

ORIGINAL ARTICLE

The Dynamics of Inequality and Mobility: A Panel Data Analysis of the Spanish Income Tax

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Abstract

Objective: This article 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.

Methods: To assess the evolution of inequality over the period analyzed, we have used some of the many metrics developed for this purpose, each of which offers a different approach depending on the segment of the income distribution they focus on (Gini coefficient, income shares, generalized entropy index, and the Atkinson class of measures).

Results: Our results suggest that, after a period of slightly declining income inequality, Spain experienced a rise in inequality in the years immediately preceding the Great Recession, before falling back to precrisis levels. With regard to income mobility, during this period, it was more common for individuals in the middle of the distribution to experience changes, while those at the top and bottom maintained a more stable position.

Conclusions: The economic boom of the late 1990s and early 2000s, as well as the Great Recession, had a significant impact on income inequality and mobility.

KEYWORDS

income inequality, income mobility, panel data, tax returns data

Income inequality has increased steadily in the OECD countries during the last three decades (OECD 2009, 2012, 2013, 2014a, 2014b, 2014c). 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 Lall, and Papageorgiou 2013; Dabla-Norris et al. 2015).

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However, an issue less discussed although closely linked to income inequality is income mobility. A higher inter- and intragenerational 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, while the rise in inequality is a crucial problem for policymakers, 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 intragenerational income mobility was conducted in the United States (Auten & Gee 2009; Gottschalk & Moffitt 2009; Bradbury 2011; Hungerford 1993 and 2011; Schiller and Mukhopadhyay 2013; Mullins, Sjoquist, and Wallace 2021), the United Kingdom (Jarvis and Jenkins 1995, 1999), 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 United States and Germany (Burkhauser and Poupore 1997; Maasoumi and Trede 2001; Gottschalk and Spolaore 2002; Van Kerm 2004; Jenkins and Van Kerm 2006); the United States and Sweden, Norway, and Denmark (Aaberge et al 2002); Canada, the United States, the United Kingdom, and Germany (Chen 2009); and different sets of E.U. countries (Gangl 2005; Ayala and Sastre 2008; Gregg and Vittori 2008; Van Kerm and Pi Alperin 2013).

Regarding Spain, most of the existing studies on income mobility inequality were conducted using survey data (Cantó 2000; Ayala and Sastre 2005; Bárcena and Moro 2013; Anghel et al. 2018; Martínez-Toledano, Haugh, and McGowan 2019), which, although guaranteeing high-quality data, have relevant shortcomings for the analysis of income dynamics. As a result, to the best of our knowledge, the only research on this issue in Spain that uses data from the main alternative source, income tax returns, is 2001. Nevertheless, it covers the period 1982–1998, leaving completely unexplored the 21st century, particularly turbulent for the Spanish economy.

Thus, the main objective of this article 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 nonresponse 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 nontaxable 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 2011; Aaberge et al. 2002; Auten and Gee 2007, 2009; Splinter, Bryant, and Diamond 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 (both of them stemming from the same source: an expanded panel including personal income tax returns for the period 1999–2011) 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 article is testing the reliability of the results using two different samples, a methodology that 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 article is organized as follows. In the next section, we review the recent literature on the dynamics of inequality and mobility in Spain. In the third section, we explain how we built our database and the main methodological challenges we faced. In the fourth section, we present the indicators we used to measure income inequality and mobility, and the information provided by each one. In the fifth section, we discuss the main results of our analysis. Finally, The last section summarizes the conclusions of our article.

LITERATURE REVIEW

The availability of nationwide surveys and tax databases has allowed many studies on inequality and, particularly, income mobility in Spain to be carried out.

The first of these analyses, to the best of our knowledge, was conducted by Cantó (2000) using quarterly data from the Spanish Household Panel Survey for the period 1985–1992. Her findings point to relatively high levels of mobility for that period, especially in the middle deciles of the income distribution. Moreover, the persistence of movements is greater for households that move downward than for those that move upward.

In the pioneering study done with microdata from income tax returns, Ayala and Onrubia (2011) focus on the period between 1982 and 1998. They report an increase in inequality until the early 1990s and a stabilization up to a new surge in the second half of the decade. Regarding mobility, they find lower levels than earlier studies and that income dynamism did not change substantially during these two decades. In addition, the paper also highlights some of the main pros and cons of working with this type of data.

Later, Ayala and Sastre (2005), using annual data from the European Community Household Panel for the period 1994–1998, point to the exchange of positions within the income distribution as the main component of income mobility in Spain, being sociodemographic characteristics and household composition and size the variables with the greatest explanatory potential for these changes.

Bárcena and Moro (2013) employ data from the Living Conditions Survey for the period 2003–2009 to analyze the effect of the economic crisis on the income distribution of Spanish households. Their findings reflect an increase in inequality since 2007, with households at the bottom of the distribution being the most affected by the economic downturn. Mobility, which is relatively high during this period, seems to be concentrated in households at the bottom and middle of the distribution, with a short range.

More recently, Anghel et al. (2018) conducted a comprehensive study on income, wealth, and consumption inequality in Spain, using data from surveys for the period 2002–2014. They find significant levels of dispersion in household income, which they attribute to the effects of the unusually high unemployment rate in Spain, especially during the Great Recession. However, although small insights on income mobility are mentioned, this topic is practically left out of the scope of their paper.

Finally, Martínez-Toledano, Haugh, and McGowan (2019), using survey data for the same period, also point to a moderate increase in income and wealth inequality in the post-crisis years. In addition, they examine income mobility: their results reveal that the highest mobility levels are observed in the middle deciles, while households in both ends of the distribution are much more static. Considering the above, their findings also suggest an increase in mobility in households at lower and top deciles, probably due to changes in the employment status of household members and to the bursting of the asset price bubble, respectively.

Since most of the research on mobility relies on survey data, whose disadvantages compared to tax data will be discussed in the next section, our article aims to contrast and enhance the previous literature using

an alternative data source in order to provide insight into aspects that could not be properly addressed until now.

DATA AND SOURCES

In the economic field, it is challenging to find time-invariant populations, except when observations correspond to institutions, countries, or other political or territorial entities, regardless of the period considered. To measure income inequality and mobility accurately, it would be ideal to have a sample that adequately represents all income levels, regardless of whether individuals file an income tax return or not. Unfortunately, neither fiscal nor survey data allow for this possibility.

Working with tax returns has several advantages over interview-based surveys. First, income tax is universally applied, allowing for the collection of microdata from a broad population, resulting in a very large sample size and higher statistical significance.

Moreover, compared to surveys, tax data are more reliable as they avoid the issue of misrepresentation of the upper end of the distribution due to a higher unit and item nonresponse rate or the possibility of misreporting of crucial information (Feldman and Slemrod 2007; Slemrod and Weber 2012; Meyer, Mok, and Sullivan 2015). In fact, empirical evidence suggests that, unlike tax data, surveys tend to systematically underrepresent personal income (Hurst et al. 2014; Domínguez-Barrero, López-Laborda, and Rodrigo-Sauco 2015).

Finally, income taxes are a more appropriate method for analyzing income mobility than other sources because they ensure regular data collection and allow changes in individual income to be tracked over long periods of time.

On the other hand, regarding the possible effects of the nontaxable minimum on the quality of the data, it should be noted that a large amount of taxpayers file tax returns even if they are not legally required to do so—either to request a refund of withholdings or to accredit negative tax bases that can be offset in subsequent tax years (Hortas-Rico and Onrubia-Fernández 2014). Therefore, this part of the distribution will be included in the data, but with a higher sampling error.

Furthermore, although tax evasion and avoidance may affect these data negatively, previous studies have shown that their impact is not significant enough to invalidate their use (Atkinson, Piketty and, Saez 2011).

The data used in this study stem from an expanded panel that is based on a random sample of individuals who filed annual personal income tax returns between 1999 and 2011. The database was not extended beyond 2011 due to two tax reforms in 2012 and 2016, which introduced significant changes to the income tax legislation that could distort the results.

This expanded panel was constructed by combining a subsample of observations from the previous period with another subsample drawn randomly from the remaining observations in the population for that year, except for the base year. This ensures that the set of observations from both sub-samples in each period is representative of the reference population.

The raw data used in this study were obtained from the Fiscal Studies Institute (*Instituto de Estudios Fiscales*, IEF), which employed a stratified random sampling method (Pérez et al 2016). It is important to note that the panel does not include data from the two autonomous communities of chartered regime, namely the Basque Country and Navarre, which happen to be two of the three Spanish regions with the highest per capita income. Their charters grant these two community-specific competences that are not recognized in the rest of the autonomous communities, known as Communities of Common Regime, including fiscal autonomy.

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

The individual is our unit of analysis, considering the significant changes that a household may undergo over time, such as births, deaths, emancipations, marriages, and divorces. In addition to the practical diffi-

TABLE 1 Main descriptive statistics by year.

	Obs.	Total taxpayers	Sample size (%)	Mean	SD	Min	Max
1999	390,613	13,895,161	2.81	35,428.11	133,117.10	−876,366.70	27,100,000.00
2000	408,439	14,297,387	2.86	35,909.78	114,615.80	−932,019.30	19,400,000.00
2001	425,040	14,903,943	2.85	40,149.39	162,773.80	−2,851,420.00	54,500,000.00
2002	443,090	15,481,382	2.86	42,067.88	166,891.80	−8,168,533.00	54,100,000.00
2003	383,237	15,985,781	2.40	42,561.00	305,640.80	−785,859.30	157,000,000.00
2004	410,351	16,474,150	2.49	43,113.52	235,974.70	−743,675.70	79,400,000.00
2005	462,793	17,105,088	2.71	45,504.39	260,405.40	−69,300,000.00	48,500,000.00
2006	511,302	17,840,783	2.87	50,771.42	443,898.90	−7,901,637.00	147,000,000.00
2007	556,311	18,702,875	2.97	47,365.09	508,463.30	−5,224,012.00	158,000,000.00
2008	578,157	19,388,981	2.98	42,889.95	223,922.60	−1,418,364.00	74,900,000.00
2009	591,746	19,315,353	3.06	40,923.91	227,948.60	−5,996,125.00	118,000,000.00
2010	582,154	19,257,120	3.02	39,541.33	208,218.20	−3,028,992.00	111,000,000.00
2011	597,941	19,467,730	3.07	40,688.59	264,870.00	−11,000,000.00	96,200,000.00

culties that may arise from using the household as a unit of analysis, we believe that individual income is better suited for the purposes of this research.

To create our panel, we merged the taxpayer database for each fiscal year using the assigned identification code. We then generated the monetary variables using the table of equivalences provided by Pérez et al (2016). Finally, we corrected missing data issues related to date of birth and gender, affecting 10.2 and 1.8 percent of individuals in the sample, respectively.

At this stage of the process, our database comprises 6,431,174 tax returns filed by 924,753 taxpayers. Next, we removed 4613 duplicate observations, that is, those with more than one observation for each taxpayer and year, to convert our database into a data panel. As shown in Table 1, which presents the primary descriptive statistics of the tax base by year prior to further processing, these more than six million observations represent approximately 3 percent of the tax returns filed each year over the 13-year period analyzed.

Since we were interested only on individuals with a positive tax base in each period, we excluded 328,060 observations with nonpositive values. Furthermore, to mitigate the impact of potential outliers that may skew the measurements of income distribution and mobility, we also excluded 1 percent of the observations from both ends of the distribution (Cowell, Litchfield, and Mercader-Prats 1999), resulting in the removal of a total of 120,170 observations.

As a result of these exclusions, we had 877,282 unique taxpayers and 5,888,331 tax returns. These figures represent 94.76 and 92.29 percent of the starting database, respectively.

To construct a pure panel, the most commonly used method in similar studies, we removed all individuals not included in the sample throughout the entire period under review. This resulted in a sample of 189,016 single taxpayers and 2,457,208 tax returns.

However, due to the fluctuations in the Spanish economy during the period analyzed, this restricted panel would not accurately represent individuals who entered or left the labor force due to a change in their employment status, or those who started earning income of any kind after 1999. For this reason, only those individuals who were required to file a Personal Income Tax return in each of the years covered by the sample are would be adequately represented.

As shown in Table 2, the transition from an unbalanced panel to a pure panel leads to a loss of data, which artificially increases the average age of taxpayers, the proportion of people whose main source of income is labor, the gender ratio, and the average individual income for each year.

TABLE 2 Comparative composition of the pure panel and the data lost to create it.

	Lost data				Pure panel			
	Average age	Labor (%)	Men (%)	Average income	Average age	Labor (%)	Men (%)	Average 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€

For comparison purposes, we decided to add a second sample to our analysis, which we will call the “unbalanced panel.” This sample includes all tax returns filed in the original sample, except duplicates and outliers. Therefore, following a methodology similar to that used by Jenkins and Van Kerm (2006), this second panel will consist of all valid income pairs in the data set for each pair of years.

METHODOLOGY

In order to assess the evolution of inequality during the period analyzed, we used some of the many metrics designed for this purpose, each of them offering a different approach depending on the segment of 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 also considered the generalized entropy—henceforth GE—index and the Atkinson class of measures.

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, an alternative would be 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. However, we decided to use a more specific measure developed by Hart (1976), although it should be noted that 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). Even so, it is useful as a starting point for analyzing income mobility.

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 measure can take values between 0 (absolute mobility) and 1 (absolute immobility). This way, we account only 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 employed 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*).

Since this indicator can be constructed 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).

RESULTS DISCUSSION

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 S1, income inequality focusing on the highest end of the income distribution decreased mildly in the first years of the period. Afterward, 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 notable 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 percent drop to reach its minimum in the last years.

Regarding the other GE 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 noted 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.

In order to focus on the individuals around the median, we use the Gini coefficient. Figure S2 shows that until the crisis, this indicator paints a picture similar to the GE measures, but with less pronounced changes. However, in the postcrisis 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.

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 notably different, particularly during the crisis and postcrisis years (Figure S3).

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.

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. 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, as evidenced a pronounced reduction of the correlations between the indices calculated for both samples. 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 individuals after the crisis.

Comparing the results of our research with previous literature, it is worth noting that, as far as income inequality is concerned, our findings reflect a Gini coefficient slightly below that captured by Martínez-Toledano, Haugh, and McGowan (2019) for a similar period of analysis. The trends depicted in this article—an increase in income inequality during the precrisis period and a moderate fall after the crisis—are similar to those observed in our results. In this sense, our study seems to reinforce the findings identified previously, but providing a much better representation of the most affluent individuals in the distribution.

It should be noted that our results contradict the trends detected by Bonhomme and Hospido (2013), which is probably because the authors consider only labor income in their calculations, thus presenting an incomplete picture of income distribution.

These income inequality trends can be directly linked to the housing bubble and, to a lesser extent, the boom in financial markets. The windfall profits earned during this period, whether in the form of capital gains or real estate and investment income, were captured disproportionately by individuals at the top of the distribution and, as the crisis set in and these windfall profits disappeared, inequality declined mildly until the last year of our sample. In this sense, changes in inequality in this period were driven essentially by nonlabor earnings.

Income mobility

We start using the Hart index, described in the previous section.

As shown in Figure S4, 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, that is, 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.

Second, 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 S5, we can identify the first period of declining mobility during the first years of the total series, and the second period in the years following the outbreak of the crisis. However, it is worth mentioning that, independent of the sample chosen, the last year of the series is the one with the highest immobility ratios, that is, 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 (second, third, and fourth) have higher levels of mobility than the two extremes.

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 afterward 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 (see Figure S6), 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 S7).

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, while the Gini coefficient, which is particularly focused on the central quintiles, 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 skyrocketed 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 precrisis levels; instead, if we put the emphasis on the individuals at the bottom, we can see 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 choose the Gini coefficient as our inequality indicator, regardless of the sample chosen.

As far as income mobility is concerned, our results are not quite comparable with those reported by Bárcena and Moro (2013) and Martínez-Toledano, Haugh, and McGowan (2019), not only because of the use of survey data, completely different in nature to the database used in this article, but also because of the use of a different set of indicators to measure mobility. However, considering the above, our study also captures greater income mobility in the central part of the distribution similar to both studies mentioned above, leaving households at both ends of the distribution in a relatively less dynamic situation.

Our results also seem to reinforce the literature regarding the behavior of high-income individuals who are always better represented by tax data than by survey data. A relevant difference of our findings with previous research is that it reveals that the trend toward slight increased mobility at the top did not start during the postcrisis years, but rather during the last years of the housing bubble. This divergence may be due, on the one hand, to the underrepresentation of this type of individuals in survey data used in previous studies, and, on the other hand, to the underreporting of income in those who participated in the surveys.

Putting these results in context, it can be argued that mobility during this period, although deeply affected by the boom-and-bust cycle and the housing bubble, was more frequent for individuals in the middle of the distribution, while those at the top and bottom keep a much more stable position. However, what we already discussed above about individuals in the lower and upper ends of the distribution, both with low but increasing mobility, is that in Spain it is relatively more difficult to go from being very rich to being somewhat less rich than it is to go from being very poor to being somewhat less poor.

Even with the limitations of our database, these results should be a warning sign about the stagnation of upward mobility, particularly for those placed in the most vulnerable positions in our society, and also about the entrenchment of a virtually unchanging elite from which it is also nearly impossible to move down.

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, while 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 nontaxable 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, we can note that, 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 2000s. 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 marked 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 2000s levels.

It is also worth mentioning that, independent 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, that is, 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 2000s.

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 precrisis 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 data set—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. It is also necessary to explore how the trends observed in our research would be affected when segmenting the sample by age, gender or main source of income.

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Additional supporting information can be found online in the Supporting Information section at the end of this article.

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