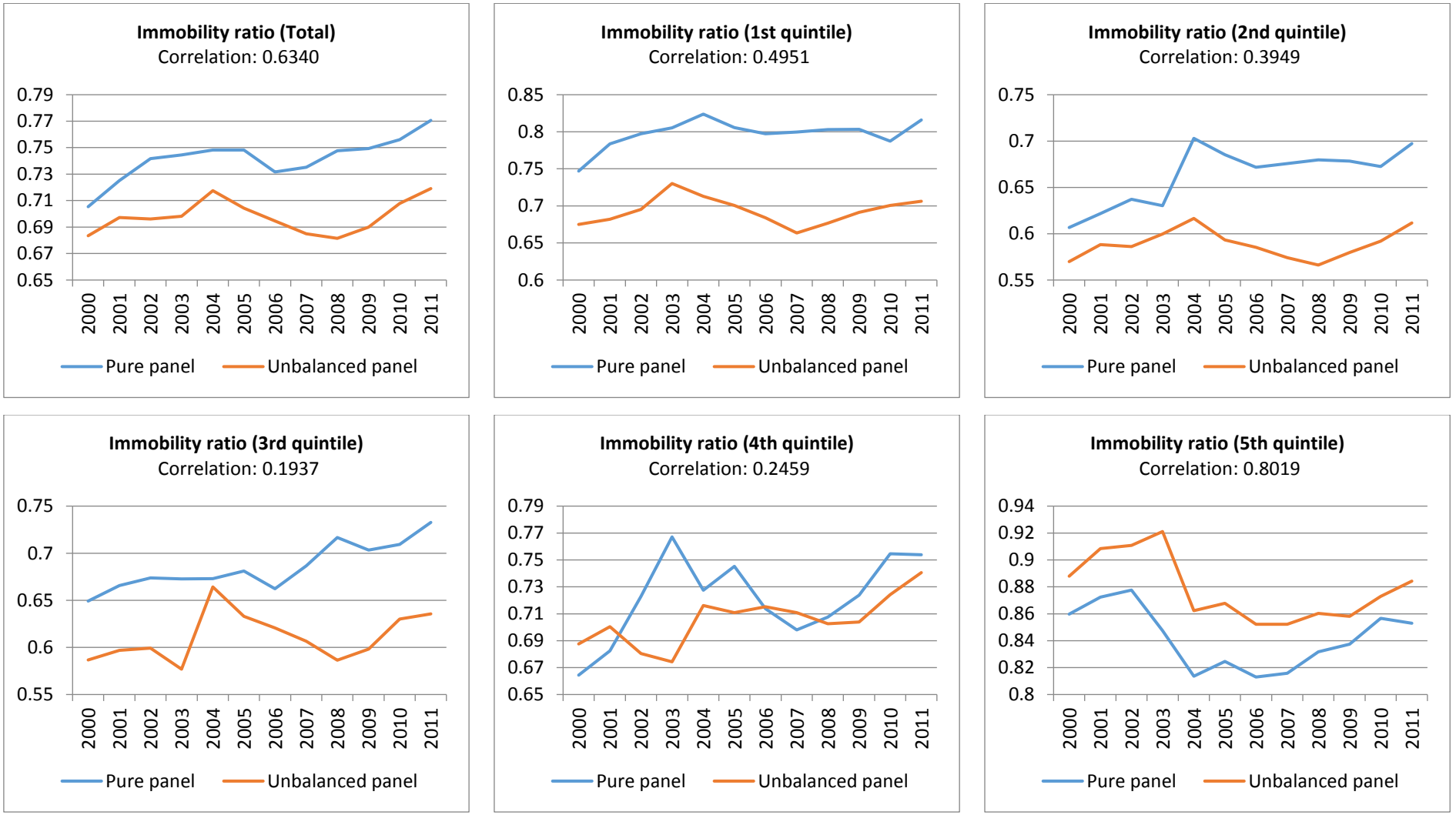
By segmenting the distribution into income quintiles, we can see how the behavior of (im)mobility can vary substantially depending on the position of the individuals within it. Although there are substantial differences between the results obtained using both samples, it can be noted that in most cases the central quintiles (2^{nd}, 3^{rd} and 4^{th}) have higher levels of mobility than the two extremes.

Figure 20. Hart indices for the whole distribution and segmented by quintiles (pure and unbalanced panels), 2000-2011



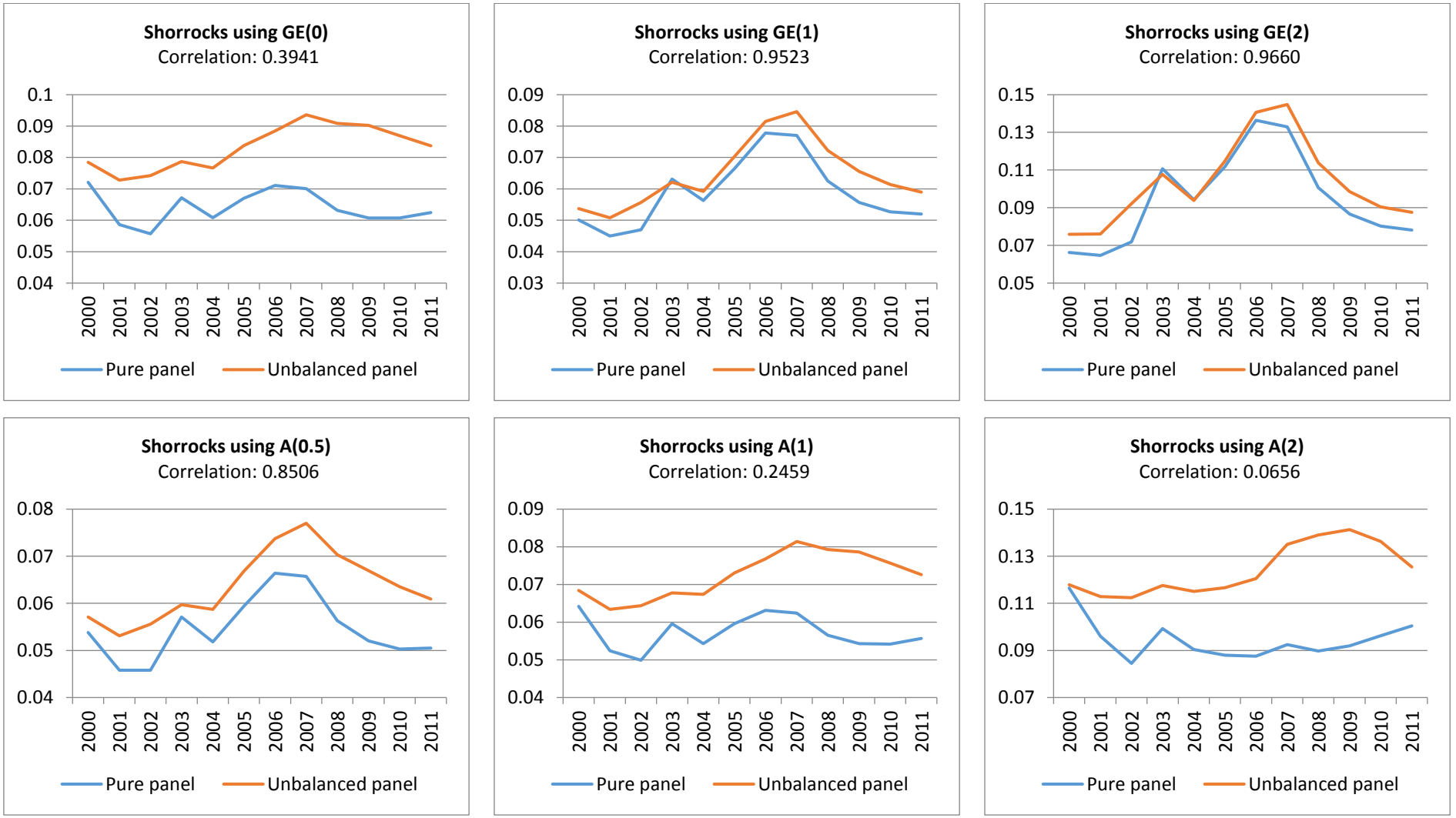
Source: Own elaboration.

Figure 21. Immobility ratios for the whole distribution and segmented by quintiles (pure and unbalanced panels), 2000-2011



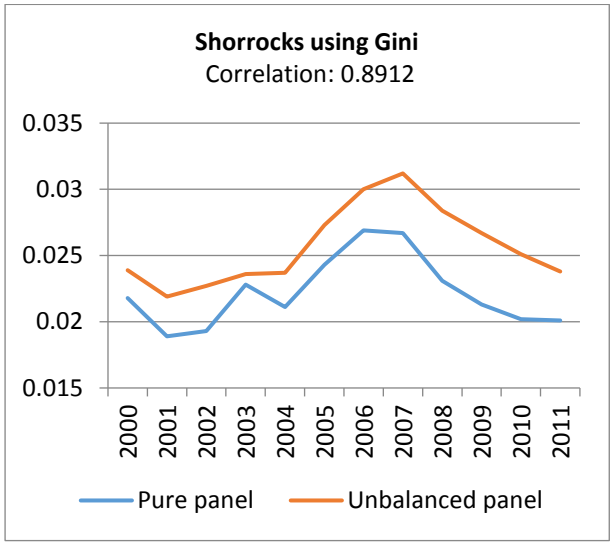
Source: Own elaboration.

Figure 22. Shorrocks indices for several inequality measures (pure and unbalanced panels), 2000-2011 (continued)



Source: Own elaboration.

Figure 22. Shorrocks indices for several inequality measures (pure and unbalanced panels), 2000-2011 (continuation)



Individuals in the fifth quintile, who unequivocally are the least mobile in the distribution and the only ones with high correlation levels, experienced a decline in mobility that ends in the first years of the period, and immediately afterwards there is a sharp increase in income mobility that lasts until the outbreak of the crisis. Since then, mobility has declined year after year, bringing it back to levels similar to those before the crisis.

On the other hand, from the results for the lowest and central quintiles, no clear conclusion can be made since the differences in trend between the two samples are extremely significant (the correlation coefficients are lower than 0.5).

Finally, we used the Shorrocks indices to grasp the relationship between income inequality and mobility.

The annual variations of these indicators follow different paths (Figure 22), and the changes they experience in some years are statistically significant: for the Shorrocks index using the GE measures, we can see a steady growth in income mobility over the period 1999-2006. In contrast, in the subsequent period, the mobility at the top suffered a considerable drop. Finally, it should be noted that for lower values of the GE alpha constant, the changes in mobility are much smoother, especially in the pre-crisis period.

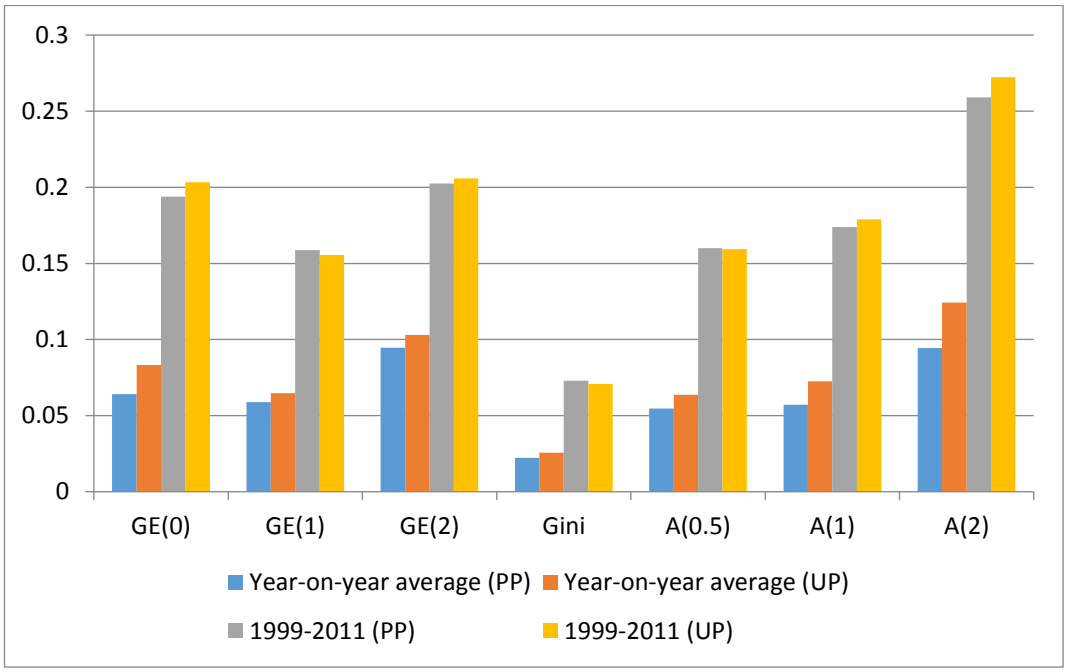
When we choose the Gini coefficient as the inequality measure to calculate the Shorrocks index, we can find a similar scenario to the one explained above for

both the pure and the unbalanced panel: an increase in the year-on-year equalization of income for the period 1999-2006, followed by a decrease in the rest of the years.

Finally, when we use the Atkinson class of measures, the behavior is completely different depending on the panel, and the results obtained for both samples are contradictory, increasingly different for higher values of the epsilon constant, so those results are not useful to know the real situation of households at the lowest end of the income distribution.

However, this measurement tool allows us to analyze the degree to which income equals in a longer term, that is, it lets us determine the persistence of inequality for longer periods of time (Figure 23).

Figure 23. Year-on-year average and long-term Shorrocks indices for several inequality measures (pure and unbalanced panels), 1999-2011



Source: Own elaboration.

In most cases, the results of the unbalanced panel show a greater degree of income equalization than the pure panel, although, if we focus on the path of long term measures, differences in trends tend to disappear –the longer the period, the higher the correlation between the pure and the unbalanced panel measures.

Indicators centered on the tails of the distribution show the highest levels of inequality reduction due to mobility, whereas the Gini coefficient, which is

particularly focused on the central quantiles, points out the smallest equalization of income in the long term.

Finally, the joint analysis of income inequality and mobility trends leads us to come to the following conclusions: until 2002, mobility was relatively low, while inequality was reducing slowly. Both variables skyrocket in 2006, just before the outbreak of the financial crisis. From this year onward the trends of the series become increasingly dissimilar for each income group. When we focus on the individuals at the top, we can see that both inequality and mobility plummet down up to pre-crisis levels; instead, if we put the emphasis on the individuals at the bottom, there are very different results depending on the sample chosen; lastly, individuals in the middle show a behavior similar to those at the top, with inequality and mobility dropping to values slightly higher than the minimum registered before the crisis. Moreover, the equalizing power of income mobility as a means of easing inequality in the long term is significantly weaker if we use the Gini coefficient as our inequality indicator, regardless of the sample chosen.

In addition, it is worth mentioning that there are differences between the mobility levels observed for the groups resulting from the segmentation of the distribution according to various criteria at our disposal, irrespective of the sample utilized.

On the one hand, women show slightly higher levels of income mobility with respect to the base year than men, a difference that is sustained throughout the analyzed period. On the other hand, taxpayers whose main source of income is labor present income mobility levels 15%-20% lower than the rest of individuals. Finally, segmenting by age group, we can say that income mobility reaches its maximum during the first years of working life (between 16 and 29 years) and decreases over time to reach its minimum for individuals over 65.

5. Conclusions

As a first conclusion, we can state that, in general, for the analysis of both income inequality and income mobility, there is a clear difference between using

the pure and the unbalanced panel. However, it should be noted that the difference for measures focusing on the upper end of the distribution seems to be negligible, whereas it becomes increasingly significant as we move closer to the lowest income segment.

This behavior may be explained by the fact that the composition of that segment of the distribution is likely to be very different in both panels. Due to the high pro-cyclicality of the low income brackets –which were most affected by the bursting of the housing bubble and the subsequent recession– and the sample bias that causes exclusion of individuals who earned an income below the non-taxable minimum.

However, the fact that both panels offer similar outcomes for measures centered on the median and the upper end of the distribution implies that if these segments were the aim of the analysis, either a pure panel or an unbalanced panel could be used by the researcher.

From our results, like Izquierdo and Lacuesta (2007), we found that after a period of slight decrease in income inequality due both to a higher concentration of income in the middle section of the distribution and to a lower dispersion at its bottom that ended during the first years of the 2000's. Spain saw a rise in inequality. This rise stemmed from the faster growth rate of highest incomes, which, according to Alvaredo (2013), was caused by a greater wage growth and, particularly, by the capital gains generated during the years of bullish stock market and real estate bubble that preceded the crisis. Its outbreak undoubtedly implied a turning point for the Spanish economy, reducing both income mobility and inequality for richer individuals, restoring the measures focused on the central part of the distribution to early 2000's levels.

It is also worth mentioning that, independently of the sample and indicators chosen, individuals at the top of the distribution have unequivocally lower levels of income mobility, while inequality metrics focused on this group show an unchanged or even decreasing path.

As regards the lower segments of the distribution, the interpretation of the results is more complicated due to their lack of robustness –i.e. Shorrocks indices seem to indicate a slight increase in income mobility compared to the first years of

the series, while Hart indices and immobility ratios suggest the opposite. With respect to income inequality, although the results for this segment are not entirely equal, there is a clear increase in inequality compared to the early 2000's.

Therefore, while it cannot be said that income inequality and mobility are pro-cyclical, we can safely claim that they were profoundly affected by the shock of the 2008 economic crisis. In the following years, indicators for both variables returned to pre-crisis levels for the middle and upper classes after a sudden increase. Finally, although we cannot come to definite conclusions for the lowest class, the results of the Atkinson index for the unbalanced panel –which seems to be the most suitable for analyzing this income group with our dataset– suggest that inequality followed an upward path throughout the period, while mobility remained unchanged or even reached lower levels than at the beginning of the data series.

These results are consistent with what Ayala (2013) stated in his analysis of the evolution of inequality in Spain: the biggest loss of purchasing power affected lower income individuals –characterized by lower levels of education, higher temporary employment rates, and, therefore, greater possibilities of losing their only source of income. However, in order to confirm these first impressions regarding the behavior of low incomes, further research using databases in which these individuals are more adequately represented is needed.

Chapter 5: Neighborhood inequality and spatial segregation: An analysis with tax data for 33 Spanish cities

1. Introduction

The recent publication by the Spanish Tax Agency of personal income tax statistics from the largest cities disaggregated by postal code offers the possibility to ascertain in greater detail the way income is distributed in the main urban centers of Spain.

Knowing how income is distributed within the most populated Spanish municipalities and the degree of income segregation within each of them is crucial, given that this issue can have extremely relevant implications. The negative effects that spatial segregation by income has on household earnings, health status, perceived well-being, educational attainment or crime rates generate a double disadvantage for those who live in more impoverished areas (Kawachi and Berkman, 2003; Krivo *et al.*, 2009; Reardon and Bischoff, 2011; Ludwig *et*

al., 2012). As a result, excessive income gaps between the neighborhoods of the same city are likely to reinforce and perpetuate socio-economic differences, undermining social mobility and, ultimately, equal opportunities.

Considering the significance of the potential consequences of spatial income segregation, it is particularly useful to study how income is distributed at a neighborhood level, as well as its evolution over time. In addition, given the very recent publication of the data by the Tax Agency, as far as we are concerned, there is no clear precedent for this type of analysis for Spain in the economic literature.

The analysis covers the years 2013 to 2016. This time span includes the exit from a lengthy recession that began in 2007 and lasted until 2013 and the first years of economic recovery, which resulted in a sharp fall in the unemployment rate. However, although the Spanish economy grew in this period well above the Eurozone average, data from the National Statistics Institute point to a stagnation or even decrease in the average disposable income of households belonging to the lowest income deciles, which led to an increase in all poverty and inequality indicators.

In this context, the available data only include the years mentioned above –thereby preventing us from analyzing the long-term evolution of income distribution and neighborhood segregation. We, nonetheless, will be able to provide an accurate picture on the situation of inequality in the main Spanish urban areas and determine the direction the concentration of income has been moving during the years immediately following the economic crisis of 2007.

Most of the literature on this subject was conducted in the United States, where there is particular interest in investigating spatial segregation and its relationship with race (Massey and Eggers, 1990; Jargowsky, 1996; Mayer, 1996; Yang and Jargowsky, 2006; Wheeler and La Jeunesse, 2006 y 2008; Andreoli and Peluso, 2018). Nevertheless, increasing inequality at national levels and certain patterns pointing to growing spatial segregation in countries such as Canada (Chen *et al.*, 2012) or Sweden (Scarpa, 2016) sparked the interest of researchers of these countries in exploring trends for major metropolitan areas.

Bearing this in mind, the main objective of our work is to know in detail how personal income is distributed in the main Spanish cities, putting these results

into context within the related literature, and to try to determine the direction that neighborhood inequality and spatial segregation in Spain seem to take. At the same time, we will characterize these trends by analyzing district mobility and changes in both tax revenue composition and the sharing of tax burden.

The chapter is organized as follows. First, we present the sample used and the definition of the main variables. Next, we perform the quantitative analysis and present and discuss the results. Afterwards, we address the policy implications of the findings and recommendations for correcting the problems identified. Finally, we summarize the conclusions of our research.

2. Methodology

The selection of the municipalities included in the database published by the Tax Agency responds to three criteria of which at least one must be fulfilled: (1) the municipality has more than 200,000 inhabitants according to the Population Census, (2) more than 100,000 personal income tax returns have been filed in the fiscal year in question, and (3) the aggregate gross income of the municipality exceeds 2,200 million euros. These three criteria are satisfied simultaneously in most of the cities included, although there are some cases in which only some of them are valid. On the other hand, it should be pointed out that no data are provided for any of the municipalities belonging to the autonomous communities with chartered regime –i.e. the Basque Country and Navarre.

This brings to a total of 33 municipalities that between 2013 and 2016 met some of the above requirements: A Coruña, Alcalá de Henares, Alcobendas, Alicante, Badalona, Barcelona, Burgos, Cartagena, Córdoba, Elche, Getafe (only in 2015 y 2016), Gijón, Granada, Jerez de la Frontera, L'Hospitalet de Llobregat, Las Palmas de Gran Canaria, Las Rozas (only in 2016), Madrid, Málaga, Móstoles, Murcia, Oviedo, Palma de Mallorca, Pozuelo de Alarcón, Sabadell, Santa Cruz de Tenerife, Santander, Sevilla, Terrassa, Valencia, Valladolid, Vigo and Zaragoza.

According to the continuous register of the National Statistics Institute, on 1 January 2017 the population living in these 33 municipalities was 13,941,813 inhabitants, which represents 29.94% of the population of Spain, and the number of tax payers who are part of the sample represents about a third of the total tax returns made throughout the country.

The municipalities are in turn divided into 541 districts, each identified by its postcode. The number of districts per municipality depends on the population size, fiscal size or total gross income. Therefore, for example, the city of Madrid, which is the most populated one in Spain, is subdivided into 54 districts, while Pozuelo de Alarcón, the smallest of the 33 selected, has only two districts.

The size of the districts can vary significantly: from a few hundred taxpayers to almost 50,000 in the most populated neighborhoods of Madrid. The average size of a district is around 11,700 taxpayers.

According to the classification of the Tax Agency, gross personal income comprises labor income, investment income, real estate income, income from self-employment, capital gains and losses, and tax-exempt income. On the other hand, disposable personal income, which is the variable we will use in our analysis, is calculated by deducting from gross personal income the amounts paid in social contributions and the personal income tax contribution.

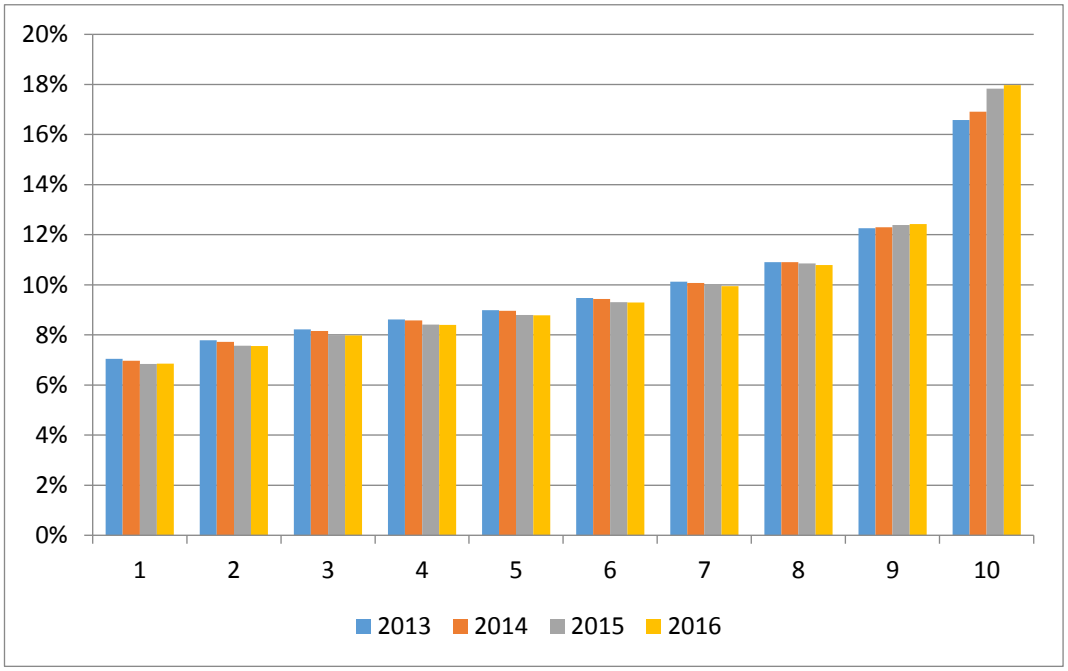
In order to analyze the income distribution in the 33 selected municipalities, in the following section we will utilize, firstly, bar charts to find out how income is distributed by deciles and how this distribution evolved in the period under analysis. Secondly, we will use box plot charts and ratios to quantify the gap between the richest and poorest districts in each municipality and their evolution over time. Third, we will apply the Gini and Theil indices to verify previous results. Finally, we will exploit the possibility offered by Theil index to distinguish between inequality between and within districts to determine whether inequality is mainly caused by either neighborhood segregation or differences within districts. In addition, in order to enrich and contextualize the results of the above analysis, we will examine the main trends in terms of district mobility, revenue composition and tax burden.

3. Results and discussion

3.1. Income distribution before neighborhood disaggregation

A first stage in analyzing the income distribution in the selected cities is to examine the distribution by deciles. This way, we ordered the more than five hundred districts in ten groups of equal number of taxpayers ascending by average disposable income and determine what percentage of disposable income is captured by each of these groups. The results can be seen in Figure 24.

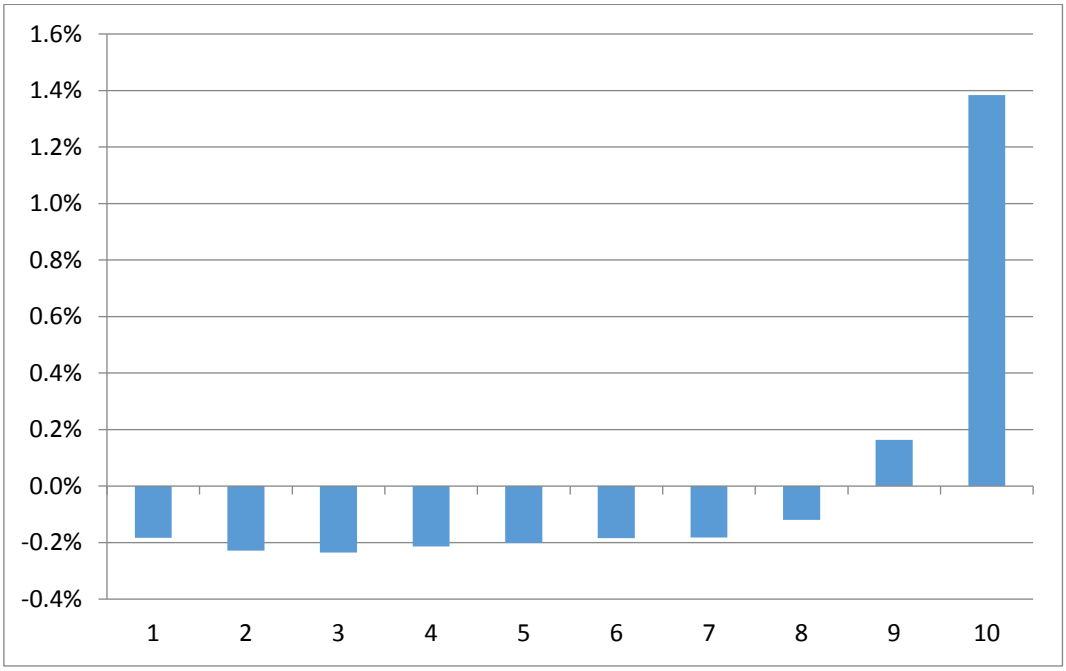
Figure 24. Bar chart of disposable income by deciles, 2013-2016



Source: Own elaboration.

Although in the previous figure it is possible to note that the groups with the highest earnings manage to capture a significant share of the total income in the municipalities studied, the changes that may have occurred in the distribution in these four years are not perfectly visible to the naked eye since this is an extremely slow process. Therefore, in order to be able to identify the direction in which the concentration of disposable income moves in the main urban centers of Spain, we have elaborated Figure 25, calculated as the difference between the first and the last histogram included in Figure 24.

Figure 25. Change in disposable income by deciles, 2013-2016



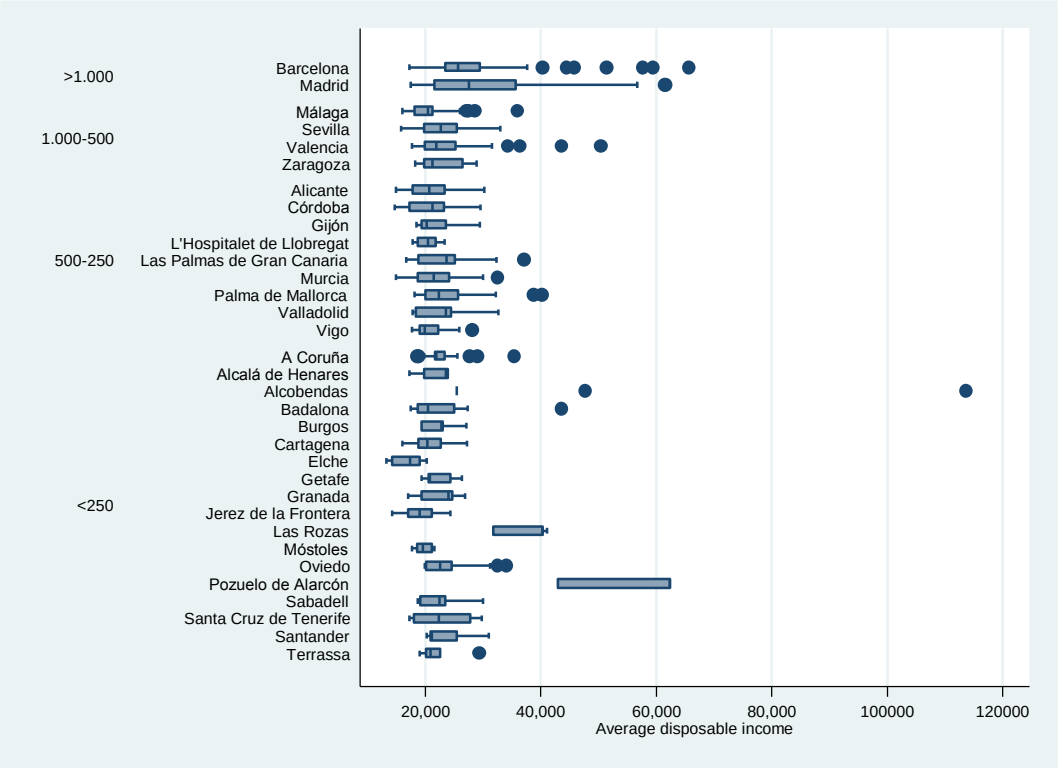
Source: Own elaboration.

In this second figure, the trend towards income concentration in the two richest deciles at the expense of the remaining eight can be perceived with greater precision.

3.2. Income distribution by municipality: Box plot diagrams and ratios

Moving deeper into the income distribution at the municipal level, it is possible to appreciate (Figure 26) that in 2016 intramunicipal inequality varies significantly depending on the city. As a result, relatively small municipalities close to other larger population centers have, on the one hand, the lowest levels of dispersion and, on the other hand, average disposable incomes below the sample average. In contrast, in cities with more than one million inhabitants and in some smaller ones, income inequalities are much more pronounced.

Figure 26. Box plots of the average disposable income distribution (in euros) by size of municipality (in thousands of inhabitants), 2016



Source: Own elaboration.

As a preliminary way of measuring these differences, we can use the ratio between the average disposable income of the richest and poorest districts (Table 15). We see again that the most populated cities have the highest levels of income polarization. This situation is not replicated in smaller provincial capitals, where the magnitude of the gap between the most prosperous and the most disadvantaged district is significantly smaller. Notwithstanding, for the group of cities with less than one million inhabitants, the results are so heterogeneous that they do not allow us to generalize the idea that inequality necessarily grows with the size of the municipality.

As for the cities with less polarization in the distribution of income, once more, we find dormitory cities located on the periphery of the two largest cities: Madrid and Barcelona. However, there are also municipalities located in the metropolitan areas of these two cities that have similar or even higher levels of income polarization. In other words, in the periphery of the two largest Spanish cities municipalities with lower average disposable income and income polarization coexist with others that are in the diametrically opposite situation.

Table 15. Ratio between the average disposable income of the richest and poorest district, 2013-2016

Municipality	2013	2014	2015	2016
A Coruña	1.8251	1.7289	1.8551	1.9047
Alcalá de Henares	1.3693	1.3793	1.3801	1.3891
Alcobendas	3.6590	4.0519	4.3246	4.4716
Alicante	1.9255	1.9549	1.9462	2.0215
Badalona	1.5077	1.5571	1.6312	2.4924
Barcelona	3.2213	3.3626	3.6304	3.8122
Burgos	1.4024	1.3880	1.3999	1.4069
Cartagena	1.7149	1.7459	1.8939	1.7009
Córdoba	2.0192	1.9932	1.9999	2.0041
Elche	1.5445	1.5271	1.5399	1.5248
Getafe				1.3596
Gijón	1.5823	1.5835	1.6319	1.5933
Granada	1.5594	1.5657	1.5932	1.5802
Jerez de la Frontera	1.7786	1.7490	1.7470	1.7108
L'Hospitalet de Llobregat	1.2971	1.2962	1.3025	1.3112
Las Palmas de Gran Canaria	2.0616	2.1048	2.5029	2.2282
Las Rozas			1.3502	1.2951
Madrid	5.0589	3.1039	3.6129	3.5227
Málaga	2.1503	2.1144	2.1740	2.2529
Móstoles	1.1938	1.1871	1.1871	1.2161
Murcia	2.1790	2.1565	2.3155	2.1880
Oviedo	1.7349	1.6868	1.6496	1.7139
Palma de Mallorca	2.0416	2.2042	2.2910	2.2119
Pozuelo de Alarcón	1.2226	1.2465	1.3830	1.4542
Sabadell	1.5597	1.5904	1.5827	1.6092
Santa Cruz de Tenerife	1.7445	1.7361	1.6715	1.7280
Santander	1.4481	1.4559	1.4801	1.5296
Sevilla	2.0813	2.0990	2.1310	2.0876
Terrassa	1.5171	1.5224	1.5625	1.5403
Valencia	2.4403	2.5715	2.9477	2.8606
Valladolid	1.7988	1.8166	1.8352	1.8369
Vigo	1.5504	1.5569	1.5932	1.5890
Zaragoza	1.6012	1.5696	1.6918	1.5839

Source: Own elaboration.

If we focus on the changes throughout the four years of the sample, the most populated municipalities and some of the surrounding localities are again the ones that feature the most noteworthy changes. These cities experienced a noticeable increase in the gap between their neighborhoods with the highest disposable income and those with the lowest, fundamentally due to the increase in

income in the former –being Madrid, which moved in the opposite direction, the only exception to this general trend.

In the remaining municipalities in the sample, which group together the main provincial capitals and the dormitory cities with the lowest average disposable income, there is a slight upward trend in income polarization, although always to modest levels.

This trend towards income polarization, which is essentially due to income stagnation in the poorest districts and its significant increase in the wealthiest ones, suggests a two-speed exit from the economic crisis. Districts with fewer resources experienced a relative deterioration in their situation relative to the more affluent ones despite the relief that the drop in unemployment may have brought.

3.3. Income distribution by municipality: Gini coefficient and Theil index

For a more detailed analysis of the results obtained by the above ratios, we can use two of the most common measures of income inequality: the Gini coefficient and the Theil index. The features and functions of these indicators are described in further detail in Chapter 1.

As can be seen in Table 16, both of them yield conclusions similar to those of the previous section: regardless of the indicator used, among the municipalities with the lower inequality there are several dormitory cities located in the two main Spanish metropolitan areas, whereas among the most unequal we find the most populated cities and some municipalities located on the outskirts of Madrid.

The main provincial capitals show average levels of inequality according to both indicators, and there does not seem to be a clear relationship between the results of these measures and the size of the population.

Although the changes over the period under analysis are very moderate, we can highlight a slight increase in the Theil and Gini indices for the total

population. This result that reinforces what was previously noted in the distribution by deciles and the disposable income gap between the poorest and richest districts of each municipality, which in both cases indicated a trend towards a greater concentration of income at the upper end of the distribution.

Table 16. Gini coefficient and Theil index by city, 2013-2016

Municipality	Theil 2013	Theil 2014	Theil 2015	Theil 2016	Gini 2013	Gini 2014	Gini 2015	Gini 2016
A Coruña	0.2086	0.2086	0.2219	0.2244	0.3399	0.3397	0.3493	0.3491
Alcalá de Henares	0.1435	0.1468	0.1595	0.1507	0.2888	0.2924	0.3015	0.2948
Alcobendas	0.4745	0.5051	0.5310	0.5469	0.4841	0.4949	0.5083	0.5147
Alicante	0.2029	0.2048	0.2137	0.2193	0.3443	0.3453	0.3510	0.3541
Badalona	0.1440	0.1431	0.1495	0.1820	0.2877	0.2874	0.2926	0.3064
Barcelona	0.2461	0.2522	0.2716	0.2829	0.3658	0.3694	0.3807	0.3865
Burgos	0.1633	0.1589	0.1733	0.1641	0.3061	0.3026	0.3114	0.3049
Cartagena	0.1639	0.1668	0.2106	0.1679	0.3123	0.3146	0.3311	0.3151
Córdoba	0.1786	0.1792	0.1844	0.1876	0.3257	0.3259	0.3307	0.3316
Elche	0.2040	0.2009	0.2019	0.2001	0.3377	0.3357	0.3353	0.3326
Getafe				0.1517				0.2949
Gijón	0.1514	0.1581	0.1601	0.1572	0.2984	0.3029	0.3039	0.3021
Granada	0.1709	0.1767	0.1855	0.1799	0.3183	0.3229	0.3297	0.3255
Jerez de la Frontera	0.1714	0.1800	0.1863	0.1755	0.3186	0.3257	0.3281	0.3200
L'Hospitalet de Llobregat	0.1197	0.1241	0.1278	0.1294	0.2645	0.2680	0.2722	0.2732
Las Palmas de Gran Canaria	0.1999	0.2000	0.2131	0.2212	0.3384	0.3380	0.3453	0.3504
Las Rozas			0.2568	0.2501			0.3867	0.3818
Madrid	0.2508	0.2648	0.3062	0.3065	0.3695	0.3774	0.4001	0.4006
Málaga	0.1730	0.1763	0.1834	0.1891	0.3172	0.3204	0.3261	0.3281
Móstoles	0.1299	0.1298	0.1353	0.1345	0.2759	0.2759	0.2797	0.2782
Murcia	0.1925	0.1969	0.1963	0.1957	0.3344	0.3372	0.3368	0.3364
Oviedo	0.1623	0.1646	0.1714	0.1709	0.3086	0.3110	0.3154	0.3142
Palma de Mallorca	0.2150	0.2302	0.2395	0.2425	0.3437	0.3522	0.3547	0.3565
Pozuelo de Alarcón	0.3351	0.3470	0.4146	0.4311	0.4396	0.4462	0.4829	0.4907
Sabadell	0.1592	0.1638	0.1650	0.1679	0.2994	0.3026	0.3036	0.3040
Santa Cruz de Tenerife	0.2163	0.2184	0.2109	0.2220	0.3514	0.3524	0.3477	0.3537
Santander	0.1775	0.1782	0.1881	0.1882	0.3207	0.3198	0.3278	0.3277
Sevilla	0.1868	0.1931	0.2006	0.1941	0.3305	0.3346	0.3404	0.3360
Terrassa	0.1503	0.1502	0.1555	0.1543	0.2918	0.2919	0.2963	0.2953
Valencia	0.2150	0.2179	0.2383	0.2431	0.3506	0.3522	0.3636	0.3661
Valladolid	0.1637	0.1637	0.1732	0.1669	0.3105	0.3098	0.3154	0.3118
Vigo	0.1790	0.1833	0.1909	0.1894	0.3195	0.3218	0.3272	0.3242
Zaragoza	0.1707	0.1739	0.1937	0.1769	0.3131	0.3144	0.3265	0.3157
TOTAL	**0.2261**	**0.2345**	**0.2600**	**0.2609**	**0.3517**	**0.3562**	**0.3702**	**0.3700**

Source: Own elaboration.

Moreover, the results of the decomposition of the Theil indices (Table 17) reveal that more than 90% of inequality comes from intramunicipal differences. Instead, if we take the district as the grouping unit of the respondents, the relative weight of the differences between groups is slightly greater, ranging from approximately 16 to 18% of the total. In addition, as with segmentation by municipality, within-group differences are gradually becoming more pronounced year after year.

Table 17. Decomposition of the Theil index, 2013-2016

Theil index	2013	2014	2015	2016
By municipality	0.226	0.235	0.260	0.261
Within group	0.215	0.223	0.245	0.246
Between group	0.011	0.012	0.015	0.015
Within group (% total)	95.10%	94.93%	94.39%	94.28%
Between group (% total)	4.90%	5.07%	5.61%	5.72%
By district	0.226	0.234	0.260	0.261
Within group	0.190	0.196	0.213	0.213
Between group	0.036	0.039	0.047	0.048
Within group (% total)	84.09%	83.51%	82.06%	81.71%
Between group (% total)	15.91%	16.49%	17.94%	18.29%

Source: Own elaboration.

The percentage of the Theil index that is due to inequalities between districts makes it possible to approximate a measure of intramunicipal segregation. This measure was previously used by Chen *et al.* (2012) and Scarpa (2016) to measure neighborhood segregation in Canada and Sweden, respectively. As such, our results allow confirming that the high levels of inequality in some municipalities arise, to a greater extent than in others, from spatial segregation in districts (Table 29 in Annex 4). This suggests that in Spain it is not usual for districts with overly significant differences in average disposable income to coexist in the same municipality –that is, heavy segregation by neighborhoods within the same municipality is not usual, except in the larger cities, where the contrasts do appear to be more pronounced.

Also, the share of the Theil index that is due to inequality within each district has high levels of correlation (they exceed 95%) with the inequalities of the municipality (whether measured by the Gini coefficient or the Theil index).

Thus, one might assert that changes in disposable income inequality are caused mainly by increases in inequality within districts rather than between them.

Finally, although the methodologies used in previous research for other countries are not perfectly comparable, Spanish cities –even the most populated ones– seem to have relatively low levels of segregation compared to their Canadian and Swedish counterparts.

Nevertheless, the upward trend in segregation rates in most of the municipalities studied should be a wake-up call for policy-makers, given the dire consequences of high neighborhood segregation by income level.

3.4. Mobility among districts

As can be seen in Table 18, the districts at both ends of the distribution hardly changed during the period under review.

Table 18. Ranking of districts by average disposable income (descending order), 2013-2016 (continued)

2013	2014	2015	2016
La Moraleja (Alcobendas)	La Moraleja (Alcobendas)	La Moraleja (Alcobendas)	La Moraleja (Alcobendas)
Valdebebas-Valdefuentes (Madrid)	La Granja-Campus Empresarial (Alcobendas)	Aravaca (Madrid)	Vallvidrera-Tibidabo i Les Planes (Barcelona)
Vallvidrera-Tibidabo i Les Planes (Barcelona)	Vallvidrera-Tibidabo i Les Planes (Barcelona)	Vallvidrera-Tibidabo i Les Planes (Barcelona)	Somosaguas-Humera (Pozuelo de Alarcón)
Pedralbes-Sarriá (Barcelona)	Pedralbes-Sarriá (Barcelona)	Salamanca- Goya (Madrid)	Salamanca-Goya (Madrid)
Castellana (Madrid)	Aravaca (Madrid)	Castellana (Madrid)	Aravaca (Madrid)
Aravaca (Madrid)	Valdebebas-Valdefuentes (Madrid)	Somosaguas-Humera (Pozuelo de Alarcón)	Muntaner (Barcelona)
Nueva España (Madrid)	Salamanca-Goya (Madrid)	Pedralbes-Sarriá (Barcelona)	Pedralbes-Sarriá (Barcelona)
Muntaner (Barcelona)	Muntaner (Barcelona)	Muntaner (Barcelona)	Nueva España (Madrid)
Somosaguas-Humera (Pozuelo de Alarcón)	Castellana (Madrid)	Nueva España (Madrid)	Castellana (Madrid)
Salamanca-Goya (Madrid)	Nueva España (Madrid)	Pla de Remei (Valencia)	Castilla-Chamartín (Madrid)

Table 18. Ranking of districts by average disposable income (descending order), 2013-2016 (continuation)

2013	2014	2015	2016
La Foia (Elche)	Guadalcacín (Jerez de la Frontera)	Ciudad Jardín (Alicante)	Las Pachecas-El Mojo-Los Isletes (Jerez de la Frontera)
Guadalcacín (Jerez de la Frontera)	Corvera-La Murta-Los Garcías (Murcia)	Guadalcacín (Jerez de la Frontera)	Los Ramos (Murcia)
Los Ramos (Murcia)	La Foia (Elche)	Alquerías (Murcia)	Alquerías (Murcia)
Alquerías (Murcia)	Alquerías (Murcia)	Sector 5º-El Asilo-El Canal (Elche)	Sector 5º-El Asilo-El Canal (Elche)
Gea y Truyols (Murcia)	Gea y Truyols (Murcia)	Los Ramos (Murcia)	Ciudad Jardín (Alicante)
Sector 5º-El Asilo-El Canal (Elche)	Sector 5º-El Asilo-El Canal (Elche)	Gea y Truyols (Murcia)	Gea y Truyols (Murcia)
Sector Sur-Polígono Del Guadalquivir (Córdoba)	Sector Sur-Polígono Del Guadalquivir (Córdoba)	Sector Sur-Polígono Del Guadalquivir (Córdoba)	Sector Sur-Polígono Del Guadalquivir (Córdoba)
Altamira-El Toscar (Elche)	Altamira-El Toscar (Elche)	Altamira-El Toscar (Elche)	Altamira-El Toscar (Elche)
Garrapilos (Jerez de la Frontera)	Garrapilos (Jerez de la Frontera)	Garrapilos (Jerez de la Frontera)	Garrapilos (Jerez de la Frontera)
Carrús-Pza. Barcelona (Elche)	Carrús-Pza. Barcelona (Elche)	Carrús-Pza. Barcelona (Elche)	Carrús-Pza. Barcelona (Elche)

Source: Own elaboration.

The limited mobility among districts is again clear if we look at the evolution of the districts in terms of the average disposable income decile to which they belong (Table 19). Each year, more than 80% remain in the same decile they occupied the previous year, and those that change groups practically move only one decile up or down. However, there is a slight increase in inter-decile mobility, particularly upwards.

Table 19. Year-to-year mobility by district, 2013-2016

District mobility	2014	2015	2016	2013-2016
More than one decile down	0.57%	0.00%	0.56%	0.93%
One decile down	5.90%	9.11%	5.21%	8.19%
Same decile	86.29%	84.44%	83.99%	79.52%
One decile up	6.86%	6.07%	9.31%	9.50%
More than one decile up	0.38%	0.38%	0.93%	1.88%

Source: Own elaboration.

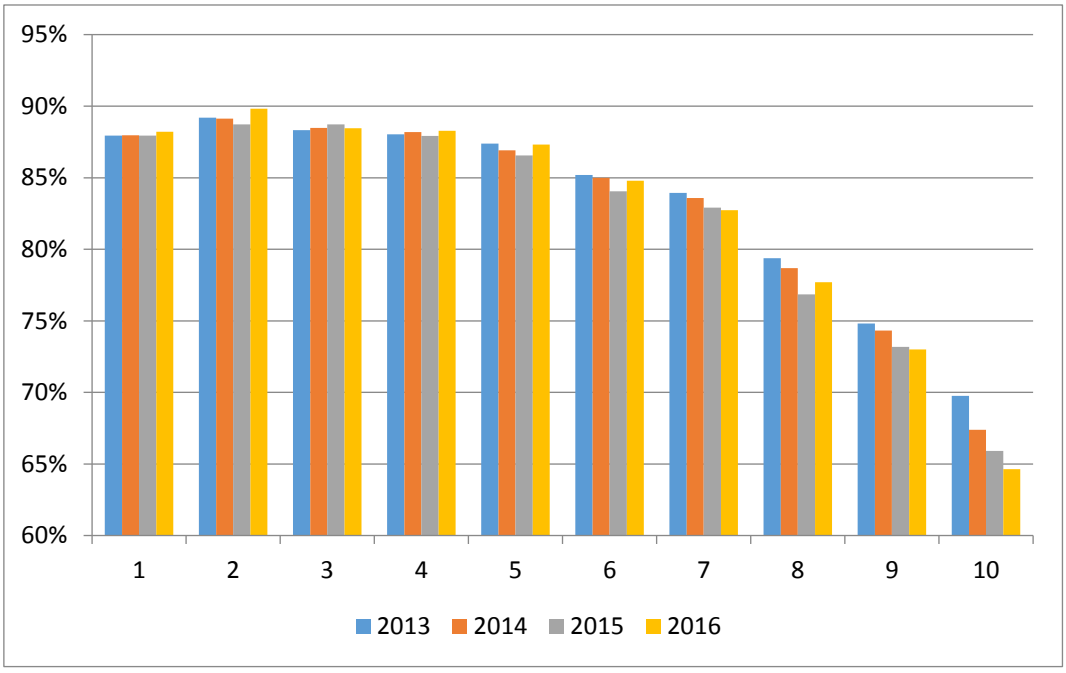
3.5. Income composition

As regards the composition of income and territorial distribution, the most noteworthy fact is that during the four years under consideration and in all districts, the main source of household income is personal labor income.

However, as can be expected, dependence on labor income is higher for districts at the bottom of the distribution, where it accounts for about 85% of average gross income (Figure 27). In contrast, as we move up in income distribution, dependence on labor decreases to account for just under 65% of total income in the richest districts.

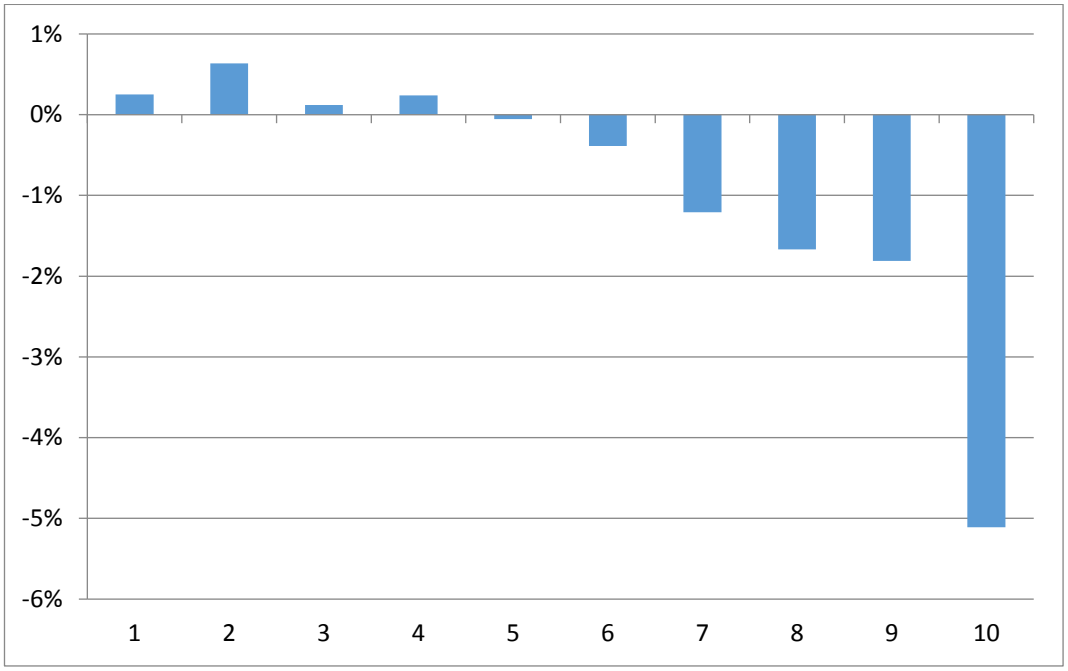
In addition, over the four years surveyed, the importance of labor income as a percentage of the total income increased for virtually all districts below the 60th percentile, while for districts above this level, and especially for the tenth decile, the contribution of labor income declined in favor of other sources of income such as income from investment income or net capital gains (Figure 28).

Figure 27. Labor income (as a percentage of total income) by deciles, 2013-2016



Source: Own elaboration.

Figure 28. Change in labor income (as a percentage of total income) by deciles, 2013-2016



Source: Own elaboration.

The fact that the increase in average disposable incomes experienced by the richest districts is coupled with a shrinking dependence on labor incomes in these neighborhoods may be linked, among other causes, to the expansionary monetary policies pursued by the European Central Bank since the onset of the crisis in 2008.

While these policies may have contributed to the recovery of economic activity and the reduction of the unemployment rate –a phenomenon that tends to affect proportionally more the districts with lower disposable income (De la Roca, 2014)– they may also have favored an increase in returns on assets, mostly in the hands of wealthier households, and on profits derived from their sale (Coibion *et al*., 2017), reducing dependence on labor incomes in the richer districts and increasing the income gap with the least advantaged ones.

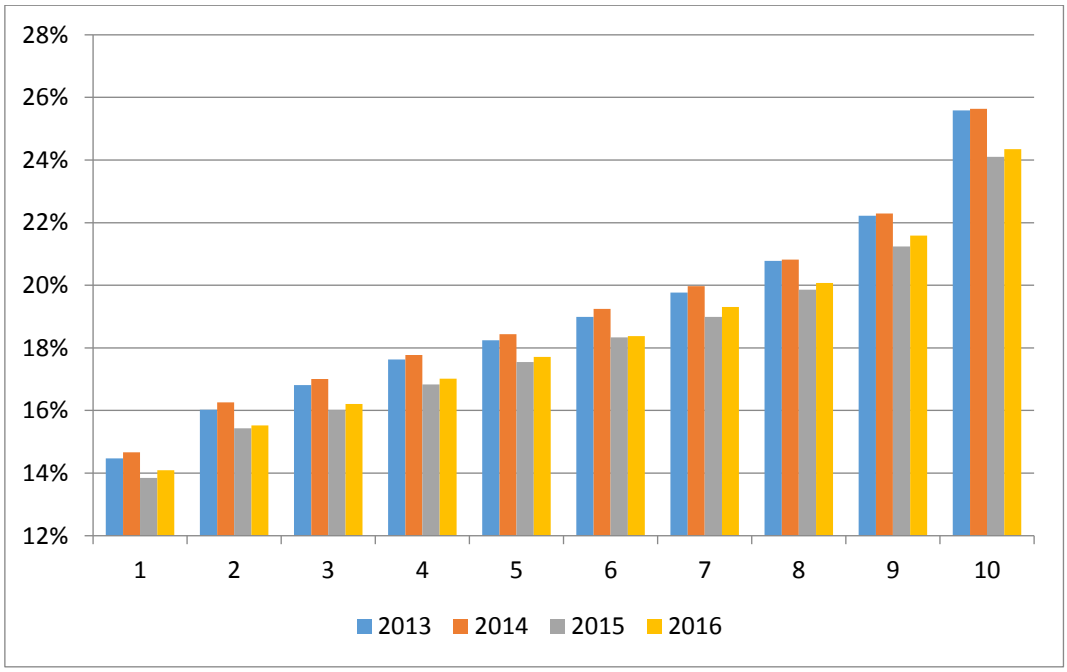
This is also reflected in the fact that the main inequality indicators remained more or less constant –or even declined slightly– when we look exclusively at average labor income, whereas they experienced a remarkable increase for the total average disposable income.

3.6. Tax burden

Regarding changes in the tax burden, measured as the percentage of disposable income paid in direct taxes (understood as the sum of social contributions and the personal income tax contribution), two outstanding points can be seen in Figure 29 and Figure 30. In the first place (Figure 29), direct taxes are indeed progressive, since the average rate applicable to the districts of each decile increases systematically as we move towards the upper end of the distribution.

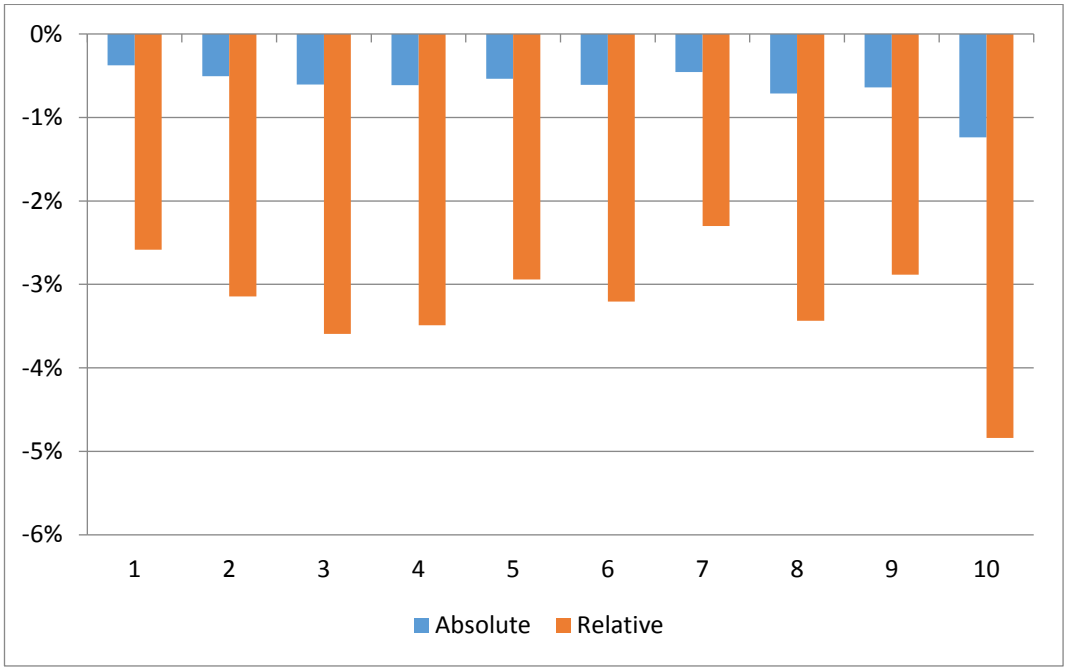
Secondly (Figure 30), the average tax burden was reduced for all groups over the period under review. However, the overall decline in the average effective rates –associated with the tax reforms that came into effect in 2015– was higher in the rich decile districts than in the rest of the distribution.

Figure 29. Average tax burden by deciles, 2013-2016



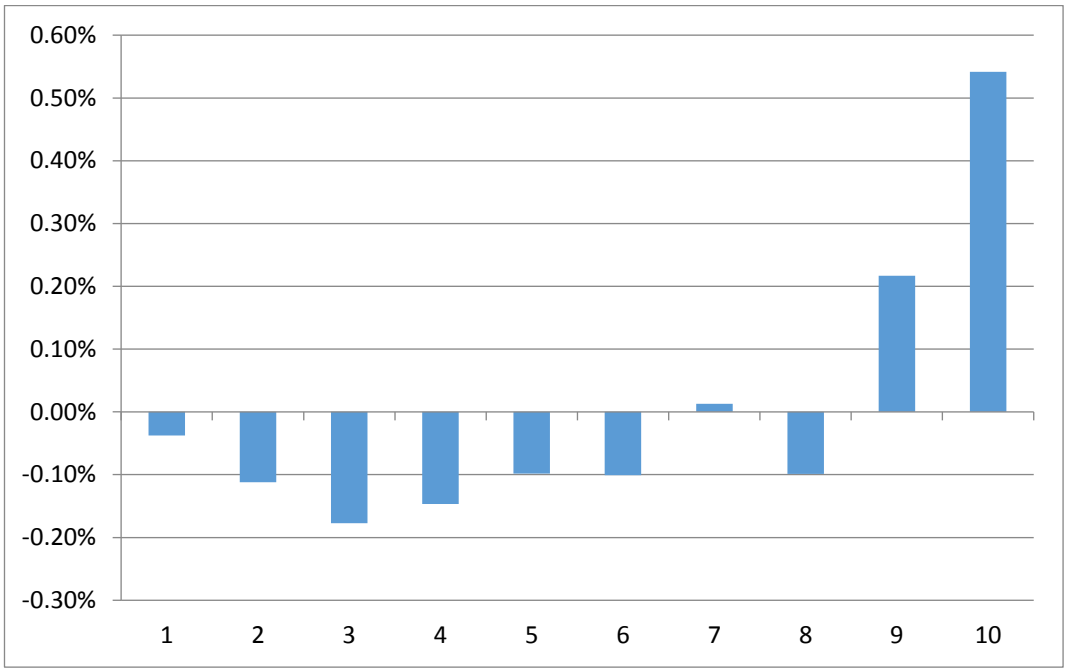
Source: Own elaboration.

Figure 30. Change in average tax burden by deciles, 2013-2016



Source: Own elaboration.

Figure 31. Changes of the contribution to total revenue by deciles, 2013-2016



Source: Own elaboration.

In spite of this, the weight of the wealthiest districts in the total revenue increased, reducing the proportional contribution corresponding to the districts placed in the lowest income deciles (Figure 31). This may be explained by the increase in average disposable income observed in the most affluent districts,

which, although paying a decreasing proportion of their gross income in taxes, account for an increasing share of total gross income.

4. Policy implications and recommendations

We must bear in mind that our results point out that one of the fundamental causes of the increase in income inequality is a stagnation in labor earnings that takes place simultaneously with a noticeable increase in income from other sources in the most prosperous districts. So, policies to relieve or counteract this trend must be based, on the one hand, on the increase in the progressivity of capital taxes and, on the other hand, on the reduction of inequality in the ownership of capital (Piketty, 2014; Milanovic, 2016).

To this end, it is necessary to promote a unified inheritance tax at the national level that reduces the ability of large fortunes to be transferred over generations without suffering perceptible reductions. In addition, in order to deconcentrate capital ownership –according to data from the Bank of Spain (2018), 82.52% of financial assets are in the hands of the two richest deciles–, policy-makers may foster fiscal policies that encourage investment in financial assets by middle-and-low-income households.

Nevertheless, for these policies to achieve the desired results, they should be complemented by a set of measures against tax avoidance and wealth concealment. Especially if we consider that the international mobility of capital makes it easier for an increase in the tax burden on higher-income taxpayers to lead to capital flights (Zucman, 2015).

Moreover, it is essential for policy-makers to adopt housing and urban planning policies that mitigate the incipient increase in segregation detected in our analysis. To this end, measures such as the development or acquisition of social housing in all the districts of each municipality would seem appropriate so that the diversification of neighborhoods increases the interaction between groups with different socioeconomic characteristics. It seems also useful the the granting of

rental subsidies that allow recipients of low incomes to broaden their range of options when renting a house (Bolt, 2009).

However, it does not seem feasible (at least in the current context) to implement in Spain some recent proposals suggesting that the so-called "anchor institutions" –large corporations, universities, hospitals, real estate developers– contribute to the dynamism of cities to ensure that prosperity and growth are not confined to a small number of districts, by offering affordable housing for their workers, contributing to the creation of quality employment, promoting programs to retrain low-skilled workers, or designing and building more inclusive public spaces (Florida, 2017).

5. Conclusions

Several considerations can be drawn from the analysis of tax data by districts on how income is distributed in the main Spanish cities.

First, there is a trend towards the concentration of income in the districts belonging to the two richest deciles at the expense of a reduction in the share of total disposable income for the remaining 80%.

Second, there are significant differences in the intra-municipal inequalities. The most populated cities and certain communities on their periphery present the highest levels of inequality and average disposable income, while in the opposite pole in both variables we find other dormitory cities located in the metropolitan areas of Madrid and Barcelona.

The changes in inequality –which, in any case, are not particularly significant taking into account the short time frame analyzed– are due, according to the decomposition of the Theil index, to the increase in differences within the districts of the same municipality, and not to changes in the distribution of income between districts. Despite the brevity of the period under consideration, our results suggest a slight increase in neighborhood segregation within most municipalities –especially those with relatively high levels of inequality.

In addition, we cannot detect large movements in the distribution of income by district, although we perceive that there may be a trend towards greater mobility, at least in the short term.

At the same time, it is clear that dependence on labor income decreases as we move towards the more prosperous districts, accounting for more than 90 per cent in some of the poorest neighborhoods and just over 60 per cent in the most affluent. Also, there is a slight tendency towards a decreasing dependence on labor in better-off neighborhoods. It is precisely this phenomenon that explains the increase in the concentration of income in the richest districts, since in the period analyzed there were hardly any changes in the distribution of labor earnings.

Finally, regarding the distribution of the tax burden, there has been a general decline in average effective rates, but these changes do not seem to have contributed to improving the progressivity of the income tax, since it was the taxpayers in the richest neighborhoods who experienced the greatest decline in the effective tax rates applied to them.

To address these issues, policy-makers could implement a set of fiscal measures aimed primarily at reducing the gap in capital income and ownership of assets, and a series of housing policies geared to reduce income segregation in cities where it may be becoming a pressing problem.

As a future line of research, it is essential to contrast whether our results are validated or refuted with the publication of successive waves of the database by the Spanish Tax Agency. Likewise, it would be of particular interest, once a series of data with a sufficient number of years is available, to analyze if there were substantial changes in neighborhood segregation by income, following the example of several of the researches referenced in the literature review (Chen *et al.*, 2012; Scarpa, 2016).

Chapter 6: Inequality and redistributive preferences: A cross-country analysis and the case of Spain

1. Introduction

As we have already pointed out previously, according to several reports by the OECD, the gap between higher and lower income households has steadily increased for more than three decades, a trend that has accelerated since 2008 in the wake of the global financial crisis (OECD, 2012, 2013; 2014a, b, and c; 2015, 2016, 2017).

The intensification of this problem has made it one of the most debated topics in economic literature in recent years. One of the factors typically associated with this increase in inequality (Atkinson, 2015) is the progressive dismantling of tax-and-transfers redistributive policies.

Concerning tax policy, these changes are evidenced by the loss of progressivity of direct taxes on personal income and the gradual disappearance of

taxes on wealth (Piketty, 2014). As for transfer policy, a reduction in the amounts paid or stricter rules for access to payment of this type of benefit can be observed (OECD, 2017).

According to median voter theory (Meltzer and Richard, 1981), the voters' redistributive preferences are those that maximize the individual utility of voters. Thus, for low-income households, the expansion of redistributive policies will be beneficial since the increase in payments received will outweigh the increase in the tax burden, while for those with higher income levels, the tax increase will exceed the benefits of greater redistribution.

Nonetheless, individuals have views on this issue that go beyond their household financial situation and the level of both income inequality and mobility within the community they live in. Other factors linked to socio-demographic characteristics, political preferences, personal beliefs regarding fairness or regional differences may come into play to determine the level of redistribution that a given individual decides to demand from his/her government.

The model proposed by Meltzer and Richard led countless authors to contrast empirically the relationship between inequality and redistributive preferences. However, the results obtained are far from conclusive, since there are findings of both the positive relationship predicted by the median voter theory (Milanovic, 2000; Mahler, 2008; Engelhardt and Wagener, 2014; Niehues, 2014) and the total independence between these two variables (Rodriguez, 1999; Lübker, 2006; Kenworthy and McCall, 2007; Pontusson and Rueda, 2010; Georgiadis and Manning, 2012; Scervini, 2012). Notwithstanding, these mixed results compel us to improve our understanding of the effects that the redistributive preferences of the electorate can have on economic policy and, as a consequence, on income distribution.

Therefore, the aim of this this study is twofold: (i) examining the effects that disposable and market income inequality, both actual and perceived, have on the redistributive policies demanded by society to its representatives, in order to determine whether the median voter theory is fulfilled using cross-country data for 87 countries; and (ii) identifying which variables actually have significant

effects on the demand for redistribution at an individual level in the Spanish society

This chapter is organized as follows. First, we undertake a review of the recent literature on the topic under study. Next, we present our cross-country study, which includes the examination of the sample and their sources, the variables of our model, the reasons for their inclusion and their main descriptive statistics, as well as the econometric methods used and the results of our estimates, and the discussion of the estimates and their implications. Then, following a similar methodical approach, we undertake the analysis of the determinants of redistribution preferences in Spain. Finally, we summarize our findings.

2. Literature review

The median voter theory, originally developed by Meltzer and Richard (1981), states that the general increase in public spending and taxes as a percentage of GDP in most democratic countries is due to the demand for redistribution of the electorate.

The authors argue that welfare maximization decisions are ultimately made by the median (or deciding) voter –so voters with incomes below the median voter will choose candidates who commit to higher taxes and more redistribution, while voters with incomes above will prefer lower taxes and less redistribution. Because of this behavior, when the average income increases relative to the median voter's income, taxes increase, and vice versa.

In this way, the authors claim that the increase in the size of the public sector during the preceding decades is due to the position of the decisive voter shifting to the lower part of the income distribution, causing a greater share of the electorate to benefit from the expansion of redistributive policies.

The relevance of the theory put forward by Meltzer and Richard is evidenced by the myriad studies dealing with its empirical verification. However, the results obtained so far have not been conclusive at all, thus highlighting the

need for further research on the interaction between redistributive preferences and income inequality.

One of the first attempts at empirical exploration of this issue was made by the authors of the median voter theory themselves (Meltzer and Richard, 1983). In their article, they analyze the percentage of income redistributed by the United States government over a period of forty years, and conclude that a considerable part of the increase in the size of the public sector is attributable to the rational decisions of voters below the median income, who benefit from a higher level of spending, even when this means an increase in the tax burden.

The many subsequent studies to determine whether the Meltzer-Richard theory is fulfilled can be divided into two categories: those that confirm what was predicted by the median voter theory, and those that offer evidence to the contrary.

In the first group, we can reference research from a sample of several countries, such as Milanovic (2000), which uses data from household budget surveys in 24 countries, and whose results strongly support Meltzer and Richard's claim that countries that are more unequal redistribute more to more underprivileged segments of the population. Mahler (2008), in turn, conducted a study for 13 countries also taking into account levels of participation in electoral processes, and his findings again support the hypotheses of the median voter theory.

Engelhardt and Wagener (2014) provide a Supplementary explanation to the Meltzer and Richard hypothesis, arguing that the most relevant variable for people when making their voting decisions is not "objective" inequality –as measured through surveys or official statistics–, but "perceived" inequality. Introducing this new explanatory variable in a model for a cross-section of 26 countries, the authors conclude that the preferences and political options of the electorate regarding redistribution may depend more on perceptions than on objective data.

In a similar line of work, Niehues (2014) calculates his own indicator of perceived inequality, called the "subjective Gini index", and uses it as a regressor in a cross-section of 24 countries. The author concludes that there is no

statistically significant relationship between the actual income distribution and the redistributive preferences of the public, since identical levels of inequality may be perceived differently depending on the country under study. Nevertheless, the perceived inequality indicator is considerably significant to explain the different redistributive preferences between countries.

Despite this, the results of many other empirical studies call into question the validity of the Meltzer and Richard hypotheses. The basic reasoning to explain these results argues that the underlying assumptions of the median voter theory imply voters have perfect information about the inequality levels and the size of the redistributive policies, so that they will be able to adjust their voting preferences based on that information. The fragility of this element of Meltzer and Richard's analysis is perhaps one of the main causes to explain the proliferation of research finding no empirical relationship between the two key variables.

For instance, Rodriguez (1999) uses both time series and cross-sections to determine whether the median voter theory is verified in the United States. In all cases, the author fails to establish a short-term causal relationship between inequality and redistribution. Georgiadis and Manning (2012) show that the increase in pre-tax inequality in the United Kingdom has not led to greater redistribution, because the demand for redistribution has been falling for years and is currently at its lowest level on record. However, the authors suggest that an increase in demand for redistribution can be expected that could lead to a policy response.

Regarding cross-country studies, Lübker (2006) uses data from a cross-section of 26 countries, and finds results that do not support the idea that public support for the expansion of redistributive policies increases because of inequality (measured through the Gini index). The author attributes this finding to the influence of "social justice norms", which can vary dramatically between groups of culturally similar countries. On the other hand, Kenworthy and McCall (2007) raise new doubts about the empirical usefulness of the median voter theory, as it is unable to prove the relationship between market inequality and support for redistributive policies using a sample of eight countries over almost two decades. Pontusson and Rueda (2010) argue that the link between inequality and

redistributive preferences depends largely on the level of mobilization of low-income voters, so that only if this group actively participates in electoral processes will the level of inequality be a key variable for policy-making.

Similarly, Scervini (2012) confirms the relationship between inequality and redistribution, but questions the role of the median voter in the income redistribution process, not only because cash transfers have been steadily decreasing throughout the period under analysis, but also because the effect of a higher level of redistribution is weaker than for any other income group.

Moreover, numerous studies have also been conducted to identify the determinants of redistributive preferences at the individual level. Other determinants, such as the prospects of upward mobility (Benabou and Ok, 2001; Benabou and Tirole, 2006), which may cause certain individuals below the median to refrain from supporting an expansion of redistributive policies because they have strong expectations of an income increase, have also been regarded as relevant explanatory variables of the preferences for redistribution. Also, it has been suggested that, at the same time, these prospects can be influenced by the individual and familiar history of social mobility (Piketty, 1995; Giuliano and Spilimbergo, 2008).

Individuals' risk aversion may lead them to prefer more or less redistribution for the same level of income and mobility (Alesina and La Ferrara, 2005, Ferrer-i-Carbonell and Ramos, 2010).

Factors concerning personal beliefs about the role of luck or effort (Fong, 2001; Alesina and Angeletos, 2005), or simply the subjective political ideology of individuals –left vs. right– have also proved to have a significant impact on redistribution preferences (Alesina and La Ferrara, 2005).

Finally, socio-demographic characteristics, such as gender, age, religion, education level, ethnicity and marital status are usually used as control variables when conducting research on this issue (Alesina and Giuliano, 2011; Guillaud 2013).

Within the most recent economic literature related to the factors that could influence the demand for redistribution at the national level, there are several

studies for the United States (Alesina and Angeletos, 2005; Alesina and La Ferrara, 2005; Alesina and Giuliano, 2011), Italy (Gaeta, 2011), and Turkey (Karayel, 2015 and 2016), as well as numerous cross-national studies (Neher, 2012; Guillaud, 2013; Olivera, 2015).

Concerning the Spanish case, to our best knowledge, there is only a similar previous work (Iglesias *et al*., 2013). In this paper, the authors analyze the determinants of preferences for redistribution in Spain both at an aggregate and a regional level for two years, 1995 and 2007, and find the existence of structural changes in those preferences. Notwithstanding, the existence of new data available for a particularly tumultuous period –the Spanish economic crisis 2008-2013– highlights the pressing need to conduct new research suggesting new approaches that can allow us, on the one hand, to grasp better what determines the preferences for redistribution and, on the other hand, to ascertain whether the consequences of the crisis were also reflected in the demand for redistribution of the population.

3. Empirical analysis for a cross-country sample

3.1. Variables

This section introduces the selected variables to study the effects of inequality on the demand for redistributive policies –as well as a series of control variables–, and the different sources from which they were collected. In Annex 5, we include a table with the main descriptive statistics (Table 31).

One of the main data sources for our study is the World Values Survey (WVS) database. This survey, conducted periodically since 1981, gathers data on changes in public values and their impact on social and political life. The WVS data are structured into six waves (1981-1994, 1990-1994, 1995-1998, 1999-2004, 2005-2009, and 2010-2014) of surveys carried out in nearly one hundred countries with standard questionnaires. In addition to rigorous research designs that ensure

the national representativeness of the samples, one of the main strengths of the WVS is being the only source of its kind that includes a sample of countries that are culturally and economically diverse.

As a first proxy for the redistribution demand (*demfor*) we will use a question included in the WVS phrased as follows: *"Please indicate your views on each of the following issues. Using a 1 to 10 scale, where 1 means you agree completely with the statement on the left ("Incomes should be made more equal") and 10 means you agree completely with the statement on the right ("We need larger income differences as incentives for individual effort"), please select the number that best reflects your own views on each issue".*

Alternatively, as a second possible proxy to the redistribution preferences of the public (*govt_resp*), we will also use another question from the WVS, which is worded in the questionnaire as follows: *"Please indicate your views on each of the following issues. Using a 1 to 10 scale, where 1 means you agree completely with the statement on the left ("The government should take more responsibility to ensure that everyone is provided for") and 10 means you agree completely with the statement on the right ("People should take more responsibility to provide for themselves"), please select the number that best reflects your own views on each issue".* Although this question does not reflect so precisely the opinion of the interviewee about income redistribution, it reveals relevant information about their position regarding the role that the state should play to provide for the community.

In order to clarify the interpretation of the results, we decided to invert the scale in such a way that the higher the response given by the interviewee, the greater their preference for redistribution, and vice versa. Therefore, for each country and wave, we calculated the average of all valid answers given to each of both questions. The correlation between both variables (*demfor* and *govt_resp*) is only 15.16%, so we can safely state that they provide different information on the personal views of the respondent (Table 20).

To measure inequality before and after taxes and transfers, we relied on the Standardized World Income Inequality Database (Solt, 2016). From this database, we used the market Gini coefficient (*gini_mkt*), since market inequality

is the variable that the median voter theory predicts as the determinant of the population's redistributive preferences, and the Gini coefficient after taxes and transfers (*gini_disp*). Both Gini coefficients are calculated based on the household income –before or after taxes and transfers, as appropriate– transformed into equivalent units by dividing the total household income by the square root of the number of household members.

Finally, we decided to include a variable that allows us to capture the inequality level perceived by the population in each country and wave. This variable was incorporated because, as stated when reviewing the literature, one of the possible causes of the mixed results obtained by empirical studies on this issue is that voters decisions' may not be driven by "objective" inequality –one of Meltzer and Richard's assumptions is perfect information–, but by "perceived" inequality.

To measure the perceived inequality in each country and wave, we again used data from the World Values Survey, which includes a question asking the respondents to place themselves in an income distribution divided into ten deciles. The question is phrased as follows: *"Below is an income scale on which 1 indicates the lowest income group and 10 the highest income group in your country. We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other incomes that come in."*

To calculate a variable that estimates the perceived level of inequality based on the answers to this question, once more, we used the original formulation of the median voter theory, in which Meltzer and Richard proposed utilizing the mean-to-median income ratio as a measure of income inequality of a given population, so the higher this ratio, the greater the demand for redistribution. Therefore, using the average and median values for each wave and country of the previous question, we could calculate a variable (*ineqperc*) that allowed us to contrast the "perceived" inequality with the "objective" inequality measured by the Gini indices.

In addition, considering that our sample of countries was extraordinarily heterogeneous, we decided to include a variable that allowed us to control by the

degree of economic development, which we measured as the logarithm of GDP per capita PPP in constant 2011 U.S. dollars (*lgdppc*).

We also included two variables in the model that, not being measures of inequality, could influence the demand for social spending and, therefore, the demand for redistribution: dependency ratio (*depratio*) and the degree of trade openness (*fordirinv*). The first is defined as the proportion of dependent population –i.e., under 15 or over 64–, as a share of the total population; and the second is defined as direct foreign investment –net inflows– as a share of GDP.

As a final element, we introduced two sets of dummy variables: the first (*region*) which group the 87 countries in the sample into 18 sub regions according to the classification made by the United Nations Department of Economic and Social Affairs (United Nations Statistics Division, 1999), and allowed us to capture underlying cultural differences between regions that may not be reflected by other explanatory variables included in our model; the second (*wave*) was used to determine whether there has been a structural change in redistributive preferences over the years of the WVS and, if so, the direction of that change.

3.2. Model and methodology

A first step towards estimating the relationship between the redistributive preferences of the population and inequality, whether real or perceived, is to calculate the correlation coefficient matrix between these groups of variables.

Table 20. Correlation matrix of the model variables

	demfor	govt_resp	gini_disp	gini_mkt	ineqperc	lgdppc	depratio	fordirinv	region
demfor	1.0000								
govt_resp	0.1516	1.0000							
gini_disp	-0.1631	-0.1067	1.0000						
gini_mkt	0.1115	-0.2583	0.6131	1.0000					
ineqperc	0.0248	0.1217	0.1895	0.1288	1.0000				
lgdppc	0.3732	-0.2457	-0.3426	0.2255	-0.0225	1.0000			
depratio	-0.2454	0.0098	0.3351	0.0301	0.1416	-0.5816	1.0000		
fordirinv	-0.0348	-0.0248	-0.0484	-0.0301	-0.0012	0.0964	-0.1302	1.0000	
region	0.1084	0.1379	-0.0059	0.0440	0.0149	-0.0078	0.0726	0.0768	1.0000

Source: Own elaboration.

As can be seen in Table 20, the correlation levels between the variables that measure demand for redistribution (*agr_dem* and *demfor*) and the indicators of actual inequality (*gini_disp* and *gini_mkt*) and perceived inequality (*ineqperc*) are practically non-existent. The absence of correlation is also evident when observing the scatter diagrams (Figure 32) of the variables included in the Annex 5. However, among the control variables it is possible to find modest levels of correlation (between 0.2 and 0.4) with the pair of explained variables.

On the other hand, as may be expected, the correlation between both redistribution demand measures is practically equal to one, suggesting that, despite the transformations carried out, both variables capture approximately the same information.

The behavior of perceived inequality in relation to actual inequality is also interesting. Although there is a positive correlation between these variables, it is very low, so we cannot assume as true one of the key assumptions of the median voter theory: that voters have perfect information about the level of inequality in their country.

In light of the above, we propose a first simple linear regression estimation method for panel data with fixed effects by region and survey wave. As a result, our first model can be expressed as:

$$demfor_{it}(or, govt\_resp_{it}) = \beta_{0i} + \beta_{1t} + \beta_2 gini\_disp_{it} + \beta_3 gini\_mkt_{it} + \beta_4 ineqperc_{it} + \beta_5 lgdppc_{it} + \beta_6 depratio_{it} + \beta_7 fordirinv_{it} + e_{it} \quad \textit{Eq. 29}$$

However, as Ferrari and Cribari-Nieto (2004) point out, the traditional linear regression method may not be appropriate for situations in which the explained variable takes values in the continuous interval (0, 1), since it may produce estimated values for the dependent variable that exceed its lower and upper limits.

The authors propose for these cases the use of the beta distribution, which produces maximum-likelihood estimates of the dependent variable without making transformations in the variables that hinder its interpretation, in addition to having other desirable characteristics such as not imposing the assumption of homoscedasticity or modeling forms of distribution that show non-linear relationships.

As neither of the two explained variables fulfills the condition of taking values between zero and one, it is necessary to perform the transformation suggested by Smithson and Verkuilen (2006), so that the transformed explained variable takes values in the continuous interval (0, 1). That is, if *a* and *b* are, respectively, the lower and upper extremes of the interval in which the original variable takes values, the transformed variable is defined in such a way that $y' = \frac{(y-a)}{(b-a)}$; in other words, for our case: $demfor' = \frac{(demfor-1)}{(10-1)}$, and $govt\_resp' = \frac{(govt\_resp-1)}{(10-1)}$.

According to the generalized linear model conventions, the standard beta model can be expressed in terms of two parameters: the first one, μ is the so-called "location parameter" (the mean of the response variable), and the second, φ, is the so-called "scale parameter", both greater than zero. Thus, the beta model is defined as:

$$f(x;\mu,\varphi) = \frac{\Gamma(\varphi)}{\Gamma(\mu\varphi)\Gamma\big((1-\mu)\varphi\big)} x^{\mu\varphi-1}(1-x)^{(1-\mu)\varphi-1} \qquad \textbf{Eq. 30}$$

Bearing in mind these considerations, the estimation model of the first of these parameters can be expressed as follows:

$$\mu_i = \frac{\exp(b_o + b_1x_1 + b_2x_2 + \cdots)}{1 + \exp(b_o + b_1x_1 + b_2x_2 + \cdots)} \qquad \textbf{Eq. 31}$$

3.3. Results and discussion

The results of the aforementioned estimates are shown in Tables 21, 22 and 23. Models 1, 2, 5 and 6 do not include regional and wave fixed effects. The estimated coefficients of the fixed effects by region and wave are shown in Annex 5.

Table 21. Estimates for linear regression (with and without fixed effects)

	Income equality (Models 1 and 2)		Government responsibility (Models 3 and 4)	
gini_disp	-0.0242	-0.0060	-0.0160	-0.0086
gini_mkt	0.0196	0.0048	-0.0057	-0.0086
ineqperc	0.3231	0.3132	1.2743***	1.2014***
lgdppc	0.2144**	0.2493**	-0.2759***	-0.0652
depratio	-0.0139	0.0046	-0.0442**	0.0110
fordirinv	-0.0086	-0.0109	0.0026	0.0020
Fix. Eff.	No	Jointly significant	No	Jointly significant
R-sq	0.1566	0.3467	0.1447	0.4976
Obs.	195	195	194	194

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 22. Estimates for beta distribution (with and without fixed effects)

	Income equality (Models 5 and 6)		Government responsibility (Models 7 and 8)	
gini_disp	-0.0084	0.0049	-0.0083	-0.0065
gini_mkt	0.0087	-0.0016	-0.0066	-0.0031
ineqperc	0.1748	0.0493	0.6752**	0.6030***
lgdppc	0.0874**	0.1143***	-0.1287***	-0.0239
depratio	-0.0055	-0.0015	-0.0150**	0.0010
fordirinv	-0.0047	-0.0071	-0.0016	0.0002
Fix. Eff.	No	Jointly significant	No	Jointly significant
AIC	-319.3430	-329.8162	-325.9311	-386.1622
Obs.	195	195	194	194

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 23. Estimates for marginal effects of models 5 to 8

	Income equality (Models 5 and 6)		Government responsibility (Models 7 and 8)	
gini_disp	-0.0021	0.0012	-0.0083	-0.0015
gini_mkt	0.0022	-0.0004	-0.0066	-0.0007
ineqperc	0.0436	0.0123	0.6752**	0.1384***
lgdppc	0.0218**	0.0286***	-0.1287***	-0.0055
depratio	-0.0014	-0.0004	-0.0150**	0.0002
fordirinv	-0.0012	-0.0018	-0.0016	0.0000
Obs.	195	195	194	194
Prop.	0.4741	0.5175	0.5836	0.6433

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

The results of our estimates (Tables 21, 22 and 23) reveal that in no case actual income inequality, whether before or after taxes and transfers, measured through the Gini coefficient has a statistically significant impact on the redistributive preferences of the population. These results lead to the rejection of Meltzer-Richard's hypothesis –at least in its original formulation–, since the first step of the MVT, which links actual income inequality and the demand for redistribution, is not fulfilled.

As for perceived inequality, introduced in the model to overcome one of its most restrictive assumptions –perfect information–, it provides mixed results. In models 1, 3, 5 and 7, where the explained variable is the preference for income equality, the perceived inequality is neither statistically significant to explain the behavior of the respondents' demand for redistribution. In contrast, in models 2, 4, 6 and 8, where the dependent variable describes the role that the government should have in providing for its citizens, the perceived inequality becomes highly significant to describe the performance of this variable.

The positive sign that takes the estimated coefficient of perceived inequality in models 3, 4, 7 and 8 has two fundamental implications. First, as suggested by previous research, the way in which voters perceive the society where they live, and not the "objective" reality, is what has effects on the preferences of the public regarding the role of the state. Second, following the reasoning of Meltzer and Richard, that the higher the levels of such perceived inequality, the greater the role that voters demand from the state.

Furthermore, it should be noted that the preliminary results obtained by the OLS method are confirmed using the most suitable beta distribution and the estimated coefficients remain virtually unchanged, which illustrates their robustness. Under no circumstances multicollinearity problems were detected, which may affect the resulting estimates.

On the other hand, the increase in the explanatory power of the model, measured through the R-square, and the combined significance of regional dummy variables, account for the importance of a country belonging to a given region to explain the redistributive preferences of its population. The significance of fixed effects by region also shows that differences in demand for redistribution between countries are not only determined by purely economic or demographic issues, but also to important cultural differences between regions.

Similarly, the dummy variables per wave, which are always jointly significant, reveal the existence of a structural change during the period under analysis. For both dependent variables, the estimated coefficients of these dummies indicate that there was a shift in recent years towards a greater demand for this type of policies that cannot be explained by the economic, demographic or cultural factors already included in the model.

Regarding the control variables, the only one that is statistically significant in the versions of the model that include regional and time fixed effects –which, as stated above, perform much better than those that do not consider them– is the degree of economic development, measured through the real GDP per capita. However, the statistical significance is only reported in the estimates for the regressor that captures the preference for income equality (Models 3 and 6). The marginal effects of the beta model –more appropriate, as stated earlier, for the explained variable and with a more intuitive interpretation– indicate that each 1% increase in a country's real per capita GDP would result in an increase of 0.0286% in the percentage of the population declaring itself in favor of greater income redistribution.

Finally, for the remaining control variables, none are significant in the fixed effects versions of the model.

4. Empirical analysis at the individual-level: The case of Spain

4.1. Variables

In this section, we present the variables selected to study what determines the demand for redistributive policies in Spain and the main data source for those variables.

The data source for our analysis is again the World Values Survey (WVS, henceforth), and the model used as starting point is the one formulated by Alesina and Giuliano (2011). Nevertheless, we have introduced some minor changes due to the lack of some data and our interest to investigate further on certain matters that were addressed in a different way by those authors.

Both proxies of redistribution preferences are defined using the same questions that we used to construct *demfor* and *govt_resp* in the previous section. Nevertheless, in this case, since we are using data on individual preferences, and therefore it is not necessary to aggregate them by country and year, it will not be required to calculate the average value for these variables –so, we will be able to use the answers given by the respondents themselves.

It is worth mentioning that, although the correlation between the two dependent variables (*demfor* and *govt_resp*) is positive, it is only 24.14%, so one is not merely a substitute for the other, but rather it provides somewhat different information on a similar issue.

Based on what has been pointed out in the previous section, we divided the explanatory variables into three groups: household income level, political ideology and personal beliefs, and socio-demographic characteristics.

Regarding the family income level, the WVS does not ask anything to its Spanish interviewees. However, there are two questions that can serve to approximate the material living conditions of each household. On the one hand,

the respondent is asked to place their household in an income distribution divided into ten deciles (*"On this card there is an income scale on which 1 indicates the lowest income group and 10 the highest income group in your country. We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other incomes that come in"*). This question allows us to evaluate the perception of the household with regard to its income in relation to the rest of the population (*inc_decile*). On the other hand, a second question about satisfaction with the financial situation of the household (*"How satisfied are you with the financial situation of your household?" where 1 indicates complete dissatisfaction and 10 complete satisfaction*) allows us to assess to what extent the interviewee considers that the needs of the household are reasonably well covered (*fin_satisf*). This pair of variables could be considered as an approximation of household income in relative and absolute terms, respectively.

As for socio-demographic characteristics of the interviewee, we included age (*age*); gender (*female*); employment status (*emplstatus*), which can take eight different values (full-time, part-time, self-employed, retired, housewife, student, unemployed, or other); marital status (*marstatus*), which can take six different values (married, living together as married, divorced, separated, widowed, or single); and number of children (*num_children*).

In relation to the educational level of the interviewee (*educ*), the WVS offers eight possible answers (no formal education; incomplete primary school; complete primary school; complete secondary school: technical/vocational type; incomplete secondary school: university-preparatory type; complete secondary school: university-preparatory type; some university-level education, without degree; university-level education, with degree). The inclusion of so many potential responses allowed us to include the variable in levels in our model (i.e., to treat it as a continuous variable) instead of as a set of dummies. This opens the possibility to determine whether there is a relationship between educational level and redistributive preferences and, if so, whether this relationship is non-linear. Unfortunately, we do not have data on the educational level of the parents that could improve our analysis, since the question was never included in the questionnaire carried out in Spain.

Finally, regarding the ethnicity of the respondents, we decided to exclude the variable from the model given that more than 98% of them were white. Also, we opted to exclude the variable concerning the size of the town where the interviewees lived since it was asked intermittently, which makes data unavailable for half of WVS waves.

With regard to the individual beliefs of the respondents, we incorporated three explanatory variables. First, we included the self-positioning in a political scale of 1 to 10 (*"In political matters, people talk of "the left" and "the right". How would you place your views on this scale, generally speaking?"*), so the higher the response on that scale, the more to the right the person place himself (*ideology*). Nonetheless, we cannot ignore that this measure is inherently flawed and may conceal more complex implications concerning the real support for democratic institutions or preference for more authoritarian regimes (Adler, 2018).

Second, we included a variable that can capture the degree of income mobility that respondents consider that exists in the community in which they live (*hardwork*). The underlying question is phrased as follows: *"Now I'd like you to tell me your views on various issues. How would you place your views on this scale? 1 means you agree completely with the statement on the left ("In the long run, hard work usually brings a better life"); 10 means you agree completely with the statement on the right ("Hard work doesn't generally bring success—it's more a matter of luck and connections"); and if your views fall somewhere in between, you can choose any number in between"*. Thus, people with prospects of upward mobility –i.e. those who subscribe to the claim that hard work brings success– should be less prone to demand more redistribution. Again, we reversed the response scale to help to interpret the results presented in the next section.

The last variable on personal beliefs refers to religious beliefs (*religiosity*), which is worded in such a way that the greater the importance that the respondent declares that God has in his or her life, the greater the value this variable takes (*"How important is God in your life? Please use this scale to indicate. 10 means "very important" and 1 means "not at all important"*). Unlike previous studies, we preferred not to include a variable concerning the religious denomination of

the respondents, since more than 97% of those who claim to have one declared themselves Catholics.

Finally, we considered the inclusion of dummies that capture the effects of idiosyncratic regional differences (*region*), which differentiate the seventeen autonomous communities into which the Spanish state is divided, and structural changes over time (*year*), which are not already collected by any of the above-mentioned variables.

Table 24 shows the main descriptive statistics of the variables included in our model.

Table 24. Main descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
demforred	3527	5.5461	2.6492	1	10
govt_resp	3490	6.5894	2.4089	1	10
age	3600	45.9603	18.3535	18	99
fin_satisf	3575	5.6915	1.9686	1	10
num_children	3590	1.5646	1.5224	0	8
inc_decile	3058	4.3221	1.7314	1	10
hardwork	3508	6.6844	2.4189	1	10
ideology	2942	4.7277	1.9404	1	10
educ	3549	3.5480	2.2998	1	8
religiosity	3502	5.7761	3.0702	1	10
female	3600	0.5097	0.5000	0	1
emplstatus	3596	3.5709	2.1490	1	8
marstatus	3593	2.7401	2.2163	1	6
region	3600	8.1000	4.7358	1	17
year	3600	2004.2840	6.8090	1995	2011

Source: Own elaboration.

4.2. Model and methodology

Considering the variables presented in the previous section, our basic specification for explaining the redistributive preferences in Spain is the following:

$$\begin{aligned} demfor_{it}(or, govt\_resp_{it}) = {} & \beta_{0i} + \beta_{1t} + \beta_2 age_{it} + \beta_3 age\_sq_{it} \\ & + \beta_4 fin\_satisf_{it} + \beta_5 num\_children_{it} \\ & + \beta_6 inc\_decile_{it} + \beta_7 hardwork_{it} + \beta_8 ideology_{it} \\ & + \beta_9 educ_{it} + \beta_{10} educ\_sq_{it} + \beta_{11} religiosity_{it} \\ & + \beta_{12} gender_{it} + \beta_{13} emplstatus_{it} + \beta_{14} marstatus_{it} \\ & + e_{it} \end{aligned} \qquad \textit{Eq. 32}$$

The inclusion of the variables regarding age and educational level in levels –instead of categorizing them in the form of dummy variables– together with their respective squares allows us to determine whether the relationship between those variables and the demand for redistribution (if any) is non-linear. Nonetheless, variables referring to employment status, marital status, region and year are incorporated as dummies since they cannot be included otherwise.

The first regressions were estimated by OLS. But considering that both dependent variables are ordinal, it can be argued that the most suitable estimation method for this type of data is the ordered logit model, a special case of the logistic regression model (Wooldridge, 2010). For this reason we also estimated an ordered logit model to check the robustness of the OLS results.

The estimated coefficients of the fixed effects by employment status, marital status, region and wave are shown in Table 32 of Annex 5.

4.3. Results and discussion

Table 25. Estimates for linear and ordered logit regression (with and without fixed effects)

	demfor (Model 1)		govt_resp (Model 2)	
	OLS	**OLOGIT**	**OLS**	**OLOGIT**
age	-0.0266	-0.0199	-0.0422**	-0.0341**
age_sq	0.0003	0.0002	0.0004*	0.0003**
fin_satisf	-0.0311	-0.0314	-0.0581**	-0.0419**
num_children	0.0070	-0.0028	0.0665	0.0455
inc_decile	-0.1267***	-0.0874***	-0.1766***	-0.1542***
hardwork	0.0779***	0.0579***	0.1669***	0.1700***
ideology	-0.1929***	-0.1586***	-0.1357***	-0.1176***
educ	-0.4293***	-0.3091***	-0.1476	-0.1080
educ_sq	0.0311**	0.0225**	0.0138	0.0100
religiosity	-0.0874***	-0.0624***	-0.0542***	-0.0404***
gender				
Female	0.3089***	0.2222***	0.0395	0.0100
emplstatus	Jointly non-significant	Jointly non-significant	Jointly non-significant	Jointly non-significant
marstatus	Jointly non-significant	Jointly non-significant	Jointly non-significant	Jointly non-significant
region	Jointly significant	Jointly significant	Jointly significant	Jointly significant
year	Jointly significant	Jointly significant	Jointly significant	Jointly significant
Obs.	2,403	2,403	2,395	2,395
Adj. R-squared	0.1225	0.0349	0.0950	0.0303

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Models 1 and 2, in which the dependent variable is a clear measure of preferences for redistribution, reveal several important points about what determines the demand for redistribution in Spain (Table 25).

First, the variables related to income and personal beliefs are especially significant in explaining preferences for redistribution, unlike the socio-demographic variables, which have no explanatory power in most cases.

Regarding the personal income variables, only the self-positioning in the income distribution (*inc_decile*) has a relevant statistical significance. Thus, each upward leap in the decile in which the respondents perceive themselves reduces their preference for redistribution between 0.08 and 0.12 on a 1 to 10 scale, depending on the estimation method used. On the other hand, the financial situation of the household (*fin_satisf*) is not significant to explain the behavior of

the demand for redistribution of individuals. This is not due to the fact that both variables provide identical information, since they have a correlation around 30%.

With reference to the socio-demographic variables included, only three of them are relevant for explaining the behavior of our first dependent variable: the educational level of the respondents, their gender and their autonomous community of residence.

The educational level (*educ* and *educ_sq*) presents high levels of significance and a clear non-linear relationship with redistributive preferences. As a result, the parabola formed by that variable indicates that the demand for redistribution decreases as the level of education increases up to a point where the relationship between the dependent and independent variables becomes positive. In both models, this point lies between the values 7 and 8 of the variable that measures educational attainment, that is, according to our results, the relationship between educational level and a higher demand for redistribution becomes positive once the respondents complete their university studies. This finding is particularly important in the light of the steady increase in the number of people with tertiary studies that the Spanish population has been experiencing for more than a decade.

When it comes to gender, females are significantly more opposed to inequality and more supportive of redistribution, a fact that is already well documented in previous economic literature (Croson and Gneezy, 2009).

As far as the region of residence is concerned, according to our results we can say that this is a relevant factor since in none of the models the regional dummies are jointly non-significant. In comparison with our reference region –which, merely because of an alphabetical order question, is Andalusia– the coastal regions of Principality of Asturias, Balearic Islands, Canary Islands, Cantabria, Catalonia, Valencian Community and Galicia are likely to demand less redistribution due to unobserved cultural determinants.

Similarly, the joint significance of the wave dummy variables reveals the existence of outstanding differences in redistributive preferences between 1995 and 2011 that cannot be accounted for the rest of the explanatory variables included in the model. In other words, our results suggest that there were

structural changes in the demand for redistribution in that period towards a stronger preference for this kind of policies.

The remaining socio-demographic variables, either presented in levels or as sets of dummies, are not significant to explain the redistributive preferences of population.

In contrast, all three variables that capture personal beliefs are highly significant.

The stated ideology (*ideology*) of the people surveyed seems to be one of the main drivers of redistributive demand. As a result, the fact that a person self-positions one step further to the right reduces his/her preference for redistribution between 0.16 and 0.19 points on a scale of 1 to 10, depending on the estimation method used. The recent evolution of ideological self-positioning (Centro de Investigaciones Sociológicas, 2019a), particularly its shift to the left from 2012 onwards, suggests an increase, at least in the short term, in the demand for redistributive policies in Spain. Notwithstanding, we must bear in mind that the evolution of this indicator is linked to both structural and cyclical issues that can make it veer in the other direction in a relatively short time.

In addition, the importance of religion in everyday life (*religiosity*) appears to have a negative effect on the demand for redistribution, reducing it by an average of 0.06 to 0.09 points. It should be noted that this variable, although slightly correlated with ideological self-positioning, captures information not contained in the other one. But it should be also pointed out that the process of secularization experienced by the Spanish population over the last few decades −which implies a decreasing proportion of believers or people who regularly attend to non-social religious services (Pérez-Agote, 2012)− again hints at a progressive increase in the redistributive demand in Spain.

Finally, the belief that individual success is essentially driven by hard work (*hardwork*) has a positive and very significant effect on the first explained variable. These findings are at odds with, on the one hand, the logic of methodological individualism that would indicate that those who believe to a greater extent in the fairness of the distributive system will be less likely to demand a higher level of income redistribution, and, on the other hand, most

recent empirical studies that link these two variables (Alesina and Giuliano, 2011; Gaeta, 2011; Iglesias *et al*., 2013). However, there is a precedent in the literature in which these atypical results emerge after an analysis similar to ours (Karayel, 2016).

After having verified the possible reasons that could explain an unexpected sign in a regression –e.g., reverse measure, common trend, functional form approximation, dynamic confusion and other wrong interpretations (Kennedy, 2008)–, we can assert that none of them seems to be present in our case. Therefore, we can safely say that, from the econometric point of view, the negative coefficient obtained is correct, but that, as Karayel (2016) points out, it is "atypical". Accordingly, it would be of interest to explore in future research whether this circumstance also takes place in other countries, and to attempt to find an explanation for this phenomenon.

Furthermore, models 3 and 4, where the explanatory variable is not a direct answer to a question about income equality, but a more general one regarding government's responsibility to provide for everyone, offer similar results: household income, personal beliefs, and some socio-demographic traits are the main determinants of the Spanish redistributive preferences.

Among the main differences we find the non-significance of educational level and gender, and the significance of age to explain the preferences on government's responsibility to provide suitable living standards to all its citizens. In relation to the effect of age, we find that its relationship with redistributive preferences is non-linear so that it decreases with age up to a point where this relationship becomes positive. The turning point is around 61-62 years of age, i.e. the average retirement age in Spain. As a result, it is possible to state that the demand for redistribution decreases with age during working life, but increases with age during the years of retirement. If this relationship does not change in the foreseeable future and given the population projections made by the Instituto Nacional de Estadística (2018), a progressive increase in the demand for redistributive policies would be expected in the forthcoming years.

Also, the lower the support for redistribution, the higher the income decile in which the respondent self-places and the greater the degree of satisfaction with

the financial situation of the household. In this case, it is apparent that the importance of family income is greater in determining government's responsibility for the living conditions of population, since both variables are significant and the estimated coefficients are slightly higher in absolute value than in models 1 and 2. In any case, the estimates of the four models reveal the relative weakness of the absolute incomes to explain the demand for redistribution and underline the importance of relative income with regard to the support or rejection for this type of policies.

The importance of these variables, especially relative income, is another indication of a foreseeable increase in demand for redistribution in the forthcoming years due to the fact that, since the beginning of this century, the percentage of respondents who place their household in the first five deciles of income distribution rose from 72.76% to 76.13%, which increased the average of this variable from 4.70 to 4.48.

As regards personal belief variables, they keep very high levels of significance and the same signs as the coefficients of models 1 and 2. Nevertheless, the estimated values indicate a slightly lesser relevance of ideology (understood as left vs. right) and religiosity, and a greater importance of the belief in hard work as a source of success to explain individuals' preferences for redistribution.

Lastly, although the regional fixed effects are jointly significant, the autonomous communities with a demand for redistribution that is higher or lower than the benchmark (reference community) demand do not match those of models 1 and 2. In this case, the regions that demand more redistribution due to cultural factors are the two Castillas, Extremadura, Madrid and the Basque Country, whereas only Murcia has a lower preference for redistribution than the reference community. In addition, the significance of the dummy variables supports the results for models 1 and 2 that indicated a shift towards a stronger preference for redistribution since the first wave of the WVS.

Although the results for models 3 and 4 somewhat reinforce most of the conclusions drawn previously for the first two models (the importance of family income, personal beliefs and region of residence), they call into question one of

the most relevant findings resulting from the first two estimates: the importance of educational attainment and age, and their non-linear relationship with the demand for redistribution.

5. Conclusions

The median voter theory claims that increasing market inequality would lead to an intensification of the demand for redistribution and, once endorsed by the ballot box, to an expansion of redistributive programs. However, recent economic literature gives mixed results on the empirical validity of this theory.

The results of our research, for a sample of 87 countries during the period 1990-2014, do not support Meltzer-Richard hypothesis either, since none of the objective inequality indicators considered present statistically significant effects on the redistributive preferences of the public. However, for one of our explained variables, perceived inequality is extremely significant to explain the behavior of the preferences regarding the role that the state should play in providing for all its citizens.

Conversely, our perceived inequality index is highly significant to explain the behavior of individual preferences for a state that provides for all its citizens, so that preferences for interventionism increase as perceived equality raises. Although our results do not support a complete rejection of the hypothesis originally proposed by Meltzer and Richard, they do call for a reconsideration of one of their most restrictive assumptions: perfect information.

On the other hand, each country's degree of economic development has a significant effect on the demand for redistribution measured as the preference for income equality, whereby citizens of countries with higher real per capita GDP tend to have a greater preference for income redistribution.

Moreover, belonging to a given region also has significant impacts on the demand for redistribution, which means that certain regions have a greater or lesser preference for this type of policies due to cultural factors not observed by the economic and demographic variables included in our model. We also detected

a structural change in the demand for redistribution towards greater support for such policies during the more recent waves of the World Values Survey.

The significance of these variables to explain the behavior of redistribution demand seems to indicate that the process of formation of redistributive preferences is much more complex than what is proposed by the MVT, and therefore, it deserves to be approached paying special attention to the relevance of other kind of factors, such as subjective perceptions of inequality and dominant culture and morals.

Moreover, our results reveal that individuals' household income and their perceived relative position within its distribution, educational level, gender, age, personal beliefs and region of residence are the main determinants of redistributive preferences in Spain. The findings also seem to indicate that there may have been a structural shift in favor of more redistribution once the effect of the other explanatory variables is accounted for.

Given the lack of impact of other socio-demographic variables –e.g., number of children, marital status and employment status–, our estimates suggest that long-term trends such as the increase in the proportion of people with university studies, the ageing of population, or the progressive secularization of Spanish society could contribute to increasing the demand for redistributive policies in the coming years. However, the effect of these longstanding trends could be offset by a shift to the right in the average ideological self-assessment and also by a widespread improvement in household income, particularly in relative terms with relation to the rest of population.

Nevertheless, as revealed by the latest wave of the WVS, the austerity and the labor reforms during the 2008-2013 period seem to have played a part in displacing many households' self-positioning towards lower tranches of income distribution –because they might be seen as a threat to the role played by the State in satisfying certain aspirations of the dwindling middle-class (health services, university education, pensions)– and, therefore, this can also contribute to an overall increase in the demand for redistributive policies, leaving the decline in size and political influence of middle-class and purely ideological factors as the only significant forces capable of curbing the rise in preference for such policies.

However, so that a stronger demand for redistributive policies results in a more egalitarian distribution of income, it is vital for this issue to become one of the most crucial topics when it comes to voting –which is not the case nowadays (Centro de Investigaciones Sociológicas, 2019b)– and thus pro-redistribution voters can oblige elected politicians to take these measures. This is becoming increasingly difficult with an ever decreasing and impoverished middle-class as contrasted with a small group of increasingly wealthy households that are able to influence policy-makers in their benefit, which ultimately helps to undermine the foundations of our democratic system. In this scenario, all the long-term demographic, social and cultural trends that favor an increase in redistribution would not lead to the effective implementation of these policies.

Considering that subjective ideology seems to play an extraordinarily important role in the future development of redistributive policies, more research is needed to establish what specific issues determine an individual's self-positioning at a particular point on the left-right scale.

On the other hand, we also emphasize the need to investigate in depth other possible determinants of redistributive preferences such as social and cultural capital, which have been relatively unexplored in the recent literature. Moreover, we also argue that it is essential to further explore the possible causes of the atypical results obtained on the relationship between redistributive preferences and beliefs about the role of luck and hard work in a person's economic position.

Overall conclusions

Our study on the determinants of income inequality provides new evidence on the significance of the effects of monetary policy on income distribution. Namely, the results suggest that expansionary monetary policies that effectively reduce real interest rates have generally contributed to reducing income dispersion, and that these effects remain relevant even two years after the measures were taken. These findings query the long-established assumption that monetary policy has little or no distributive effect and, ultimately, raise questions about the desirability of central bank independence.

Second, our analysis on wealth and consumption inequality in Spain draws several relevant conclusions. Particularly, the divergent trend of inequality of these two variables, the importance of the wealth effect –particularly, of real wealth– on consumption, and the growing differences between affluent people, the middle classes and low-income households, who are losing ground rapidly.

Concerning income inequality and mobility in that country, in this research we obtained two key results: on the one hand, the increase in income inequality experienced in Spain had begun long before the outbreak of the crisis of 2008, which, in fact, was a momentary halt to this trend that resumed at the beginning of the present decade; and, on the other hand, the offsetting of the increase in mobility undergone throughout the pre-crisis period, to such an extent that, in many cases, the mobility reduced to the lowest levels of the whole series.

Despite the challenges involved in measuring this phenomenon, our findings (i.e., an increase in inequality accompanied by a drop in income mobility) point to the existence of a broken "social elevator". As discussed in the literature, this issue can have far-reaching consequences on the way our societies function.

This trend towards the concentration of income in Spain also highlights the emergence of an incipient problem of segregation by income in the major Spanish cities. It is suggested that inequality in capital income may be the main cause of this increase, and that, in order to reverse this pattern, policy-makers should take appropriate immediate action.

Finally, our analysis of the redistributive preferences of the public leads to a series of lessons. First, our results challenge the validity of the median voter theory (MVT) in its original formulation, since inequality has no significant effect on redistributive preferences for a cross-country sample. However, perceived inequality is indeed significant to explain the demand for redistribution in this group of countries as predicted by the MVT.

The case study on redistributive preferences in Spain also reaffirms the importance of subjective factors in the process of formation of redistributive preferences. Although many socio-demographic variables are crucial in this process, our estimates indicate that the role of subjective factors, such as political preferences or personal beliefs, is undeniable.

There are multiple policy implications of the results reported before. The distributional effects of monetary policy are not neutral or insignificant, which should encourage a debate on the independence of central banks in most developed countries and the relative lack of accountability of monetary

authorities. A further point to consider is that, in view of our findings, the low interest rates that have been implemented in Europe or the United States since the 2008 financial crisis might have suppressed the potential redistributive effects of changes in real interest rates.

Moreover, the general increase in both income and wealth inequality accompanied by the fall in income mobility and the incipient increase in intra-urban segregation should be worrying for the Spanish decision-makers. In order to tackle these problems, several lines of action should be carried out. On the one hand, policies aimed at reversing the trends of income and wealth inequality, such as the introduction of higher progressive taxes on capital income, or the creation of progressive taxes on wealth and the inheritance of the ultra-rich. On the other hand, measures such as increased funding for public education or the desegregation of urban centers through public housing programs would be useful to reactivate social mobility and prevent the consolidation of the social status of individuals at the time of their birth –ultimately, to guarantee equality of opportunity.

While there is a growing demand for redistributive policies, we are somewhat skeptical about the feasibility of these measures due to the growing influence of the upper class in the political process and technical difficulties involved in their implementation. Nevertheless, if not addressed timely by policy-makers, these issues have the potential to become increasingly difficult to solve, slowly pushing countries like Spain towards plutocratic forms of government and status society.

Finally, among the future lines of research arising from this project, we could include: (i) a study on the disparate effects that monetary policy might have on different income groups, taking into consideration its multiple transmission channels; (ii) the expansion and cross-check of our research on wealth and consumption inequality for a fixed set of households; (iii) a complementary analysis on income mobility that overcomes the challenges we faced; (iv) successive studies monitoring the level of income segregation in Spanish cities, and the link between this variable and the political preferences of the electorate; (v) an analysis on other possible determinants of redistributive

preferences such as social and cultural capital; and (vi) an in-depth study of the changes in the functional distribution of income in the last few decades, its determinants and its consequences.

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Annex 1. Resumen extendido en castellano

La tesis doctoral intenta arrojar luz sobre diversos aspectos vinculados con la desigualdad: medición, determinantes, comportamiento de riqueza y consumo, movilidad de ingresos, segregación intramunicipal y preferencias redistributivas de la población.

El estudio de la desigualdad ha cobrado particular importancia en el debate económico a lo largo de los últimos años. Exhaustivos y rigurosos estudios llevados a cabo por organizaciones internacionales e investigadores académicos de reconocido prestigio han puesto de manifiesto la relevancia de esta cuestión en tiempos recientes y en el futuro próximo. Según las mencionadas investigaciones, la brecha entre los grupos de mayor y menor renta (y riqueza) en la práctica totalidad de los países desarrollados lleva creciendo de manera continua desde hace aproximadamente cuatro décadas, y dicha tendencia se aceleró a partir del año 2008 como consecuencia de la crisis financiera mundial.

El agravamiento de este problema ha dado lugar a que éste se haya convertido en una de las cuestiones más debatidas dentro de la literatura económica reciente, así como al resurgimiento de la lucha contra la desigualdad como objetivo clave de la política económica, Ello induce a preguntarnos en primer lugar por qué es una variable tan importante. En este sentido, podemos distinguir entre su valor intrínseco y su valor instrumental. Si bien el debate filosófico en torno a su valor intrínseco parece estar condicionado por los juicios de valor realizados por el observador, la evidencia de su valor instrumental –es decir, el hecho de que la desigualdad económica tiene efectos sociales, económicos y políticos negativos– es una justificación más convincente para mejorar los conocimientos sobre el tema que permitan contrarrestarlo de la manera más apropiada.

Entre las consecuencias nocivas del incremento de la desigualdad se pueden citar, entre otras, la desaceleración del crecimiento económico, el deterioro de la cohesión social y la legitimidad percibida de las instituciones democráticas, las distorsiones que introduce en el adecuado funcionamiento de los

sistemas democráticos, el aumento de la criminalidad, o la reducción de la esperanza de vida.

Teniendo en cuenta la importancia de los argumentos expuestos y las tendencias globales señaladas, es indispensable una comprensión más profunda de las diferentes dimensiones de este fenómeno, sus interconexiones con otras variables y sus consecuencias potenciales para la democracia y el capitalismo.

Capítulo 1. El reto de medir la pobreza y la desigualdad

Consideramos fundamental comenzar el análisis determinando qué herramientas de medición existen para cuantificar la desigualdad y qué dimensiones del fenómeno capturan cada uno de estos indicadores, para decidir cuál utilizar de acuerdo con las necesidades de cada investigación. Por ello, el primer objetivo de esta tesis doctoral consiste en revisar los principales indicadores disponibles para medir la pobreza y la desigualdad de ingresos, examinando sus propiedades e idoneidad para diferentes tipos de análisis económicos, e ilustrando su funcionamiento utilizando datos del mundo real.

La importancia de este primer capítulo, de carácter exclusivamente descriptivo, es indiscutible pues a lo largo de la tesis se volverá sobre los análisis aquí realizados para determinar qué indicadores utilizar para la medición de diferentes fenómenos

Capítulo 2. Política monetaria y distribución del ingreso

En el segundo capítulo, se indaga sobre las potenciales causas de las tendencias de la desigualdad descritas en el capítulo introductorio haciendo especial hincapié en un factor que tradicionalmente se había mantenido en segundo plano, pero en fechas recientes ha comenzado a ganar atención para la comunidad investigadora: la política monetaria. La aplicación de políticas monetarias no convencionales –especialmente, desde la crisis económica de 2008– y sus efectos netos a priori desconocidos sobre la distribución de la renta hacen del estudio de esta cuestión una necesidad fundamental para los policy-makers.

Por ello, los siguientes objetivos de esta tesis doctoral se centran en el estudio de los determinantes de la desigualdad con especial atención a indicadores que pueden capturar las decisiones de política monetaria. En primer, se aborda un análisis panel para el período 1996-2015 para 54 países que controlan su política monetaria –por lo que se excluye a los países pertenecientes a la Eurozona. Posteriormente, se presenta una investigación empírica sobre cómo la política monetaria puede afectar a la distribución del ingreso para un panel de 15 países de la Unión Europea que abarca el período 1995-2014.

En estos estudios se utilizan metodologías econométricas para paneles de datos que están adaptadas a las peculiaridades de cada muestra. No obstante, los resultados en ambos casos apuntan hacia la existencia de efectos significativos del tipo interés real sobre los indicadores de desigualdad y polarización.

Concretamente, los resultados sugieren que las políticas monetarias expansivas que reducen efectivamente los tipos de interés reales han contribuido en general a reducir la dispersión en la distribución personal de la renta, y que estos efectos siguen siendo significativos incluso dos años después de la adopción de las medidas. Estos hallazgos ponen en duda el supuesto de que la política monetaria tiene poco o ningún efecto distributivo y, en última instancia, plantean interrogantes sobre la conveniencia de la independencia de las autoridades monetarias.

En cuanto al resto de determinantes, nuestros resultados coinciden en general con la literatura existente. Las variables clave que son consistentemente significativas para explicar el comportamiento de la distribución de la renta disponible son: el desempleo, el envejecimiento de la población, el gasto público (especialmente el gasto social), la influencia de los sindicatos o la apertura comercial. Sin embargo, dependiendo del caso de estudio, hay motivos para creer que otras variables como la financiarización o el cambio tecnológico también pueden tener efectos relevantes.

Capítulo 3. Desigualdad en consumo y riqueza

Por otra parte, aunque la distribución de la renta ha sido el punto central del renovado interés por la desigualdad, es sólo uno de los tres aspectos principales a tener en cuenta al investigar sobre este fenómeno. Las dos variables restantes, riqueza y consumo, también pueden ser utilizadas como indicadores del bienestar y tienen la ventaja de ser más estables en el tiempo o, lo que es lo mismo, de no estar tan expuestas a perturbaciones inesperadas. Es por ello que entendemos que para tener una visión global de la desigualdad económica en España es preciso completar el trabajo de investigación con un estudio que tenga en cuenta estas tres dimensiones.

Así, el siguiente objetivo de la presente tesis doctoral es, por una parte, realizar un análisis descriptivo de la evolución de la desigualdad de la riqueza y el consumo en España el fuerte ciclo de auge y caída que caracterizó las primeras dos décadas de este siglo y, por otra parte, estimar los efectos sobre el consumo de los cambios en la riqueza real y riqueza financiera.

Para hacerlo, recurrimos a los microdatos de las primeras cinco oleadas de la Encuesta Financiera de las Familias (EFF) (2002-2014), que proporcionan datos de riqueza y consumo para una muestra representativa de hogares. Las características de la EFF garantizan la fiabilidad de los resultados obtenidos en términos de representatividad a nivel nacional, y permiten la incorporación de un conjunto de variables demográficas (por ejemplo, la edad, el tamaño del hogar o el nivel educativo) al análisis que podrían ser pertinentes para explicar el consumo de los hogares.

Los resultados de este capítulo apuntan hacia la tendencia divergente de la desigualdad de dos variables analizadas, así como a la importancia del efecto riqueza –en particular, de la riqueza real– sobre el consumo, y las crecientes diferencias entre los las personas más adineradas, las clases medias y los hogares de bajos ingresos, que están perdiendo terreno rápidamente.

Capítulo 4. Desigualdad y movilidad de ingresos en España

En cuarto lugar, se estudia el vínculo entre el fenómeno de la desigualdad y la movilidad de ingresos. Si bien se han realizado numerosos estudios sobre la movilidad de la renta intrageneracional en España, muchos de ellos adolecen de una serie de debilidades, tales como haber abarcado tan solo períodos de auge económico, o poder verse afectados negativamente por las inexactitudes que conlleva el uso de los datos de la encuesta, especialmente en el análisis de la parte superior de la distribución de la renta.

Así pues, el objetivo principal de este capítulo es analizar las tendencias de la desigualdad personal de ingresos y la movilidad en España. En nuestro caso, el interés por abordar un nuevo estudio sobre la movilidad de la renta en España radica en la posibilidad de analizarla durante los primeros años de este siglo. Esta situación puede haber causado una perturbación importante tanto en la forma en que se distribuye el ingreso como en la forma y frecuencia en que los individuos han cambiado su posición en dicha distribución durante este período.

Para hacerlo, recurriremos a la base de declarantes del IRPF para el período 1999-201, cuya utilización nos permite, por un lado, evitar los problemas de inexactitud y falta de respuesta asociados a los datos de las encuestas y, por otro, trabajar con un tamaño de muestra mucho mayor. Sin embargo, la utilización de datos fiscales tropieza con algunos obstáculos metodológicos que pueden hacer que los resultados obtenidos presenten problemas relevantes, que surgen de la disyuntiva entre utilizar un panel de datos puro o un panel no balanceado.

Dentro de las contribuciones relevantes de este capítulo podemos afirmar, en primer lugar, que tanto para el análisis de la desigualdad como de la movilidad existe una clara diferencia entre el uso del panel puro y el panel no balanceado. Sin embargo, cabe señalar que la diferencia para las medidas centradas en el extremo superior de la distribución parece ser insignificante, mientras que se hace cada vez más significativa a medida que nos acercamos al segmento de renta más baja.

Tomando en consideración lo anterior, nuestros resultados reflejan que después de un período de ligera disminución de la desigualdad del ingreso debido a una mayor concentración del ingreso en la parte central de la distribución y a

una menor dispersión en su parte inferior, en España se produjo un aumento de la desigualdad que se inició antes del estallido de la crisis en 2008. Este aumento se debió a la mayor tasa de crecimiento de las rentas más altas, provocada por un mayor crecimiento salarial y, en particular, a las plusvalías generadas durante los años de bonanza bursátil y burbuja inmobiliaria que precedieron a la crisis.

Su estallido supuso un punto de inflexión para la economía española, al reducir tanto la movilidad de los ingresos como la desigualdad de los individuos más ricos, restableciéndose los niveles de principios del año 2000. Así, aunque no se puede afirmar que la desigualdad de ingresos y la movilidad sean procíclicas, sí se puede decir que se vieron profundamente afectadas por el impacto de la crisis económica de 2008. En los años siguientes, los indicadores de ambas variables volvieron a las cotas anteriores a la crisis para las clases media y alta.

Capítulo 5. Desigualdad y segregación intramunicipal

En relación a lo anterior, también es relevante estudiar la distribución espacial de la renta. En un país como España, donde cuatro de cada cinco personas viven en áreas urbanas, es fundamental conocer los niveles de segregación de ingresos presentes en dichas áreas, ya que la existencia de ciudades extremadamente segregadas podría tener un enorme impacto tanto en la desigualdad como en la movilidad.

Para ello, se lleva a cabo un análisis para 33 ciudades españolas divididas por distrito postal, explotando nuevamente información de las declaraciones del IRPF para el período 2013-2016.

Teniendo en cuenta las limitaciones de este tipo de datos que se analizan con anterioridad, en las estimaciones obtenidas se observa nuevamente una propensión a la concentración del ingreso en la parte superior de la distribución, que profundiza las tendencias observadas en el capítulo anterior en términos de desigualdad de ingresos. Según nuestros resultados, este incremento de la concentración del ingreso viene causado por el estancamiento de las rentas del trabajo y un aumento muy marcado de la desigualdad en las rentas no laborales para los individuos de mayores ingresos. Este resultado refleja un comportamiento

similar al experimentado por los individuos de mayores ingresos durante los años inmediatamente anteriores a la crisis de 2008.

Por otra parte, los niveles de segregación intramunicipal del ingreso, si bien relativamente bajos en comparación con otros países desarrollados, apuntan a un incipiente incremento de la segregación que podría suponer una carga extra para una movilidad de ingresos en franco descenso. Los niveles de segregación varían de manera sustancial entre los municipios analizados y no se puede afirmar que exista una relación directa entre la segregación y el tamaño de cada municipio.

Capítulo 6. Desigualdad y preferencias redistributivas

Por último, dado que en sociedades democráticas el papel de las políticas fiscales depende en gran medida de las preferencias de los votantes, es necesario conocer cuáles son los factores que determinan la demanda de redistribución.

Según la Teoría del Votante Mediano (TVM), las preferencias redistributivas de los votantes son aquellas que maximizan la utilidad individual de los votantes. Así, para los hogares de bajos ingresos, la expansión de las políticas redistributivas será beneficiosa, ya que el aumento de los pagos recibidos compensará el aumento de la carga tributaria, mientras que para aquellos con mayores niveles de ingresos, el aumento de los impuestos excederá los beneficios de una mayor redistribución.

Teniendo en cuenta la intensificación de los procesos de concentración del ingreso que fueron descritos con detalle a lo largo de capítulos anteriores, la TVM anticiparía un incremento de la demanda de políticas redistributivas, dado que una proporción mayor de la población se vería beneficiada por ellas. Sin embargo, como se plantea en la literatura económica, esta relación no sería tan simple y estaría plagada de interferencias de otros factores vinculados a las peculiaridades de la economía de cada país, las características sociodemográficas de su población y sus valores y creencias subjetivas respecto de la desigualdad, entre otras muchas cuestiones.

El objetivo de este capítulo es doble: por un lado, examinar los efectos que la desigualdad de renta disponible y de mercado, tanto real como percibida, tiene sobre las políticas redistributivas que la sociedad exige a sus representantes, con el fin de determinar si se cumple la teoría de la mediana del votante utilizando datos comparativos de 87 países; y, por otro lado, identificar qué variables tienen efectos significativos sobre la demanda de redistribución a nivel individual en la sociedad española

Para ambos casos de estudio utilizaremos datos de Encuesta Mundial de Valores (EMV), que explora los valores y opiniones de los ciudadanos de una muestra creciente de países, cómo estos cambian con el tiempo, y su impacto social y político –entre los cuales se encuentran, obviamente, las preferencias por la redistribución.

Los resultados de nuestra investigación para una muestra de 87 países durante el período 1990-2014, no nos permiten apoyar la hipótesis de la TVM, ya que ninguno de los indicadores de desigualdad objetiva presenta efectos estadísticamente significativos sobre las preferencias redistributivas del público. Sin embargo, la desigualdad percibida es extremadamente significativa para explicar el comportamiento de las preferencias en cuanto al papel que el Estado debe desempeñar en la atención a todos sus ciudadanos. Aunque nuestros resultados no apoyan un rechazo total de la hipótesis originalmente propuesta por Meltzer y Richard, sí exigen una reconsideración de sus supuestos. Además, nuestras estimaciones apuntan a la relevancia de otras variables, tales como el grado de desarrollo económico o la pertenencia a una región determinada, para explicar la demanda de redistribución.

Por otra parte, en lo referido al segundo caso de análisis, que se centra exclusivamente en España, nuestros cálculos revelan que los ingresos del hogar y su posición relativa percibida dentro de su distribución, nivel educativo, sexo, edad, creencias personales y región de residencia son los principales determinantes de las preferencias redistributivas en España. Estos resultados también parecen indicar que puede haber habido un cambio estructural a favor de una mayor redistribución una vez que se tenga en cuenta el efecto de las otras variables explicativas.

Los resultados de ambos estudios sugieren que el proceso de formación de preferencias redistributivas es mucho más complejo que el propuesto por la TVM y, por lo tanto, merece ser abordado con especial atención a la relevancia de otro tipo de factores, tales como las percepciones subjetivas de la desigualdad y la cultura y moral dominantes.

Consideraciones finales

Se cierra la tesis doctoral con un resumen de las conclusiones descritas así como de las implicaciones políticas de nuestros estudios y las líneas de investigación que se abordarán en el futuro.

El hecho de que los efectos distributivos de la política monetaria no sean neutrales debería fomentar un debate sobre la independencia de los bancos centrales en la mayoría de los países desarrollados y la relativa falta de responsabilidad de las autoridades monetarias. Otro punto a considerar es que, a la vista de nuestros resultados, la baja tasa de interés que se ha aplicado en Europa o en los Estados Unidos desde la crisis financiera de 2008 podría haber eliminado los potenciales efectos redistributivos de los cambios en las tasas de interés reales.

Por otra parte, el aumento general de la desigualdad de ingresos y riqueza, junto con la caída de la movilidad de los ingresos y el incipiente aumento de la segregación intraurbana, deberían ser fenómenos preocupantes para las autoridades económicas españolas.

Para hacer frente a estos problemas, las medidas deben organizarse en varias líneas de acción. Por un lado, las medidas destinadas a invertir la tendencia de la desigualdad ingresos y riqueza, como la introducción de impuestos progresivos más elevados sobre las rentas del capital o la creación de impuestos progresivos sobre la riqueza y la herencia de los individuos en la parte superior de la distribución. Por otro lado, medidas como el aumento de la financiación de la educación pública o la desegregación de los centros urbanos a través de programas de vivienda pública serían útiles para reactivar la movilidad social y evitar la consolidación del estatus social de las personas en el momento de su nacimiento, es decir, para garantizar la igualdad de oportunidades.

Si bien existe una demanda creciente de políticas redistributivas, somos algo escépticos sobre la viabilidad de estas medidas debido a la creciente influencia de los grandes capitales en la política y a las dificultades técnicas que implicaría su aplicación. Sin embargo, si no son abordados oportunamente por los responsables políticos, estos problemas pueden llegar a ser cada vez más difíciles de superar, empujando lentamente a países como España hacia formas plutocráticas de gobierno y sociedades de estatus.

Annex 2. Supplementary material for Chapter 1

Table 26. ISO codes for each EU country

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

Source: Own elaboration.

Table 27. Correlation coefficients of several inequality measures for the EU-28 countries in 2012

	GINI	MLD	SCV	THEIL	A(0.5)	AT(1)	AT(2)
GINI	1.0000	0.9761	0.8364	0.9821	0.9952	0.9772	0.6213
MLD	0.9761	1.0000	0.7627	0.9493	0.9860	0.9999	0.7422
SCV	0.8364	0.7627	1.0000	0.9199	0.8477	0.7644	0.3576
THEIL	0.9821	0.9492	0.9199	1.0000	0.9870	0.9501	0.5755
A(0.5)	0.9952	0.9860	0.8477	0.9870	1.0000	0.9864	0.6494
AT(1)	0.9772	0.9999	0.7644	0.9500	0.9864	1.0000	0.7432
AT(2)	0.6213	0.7422	0.3576	0.5755	0.6494	0.7431	1.0000

Source: Own elaboration based on statistics from the European Commission.

Annex 3. Supplementary material for Chapter 4

Table 28. Socio-demographic characteristics of households by net wealth quintile, 2014

2014	Average age	% Below secondary education	% Secondary education	% University education
Q1 %share	45.21	63.36%	25.52%	11.13%
Q2 %share	53.26	64.22%	20.35%	15.43%
Q3 %share	56.70	66.68%	18.60%	14.72%
Q4 %share	57.77	51.60%	26.27%	22.12%
Q5 %share	59.67	33.60%	23.56%	42.85%
2014	**% Employee**	**% Self-employed**	**% Retired**	**% Unemployed**
Q1 %share	48.66%	4.19%	9.82%	37.33%
Q2 %share	42.58%	7.06%	22.40%	27.96%
Q3 %share	36.74%	7.08%	27.19%	29.00%
Q4 %share	36.87%	9.44%	34.37%	19.32%
Q5 %share	27.77%	19.86%	40.30%	12.08%
2014	**Average Household members**	**Average number of members working**	**% Homeowner**	**% Holding financial assets**
Q1 %share	0.9128	2.4680	28.95%	21.49%
Q2 %share	0.8820	2.4234	86.07%	37.19%
Q3 %share	0.8552	2.4661	95.91%	50.74%
Q4 %share	0.8876	2.4529	95.36%	59.75%
Q5 %share	1.0240	2.6203	95.46%	81.59%

Source: Own elaboration.

Annex 4. Supplementary material for Chapter 5

Table 29. Income segregation index by municipality

	2013	2014	2015	2016
A Coruña	6.66%	5.69%	6.42%	7.02%
Alcalá de Henares	2.91%	3.10%	3.06%	3.22%
Alcobendas	33.57%	38.14%	39.87%	41.24%
Alicante	9.08%	9.32%	9.33%	10.02%
Badalona	5.83%	5.97%	6.63%	8.99%
Barcelona	15.63%	16.39%	17.29%	18.18%
Burgos	2.79%	2.67%	2.72%	2.82%
Cartagena	4.77%	5.22%	5.15%	5.05%
Córdoba	9.22%	8.78%	8.45%	4.55%
Elche	5.33%	5.11%	5.13%	5.06%
Getafe				2.93%
Gijón	6.24%	6.27%	6.68%	6.53%
Granada	5.00%	5.14%	5.16%	4.98%
Jerez de la Frontera	5.78%	5.57%	5.69%	5.62%
L'Hospitalet de Llobregat	2.23%	2.29%	2.59%	2.84%
Las Palmas de Gran Canaria	9.18%	9.19%	10.08%	9.47%
Las Rozas			3.82%	2.79%
Madrid	14.61%	14.75%	16.49%	16.43%
Málaga	10.05%	10.14%	9.88%	10.58%
Móstoles	1.54%	1.45%	1.42%	1.73%
Murcia	8.42%	8.77%	8.69%	8.25%
Oviedo	6.98%	7.04%	6.31%	6.95%
Palma de Mallorca	6.90%	7.54%	7.50%	8.02%
Pozuelo de Alarcón	1.48%	1.71%	3.08%	3.94%
Sabadell	6.06%	5.90%	5.92%	6.41%
Santa Cruz de Tenerife	9.12%	9.53%	8.91%	8.79%
Santander	4.37%	4.95%	4.78%	5.05%
Sevilla	9.13%	9.32%	9.26%	9.48%
Terrassa	4.85%	4.91%	5.50%	5.25%
Valencia	8.46%	8.89%	9.90%	10.32%
Valladolid	7.05%	7.03%	7.24%	6.97%
Vigo	4.28%	4.77%	4.47%	4.58%
Zaragoza	6.20%	6.17%	6.98%	6.28%

Source: Own elaboration.

Annex 5. Supplementary material for Chapter 6

Table 30. Countries included in the sample next to their corresponding sub-region (continued)

Country	Region	Country	Region
Albania	Southern Europe	**Latvia**	Northern Europe
Algeria	Northern Africa	**Lithuania**	Northern Europe
Argentina	South America	**Macedonia**	Southern Europe
Armenia	Western Asia	**Malaysia**	South-Eastern Asia
Australia	Australia and New Zealand	**Mali**	Western Africa
Azerbaijan	Western Asia	**Mexico**	Central America
Bahrain	Western Asia	**Moldova**	Eastern Europe
Bangladesh	Southern Asia	**Morocco**	Northern Africa
Belarus	Eastern Europe	**Netherlands**	Western Europe
Bosnia and Herzegovina	Southern Europe	**New Zealand**	Australia and New Zealand
Brazil	South America	**Nigeria**	Western Africa
Bulgaria	Eastern Europe	**Norway**	Northern Europe
Burkina Faso	Western Africa	**Pakistan**	Southern Asia
Canada	Northern America	**Palestine**	Western Asia
Chile	South America	**Peru**	South America
China	Eastern Asia	**Philippines**	South-Eastern Asia
Colombia	South America	**Poland**	Eastern Europe
Croatia	Southern Europe	**Qatar**	Western Asia
Cyprus	Western Asia	**Romania**	Eastern Europe
Czech Republic	Eastern Europe	**Russia**	Eastern Europe
Dominican Republic	Caribbean	**Rwanda**	Eastern Africa
Ecuador	South America	**Singapore**	South-Eastern Asia
Egypt	Northern Africa	**Slovak Republic**	Eastern Europe
El Salvador	Central America	**Slovenia**	Southern Europe
Estonia	Northern Europe	**South Africa**	Southern Africa
Ethiopia	Eastern Africa	**South Korea**	Eastern Asia
Finland	Northern Europe	**Spain**	Southern Europe
France	Western Europe	**Sweden**	Northern Europe
Georgia	Western Asia	**Switzerland**	Western Europe
Germany	Western Europe	**Tanzania**	Eastern Africa
Ghana	Western Africa	**Thailand**	South-Eastern Asia
Guatemala	Central America	**Turkey**	Western Asia
Hong Kong	Eastern Asia	**Uganda**	Eastern Africa
Hungary	Eastern Europe	**Ukraine**	Eastern Europe
India	Southern Asia	**United Kingdom**	Northern Europe
Indonesia	South-Eastern Asia	**United States**	Northern America
Iran	Southern Asia	**Uruguay**	South America
Iraq	Western Asia	**Venezuela**	South America

Table 30. Countries included in the sample next to their corresponding sub-region (continuation)

Country	Region	Country	Region
Italy	Southern Europe	**Yemen**	Western Asia
Israel	Western Asia	Vietnam	South-Eastern Asia
Japan	**Eastern Asia**	**Yugoslavia**	**Southern Europe**
Jordan	Western Asia	Zambia	Eastern Africa
Kazakhstan	**Central Asia**	**Zimbabwe**	**Eastern Africa**
Kyrgyzstan	Central Asia		

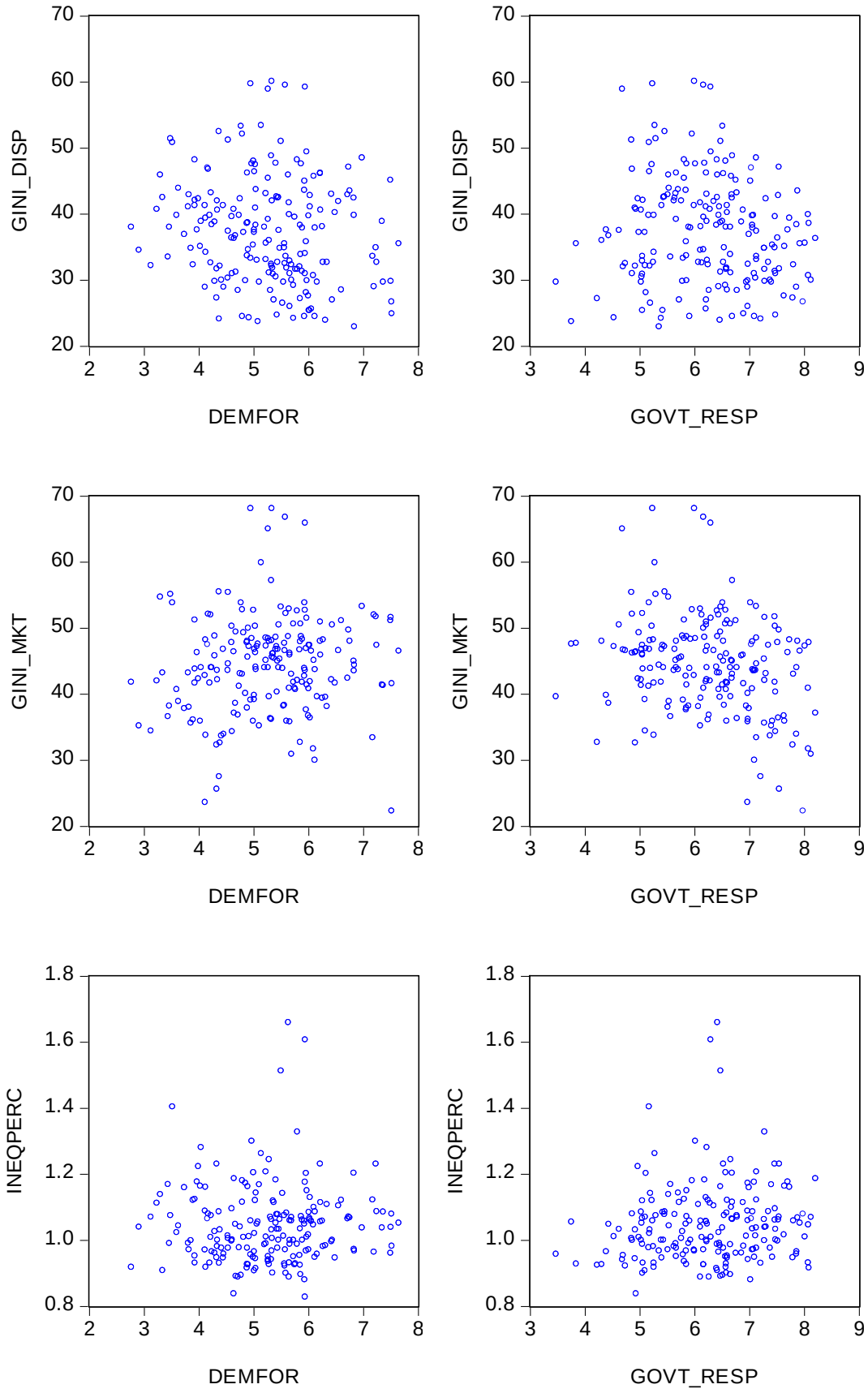
Source: Own elaboration.

Table 31. Main descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
demfor	195	5.2692	1.0103	2.7683	7.6484
govt_resp	194	6.2462	0.9963	3.4759	8.2061
gini_disp	195	37.3692	8.0809	22.9	60.1
gini_mkt	195	44.5067	7.3651	22.3	68.1
ineqperc	195	1.0457	0.1193	0.8278	1.6593
lgdppc	195	8.8245	1.3579	5.6072	11.4254
depratio	195	35.3820	5.5551	14.1283	52.2975
fordirinv	195	3.7422	6.6476	-43.4628	51.6255
region	195	10.6103	4.6398	1	18
wave	195	3.4103	1.2501	1	5

Source: Own elaboration.

Figure 32. Scatter plots of redistributive preferences and inequality indicators



Source: Own elaboration.

Table 32. Estimations of fixed effects by region and wave

	Model 2	Model 4	Model 6	Model 8
Dependent variable	**demfor**	**govt_resp**	**demfor**	**govt_resp**
Estimation method	OLS	OLS	Beta	Beta
Region				
Caribbean	-1.6490	0.3823	-0.8288*	0.2050
Central America	-0.2718	0.4454	-0.0999	0.3372
Central Asia	0.3221	1.1198	0.1728	0.4915*
Eastern Africa	0.4294	1.0966	0.1906	0.6194***
Eastern Asia	-0.0473	1.4002**	-0.0817	0.6523***
Eastern Europe	0.1207	1.6718***	0.0314	0.7592***
Northern Africa	-0.4697	1.8001***	-0.2266	0.9653***
Northern America	-0.2054	-0.2895	-0.1132	-0.1390
Northern Europe	0.2971	0.7918	0.1492	0.2811*
South America	0.2498	1.0124*	0.0536	0.5264***
South-Eastern Asia	-0.5436	0.2745	-0.3058	0.1694
Southern Africa	0.3329	0.9989	0.0383	0.5129**
Southern Asia	0.8683	0.8389	0.4074*	0.4316**
Southern Europe	0.5348	1.7095***	0.2316	0.7728***
Western Africa	-0.7676	1.1495*	-0.3828	0.6678***
Western Asia	0.0142	1.8674***	0.0249	0.8944***
Western Europe	0.6373	0.1950	0.3475*	0.1338
Wave				
1994-1998	0.3376	0.9999***	0.1017	0.4183***
1999-2004	0.3193	1.0416***	0.0560	0.4064***
2005-2009	0.3179	1.0632***	0.0830	0.3907***
2010-2014	0.8763***	1.2108***	0.3019**	0.4837***
Joint significance (chi2)				
Region	0.0559	0.000	0.0002	0.0000
Wave	0.0019	0.000	0.0169	0.0007

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 33. Estimations of fixed effects by employment status, marital status, region and wave

	demfor (OLS)	demfor (OLOGIT)	govt_resp (OLS)	govt_resp (OLOGIT)
emplstatus				
Part time	-0.1298	-0.1339	0.3931*	0.2250
Self employed	0.0906	0.0743	-0.0125	-0.0229
Retired	0.0832	0.0451	0.1090	0.0770
Housewife	-0.0240	0.0144	0.1322	0.1011
Student	-0.4057	-0.3279*	-0.2628	-0.2632
Unemployed	0.0811	0.0757	0.1945	0.1705
Other	-1.5409	-0.9986	-0.8301	-0.8779
marstatus				
Living together	0.2528	0.2018	-0.3664*	-0.2973*
Divorced	0.1606	0.1814	0.0301	0.0751
Separated	0.2792	0.2257	0.4545	0.3646*
Widowed	-0.2950	-0.1940	-0.3715*	-0.2394
Single	0.2564	0.2018	-0.0539	-0.0650
region				
Aragón	0.0028	0.0466	0.4590	0.2882
Asturias	-0.6885**	-0.5518**	0.4704	0.3177
Baleares	-1.3031***	-1.0262***	0.2255	0.1734
Canarias	-0.4289*	-0.2983*	-0.0415	-0.0149
Cantabria	-0.6821*	-0.4784*	0.2026	0.2070
Castilla-La Mancha	0.2146	0.2145	0.8275***	0.6855***
Castilla y León	0.0094	0.0020	0.6345**	0.3764**
Cataluña	-1.2783***	-1.0005***	-0.0958	-0.1841
C. Valenciana	-1.3960***	-1.0767***	-0.1627	-0.1893
Extremadura	0.1569	0.1023	1.2308***	0.8660***
Galicia	-0.7207***	-0.5208***	0.1266	0.0407
Madrid	0.1063	0.0816	0.6845***	0.5513***
Murcia	-0.3695	-0.2248	-0.5168*	-0.4203**
Navarra	0.4544	0.2991	-0.3666	-0.3306
País Vasco	0.2174	0.1622	1.1070***	0.8791***
Rioja	0.8714	0.5630	0.8621	0.4962
year				
2007	0.0036	0.0400	0.1614	0.0990
2011	0.5453***	0.4190***	0.2325*	0.1738*

Source: Own elaboration. *Note:* ***, **, * indicate statistically significant at the 1, 5, and 10 percent levels, respectively.