



PAPER

Title: Spatial wealth inequalities: An estimation of asset-poverty rates for the Spanish regions

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Abstract:

The increasing concentration of wealth distribution is becoming a very important issue in the analysis of inequality. Although in global terms, the Credit Suisse global report has pointed out that the richest 1% owns 44% of the global wealth, there is a lack of the inclusion of financial and real assets in the study of household inequality. The need to include wealth in the household inequality analysis is calling attention nowadays. However, there are no datasets that provide the level of geographical detail needed to analyse this from a spatial perspective. This paper aims to fill this gap by the analysis of Spanish households.

The methodology applied estimates asset-poverty indicators for the 17 Spanish NUTS2 regions by combining the use of the Survey of Household Finances (EFF) produced by the Bank of Spain (where the net wealth is available on a national scale) and the living conditions survey. In the second database the same variables we use from the first database are included with the advantage that in this one the variables are disaggregated according to autonomous communities. The main novelties of the technique presented are that the geographical mapping produced is consistent with the national aggregates and that it does not require imposing strong distributional assumptions.

According to this, we develop an analysis of the regional heterogeneity in the distribution of wealth from the Spanish households.

Keywords: *asset poverty rate, regional inequality*

JEL codes: R20 D31 G51

1.Introduction

Inequality has traditionally been an object of study in economic analysis. Its implications, not only in economic terms but also from a social perspective, have led to a need for comprehension of the causes and possible solutions of high inequality rates. However, most of the literature focuses solely on income inequality (see Dabla-Norris, et al. 2015 or Jenkins, 2017) and this approach focused on income inequality could be limited. The concentration of wealth should be considered a key element to understand the evolution of inequality. Piketty (2014) pointed out that accumulated wealth grows faster than wages. This implies that the upper class in terms of wealth tends to maintain its position along time. Consequently, families relying only on labour wage will tend to stay at the bottom of the income distribution, making the gap bigger over time. The wealth inequality will increase due to the dynamics of wealth distribution.

The omission of wealth has important drawbacks (see for example Piketty, 2015; Ohlsson et al. 2014 or Elinder et al. 2018). One of them is the relatively easy way in which a flow of income can end. In that sense, the main consequence of crises is the loss of jobs. In consequence, a stop in labour income is frequent during a crisis. Besides, this lack of income from the labour market has a greater impact on low-income households. This fact made the inequality even larger.

Although assets contribute to economic security of families thanks to their liquidity, it is also important to analyse how wealth contributes to inequality. This means analysing how it is distributed across families.

Labour income is still the most important source of family income. The volatility of this economic system can mean a stop in the household's income flows of labour at any moment. If this happens, the family can only survive with their assets, and we

will find it a huge problem if the families do not have any or only have passives as a general tendency.

Recent research indicates that wealth is becoming more and more important as an inequality driver (Piketty & Zucman, 2014). The Credit Suisse Global Report has pointed out that in 2019 the richest 1% owns 45.8% of the global wealth (see Credit Suisse Research Institute, 2020). At a global scale, long-run asset price recovery has contributed to a gradual rise in wealth-income ratios, and, as a consequence, according to *The World Inequality Report* (2018), income inequality and wealth inequality have increased during the latest decades in almost all world regions. However, there is a wide variety of speeds even between countries with the same level of development. This means that specific national policies and institutions can impact largely on poverty rates.

Wealth inequality has followed the same path. However, is important to highlight that public wealth is or zero or negative while private wealth is rising because of the huge number of transfers from public to private that has been occurred since the eighties. Consequently, there is a lack of capacity in the governments to face this increasing inequality with redistribution and other policies. (Alvaredo et al.2018).

Rise in capital incomes which includes interest, dividends, rents, and retained earnings of corporations has been an important part of the increase in income inequality. In addition, this capital earns belongs mainly to the top of the income distribution. This recognition has led to identify wealth inequality as one important piece of global inequality in distribution. (Alvaredo et al. 2018).

This sums to the fact that wealth is rising faster than income, giving special attention to inherit wealth which causes that the top of the income wealth sees its wealth increasing with a higher speed than the average person (Piketty & Zucman, 2014). Specifically, wealth in global terms rose by 7.4% in 2020, while, at the same time, wealth per adult has increased by 6% (see Suisse, 2020). The combination of these two factors implies that wealth is rising and is getting more and more concentrated.

For the specific case of Spain, the data compiled in the Survey of Household Finances (EFF) produced by the Bank of Spain shows that the wealth per adult has risen at an average annual rate of 5.6% between 2000 and 2020 and the wealth Gini coefficient has risen from 65.6 to 69.2 at the same period. Knowing that the top 1%

owns 23% of the total wealth and that this has not changed significantly since 2000, it suggests that the variation has occurred in the lower part of the distribution. (Suisse, 2021)

Knowing the inequality existing in Spain research as Ayala & Palacio (2000) has shown that the household's place of residence has a great impact on the poverty in Spain. At the same time Adiego & Ayala (2006) suggest that since the nineties, the impact of education in inequality measure in terms of wealth in Spain has been diminishing while the weight of the territorial variables is increasing.

While the data in the EFF are useful to understand the dynamics of the wealth inequality among Spanish households, it does not allow us for studying spatial differences since the information lacks any geographical detail. This document tries to overcome this limitation by producing wealth indicators with regional detail for the 17 Spanish NUTS2 regions.

The rest of the paper is organised as follows. The second section presents a brief literature review to summarize the state of the research on the distribution of wealth on a disaggregated scale. In section three we explain the methodology used. Next, in section four, describes the main features of the two sources of data used in this analysis, and in section five, we present the results obtained in this paper. Finally, we include some conclusions and suggest further lines of research in the sections six.

2.Literature review

Inequality has called the attention not only in economics but also in sociology and political science. Studies as Dabla-Norris et al. (2015) have highlighted the fact that high inequality rate has negative effects on growth, reduces access to opportunities, reduces labour productivity, and dampens investment by increasing instability, to name a few of the social effects derived from inequality. (See Ostry et al. 2014)

Trends in income inequality have been analysed establishing that the inequality rates have been increased since 1980 until now. For instance, Hoffmann et al. (2020) present that EEUU, Germany, Italy, and United Kingdom have seen how their inequality has risen rapidly in the 1980s and 1990s and then grew at a slower rate.

On the other hand, as lower rates of inequality are related to sustainable growth and less crisis risk (see Ostry et al. 2014), many studies have set their focus on the

distribution of household income trying to analyse how the differences in tax-benefit rules can influence over the distribution of income between households and concluding that determines over one-third of the observed inequalities (Sologon et al. 2021). In this line, the positive effect in the fight against inequality of fiscal instruments has been demonstrated in Clifton et al. (2020) in the case of America Latina.

Although income is easier to record, the measure of inequality based only on income is a limited vision. The academic literature is focussing their attention on the wealth, measuring the assets of each household to make the vision of inequality more precise. Recent studies have set an innovative criterion to measure inequality (see for example Azpitarte, 2011; Brandolini et al. 2010; Caner & Wolff, 2004): they propose to use household assets instead of income. This more recent concept of asset poverty was defined by the household assets needed to fund the basic needs over a determined time when no other sources of income are available (see Haveman & Wolff, 2004).

In the same line of research, Caner & Wolff (2004) explained the necessity to include wealth in the US as a measure of well-being due to the advantage of the stability that wealth provides as an indicator; and more recently, Saez & Zucman (2016) have estimated the national distribution of wealth in the United States revealing that wealth inequality not only is high but is also rising fast in the United States since 1913.

Due to the advantages that provides adding wealth to these kinds of studies, some literature has aimed to measure poverty using both characteristics: income and wealth. Particularly Azpitarte (2011) quantifies poor households in the United States and Spain by a multidimensional approach. The role of assets to get resilience to face economic hardships has been analysed in papers as McKernan et al. (2009) showing that assets holdings play an important part in dealing with negative family events. Assets provide a cushion making the crises less pronounced and they are even more important in the case of low-income families for their effects in the improvement of their well-being. Additionally, the fact that wealth inequality is more concentrated than income inequality has been argued too in Davies & Shorrocks (2000). Besides, the article concluded that 35-45% of the aggregate wealth in the United States is due

to inherits. Inheritance is a basic instrument to carry on wealth, and it usually contributes to the preservation of inequality.

All these researchers agree on the necessity to include wealth distribution in the analysis of inequality. In this paper, we aim to analyse the wealth inequality in Spain providing a spatial disaggregation of the household wealth, which is a gap in the academic research of this area because the main part of the articles analyses wealth in a global or in a country level. This is mainly since one of the problems that academic researchers must face is the availability of data sources. In this line, in order to analyse the global income distribution, studies as Solt (2009) have standardized the world income inequality database. Transforming the multiple and unequal dataset available in each country and making it comparable between them. This has provided a useful tool to analyse the causes and consequences of income inequality which has enriched the literature. While databases with a geographical detail enough to implement regional analysis are abundant with regard to income distribution, there is a lack of information with this detail when referring to the within-country geographical distribution of wealth. Spain is not an exception to this absence of rich geographical information, and our main aim in the present research is to analyse the household wealth distribution at a regional scale. Not only this level of disaggregation is important for research, but it also is necessary to elaborate better policies oriented to diminish wealth inequalities.

To solve this inconvenience, we need to produce wealth indicators for small areas. To do so, we based our approach on the Small Area Estimates (SAE) method. It was used in Elbers et al. (2003) which based their process on joining two data samples and estimating a vector of covariates that allowed them to generate a conditional distribution of the poverty. The method was later modified by Tarozzi & Deaton (2009) which modifies the poverty mapping and provides homogeneity assumptions. We can see more examples of this in Modrego & Berdegué (2015) which applied this method to analyse the dynamics of poverty and income distribution in Latin America. This poverty mapping methodology has been applied to estimate risk-poverty rates in the UK in Melo et al. (2016). In this line, the analysis of poverty index in Valencia has been analysed in Morales et al. (2018). The SAE methodology has been reviewed in papers such as Pfeffermann (2013) which analyses the

differences, advantages, and disadvantages of using a Bayesian approach or a frequentist approach.

The development of SAE has continued not only in terms of new theories but also in applications. One example is Molina et al. (2014) who make a poverty mapping in Spain of the poverty rate (based on incomes) and analysed this distribution by provinces. In this line, the poverty data is also analysed in Pratesi (2016). On the other hand, the methodology of SAE has been discussed in papers such as Guadarrama et al.

(2016) and Tzavidis et al. (2018).

In this study, we follow the same steps as the SAE literature, and we link two databases. The method starts with an identification of the variables correlated with wealth, for, in a second step to match both sources of data. By applying this procedure, we can estimate an indicator of wealth poverty rate for each Spanish region, making our estimates consistent with the national aggregates. In the next section, we will explain with more detail the methodology used in this research.

3. Methodology

To estimate these poverty rates, we apply a Small Area Estimation (SAE) procedure.

The method proposed by Elbers et al. (2003) and the later modification described in Tarozzi & Deaton (2009) not only has been used in this kind of research but also has been applied by the World Bank with the aim of mapping poverty. The methodology used in this paper is based on the method proposed in previous articles such as Cartone et al. (2021), Rao (2003), and Fernandez-Vazquez et al. (2021).

The methodology consists of an estimation of the linear relation which exists between the dependent variable and the independent variables which are obtained from the Household Financial Survey and are observable too in the Living Conditions Survey. With the parameters obtained, the method proposed by Tarozzi & Deaton (2009) will predict the dependent variable with the same level of spatial disaggregation as the available in the living conditions survey as:

$$\hat{y} = X\hat{\beta} \tag{1}$$

To start the procedure, the method draws from the premise that the aim is to recover the matrix P (with dimension n x j), where p_{ij} represents the probability of the category j for individual i. We will choose that solution that requires the minimum rate of information or, in other words, that solution that maximizes the entropy; and, at the same time, assures the consistency of the estimation with the observed data. This measure of entropy is represented in Eq. (2)

$$Ent(p) = - \sum_{i=1}^N \sum_{j=1}^J p_{ij} \ln(p_{ij}) \quad (2)$$

Assuming that $p_{ij} > 0$, $\sum_{j=1}^J p_{ij} = 1$ and $i=1,2,3,\dots,n$

It is assumed that Y is a variable categorical which reflects the belonging of each individual to one single category of the J alternatives. The matrix Y (Eq.3) will have a n x J dimension where P is the unobservable probability of belonging to that categories and U is the random noise.

$$Y=P+U \quad (3)$$

$$U=WV \quad (4)$$

The random noise is composed of the combination of the L possible values for U (V) and their respective probabilities (W). The vectors in V are bounded between -1 y 1 due to the categorical nature of the variable.

The aim is to estimate the elements of P with the observed data. To do so, it is assumed that the p_{ij} cells are connected to the explanatory covariates found in the matrix X (whose dimension is n x k) and that includes the characteristics of the individuals. We will capture this correlation following the proposal of Golan (2018).

$$\frac{1}{n} X^T Y = \frac{1}{n} X^T [P + U] = \frac{1}{n} X^T [P + WV] \quad (5)$$

In the Eq. (6), which represents the estimator GME (Generalized Maximum Entropy) of cross- moments, the entropy related to the cells u_{ij} is represented by the second part of the equation, where $Ent(W) = - \sum_{i=1}^L \sum_{j=1}^n \sum_{l=1}^J w_{ijl} \ln(w_{ijl})$.

$$\text{Max}_{P,W} \text{Ent}(P, W) = - \sum_{i=1}^n \sum_{j=1}^J p_{ij} \ln(p_{ij}) - \sum_{l=1}^L \sum_{i=1}^n \sum_{j=1}^J w_{ijl} \ln(w_{ijl}) \quad (6)$$

Subject to:

$$\begin{aligned} \frac{1}{n} \sum_{i=1}^n x_{ik} y_{ij} &= \frac{1}{n} \sum_{i=1}^n x_{ik} [p_{ij} + u_{ij}] = \frac{1}{n} \sum_{i=1}^n x_{ik} [p_{ij} + w_{ijl} v_l]; j = 1, \dots, J \\ \sum_{j=1}^J p_{ij} &= 1; i = 1, \dots, n \\ \sum_{l=1}^L w_{ijl} &= 1; i=1, \dots, n; j = 1, \dots, J \end{aligned} \quad (7)$$

Solving the problem of optimization, we obtain estimations for $P(\hat{P})$ and $W(\hat{W})$ which will lead us to the estimations of Y where $\hat{Y} = \hat{P} + WW$. Due to the restrictions expressed in Eq. (7) the solution is pushed to be consistent with the cross-Moments observed between X and Y.

Eq. (5) is modified to include information recovered from different sources, usually a household survey (s) and a population census (c).¹ It is important to highlight the need of using the two sources of data since we cannot find the net wealth at a disaggregated level in the Survey of households, so we need to combine it with an additional database with the required spatial detail. In addition, one requirement for using this methodology is that we should find the same variables X to project the results from a national to a regional scale. As a result, the following expression is used as a constraint in the GME estimation:

$$\frac{1}{n} X_s^T Y_s = \frac{1}{N} [X_c^T P + X_c^T U] = \frac{1}{N} [X_c^T P + X_c^T W V] \quad (8)$$

¹ The combination of a household survey with a population census basically relies in the richer geographical detail present in a census (c) when compared with a household survey (s). Even when we are not using any population census in our empirical exercise, we keep this notation for the sake of clarity in the presentation of the methodology.

Following the logic previously described with the estimations for \hat{P} and \hat{W} , we will produce at the disaggregated level, cross-moments consistent with the information observed in the survey of households (s). In this line, the predictions for $\hat{y}_{ij}^d = \hat{p}_{ij}^d + \hat{u}_{ij}^d$, where d is a categorical indicator that refers to each area (in our case each Autonomous

Community); will be consistent with the aggregates in $\frac{1}{n} X_s^T Y_s$

This represents the main advantage of this method, the GME estimator not only considers the data of the small areas but also the exogenous data. Specifically, it considers that aggregates which could give information about the small areas and incorporates this data into the estimation problem improving the precision of the results.

Summarising, we follow the method proposed by by Elbers et al. (2003) and Tarozzi &

Deaton (2009) which consists mainly in the estimation of an econometric model as $\hat{y} = X\hat{\beta}$ and the $\hat{\beta}$ obtained are applied to the disaggregated level. However, this has not necessary to be consistent, so we apply the Fernandez Vazquez et al. (2020). In this proposal, we maximize the entropy as in Eq. 6 which is subject to the Golan restriction with information of both sample (Eq. 8) which makes the estimation consistent.

4.Database and basic statistics

As we have stated before, we aim to analyse the asset poverty rates with a regional disaggregation level. The particular spatial disaggregation considered corresponds to NUTS2 regions or Autonomous Communities. In this research, we combine two sources of data. First, we use the Survey of Household Finances (EFF, which plays the role of \mathbf{s} in the GME methodology) and we combine it with the information contained in the Income and Life Conditions Survey (ILCS, which plays the role of \mathbf{c}). EFF is an official survey, which is included in the National Statistics Plan provided by the Spanish National Central Bank (BdE). This survey has been conducted since 2002 and in this research, we use the seventh edition of this survey and include in the analysis the changes produced in the financial situation of the families in 2017. The goal of this survey is to establish a link between the assets, the debts, and the spending of each household. By this way, the survey tries to characterize the property status of the Spanish families.

This is a very useful source of data since it provides detailed information about income, assets, debts, and consumption of Spanish households. The information supplies data about the Spanish household investment and financial decisions.

The real assets include the main dwelling, other real estate properties, business as a freelance, jewellery collection, pieces of art, antiques, and other real assets.

The financial assets include bank accounts, shares, investment funds, pension plans, life securities, investment or fixed, fixed income securities, unlisted shares, participations, and other financial assets.

All the information referred to the household net wealth is based on household characteristics such as the age of the household head, income percentile, wealth net percentile, and the number of members in the family.

Talking about liquid we can find cash and demand deposits, saving deposits, government, corporate and foreign bonds, other financial securities, the cash associated with life insurance plans, and corporate stock and mutual funds.

Additionally to the EFF, we use also the information from the ICLS, which is produced annually since 2004 based on harmonized criteria used in all the countries belonging to the European Union. In this survey between 13,000 and 35,000 households have been included. By using this source, we can rely on this instrument to understand and study inequality and poverty. It is important to highlight the necessity of using two data sources. First, because the information of household wealth available in the EFF is only observable on a national scale. Second, because we can use the same variables in the two sources of data with the advantage that in the ICLS, the region of residence for each household surveyed is observable. The use of the same variables in both sources allows us to situate each household to analyse the net wealth in Spain between NUTS2 regions.

Specifically, the surveys provide information about household income, poverty, gender inequality, employment, childcare, pensions, and socioeconomic aspects of the elderly, regional development, migrations, educational level, health, and different effects on socioeconomic status. By combining these two sources we will be able to estimate the distribution of household wealth with spatial disaggregation and to overcome the problem that the data referred to the net wealth are only available on a national scale in the Survey of Household Finances.

In our analysis we study the spatial distribution of asset-poverty rates, classifying a household as asset-poor when their liquid assets are not enough to cover basic consumption requirements. Following the approach explained in Haveman, & Wolff (2004), this happens when these liquid assets are below the quarterly mean consumption. Given that the annual mean consumption per household in Spain in 2017 were €12,981.80, in order to obtain the poverty rate we will consider a household as poor if their liquid assets are below $\frac{€12,981.80}{4} \times uc$, being *uc* the number of consumption units in the household.

As independent variables we have selected the household percentage with university studies, the number of working members in the household, the number of employed and unemployed members, the number of retired members, the gross household income, the units of consumption in the household, the average age, the gross income and the net wealth. In Table 4.1 we show the main descriptive statistic from both the EFF and ILSC.

Table 4.1 Main descriptive statistic.

Survey of Household Finances				
Includes about 6000 households				
Variable	Mean	Minimum	Maximum	S.E.
Poverty based on liquidable	0.288	0.000	1.000	0.453
Poverty based on net wealth	0.107	0.000	1.000	0.309
Employed members	0.942	0.000	6.000	0.947
Unemployed members	0.214	0.000	6.000	0.501
Retired members	0.561	0.000	4.000	0.711
College percentage	0.278	0.000	1.000	0.368
Average age	53.1	11.6	85	19.3
Gross income	61658	0	11242000	178830.75
Liquidable assets	586846.57	0	399560000	7072519.3
Equivalent consumption units	1.80	1.00	5.500	0.705

Life conditions survey

Includes between 13000 and 35000 households

Variable	Mean	Minimum	Maximum	S.E.
Employed members	0.967	0.000	5.000	0.920
Unemployed members	0.231	0.000	7.000	0.526
Retired members	0.479	0.000	4.000	0.675
College percentage	0.279	0.000	1.000	0.378
Average age	44.6	6.5	80	19.4
Equivalent consumption units	1.6802	1.00	5.60	0.53602

Own elaboration based on information from the Survey of Household Finances and the life conditions survey.

As we can observe in the previous table there are no significant differences between the two sources. This leads us to think that there would be no problem in using the Living Conditions Survey to estimate.

The financial household survey has included variables whose aim is to characterize the household's social and economic situation. This household characterization is the main reason to include the number of employed and unemployed members as well as the colleague percentage and the average age.

The basic logic of this is that households with unemployed members or with fewer studies have more probabilities to be in poverty in terms of income and wealth.

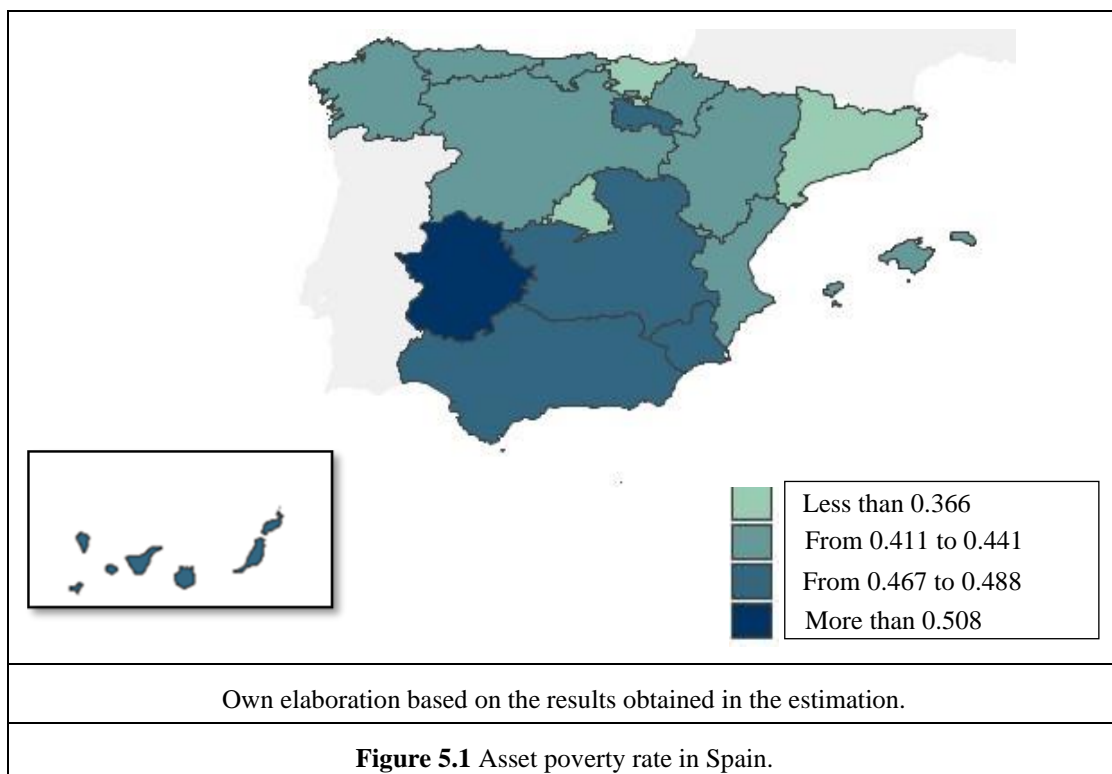
5.Results

5. 1 Asset poverty rate based on liquid assets by Autonomous Communities in Spain

As we have explained before, the concept of asset poverty is based on a measure of the capacity of household assets to satisfy basic needs for some limited period if the incomes were suddenly reduced or suppressed. Intending to measure the financial risk in the Spanish household, we have set the time in three months. By doing so, a household should have enough financial assets to overcome three months without any other income. In this case, we analyse the liquid assets such as deposits, own accounts, or inversion funds to name a few.

By developing the process explained before, we have obtained the estimated poverty rates for each Autonomous Community in Spain. Understanding asset poverty rate as the percentage of households whose assets fall below the assets poverty line. We analyse the weighted mean in order to make the estimation consistent with the national data. The weighted means are represented in the next map. However, the complete data are available in the table A.1 from de annex.

As we can see in the figure 5.1, the vulnerability of the households is superior in the south than in the north. Although most of the regions have rates closer to the national mean we found disparities within an interval of 0.34-0.54. This means that the heterogeneous in the Spanish regions can reach a difference of 0.20 in the asset poverty rates.



In the map, we can appreciate the distinction between north and south. Whilst the asset poverty rate in the north is lower than 0.441, in the south the rate rises above 0.467 with Extremadura reaching the maximum rate with 0.54. However, the exception in the north is La Rioja, which has an asset poverty rate higher than its bordering communities. A higher poverty rate is found in the Island Canary too; in this case, its rate surpasses 0.467.

On the other hand, we have regions as Madrid, País Vasco, and Cataluña with the lower rates (lower than 0.366), followed by the rest of the regions in the north whose asset poverty rates are situated between 0.41 and 0.44.

Previously, we have discussed the differences between wealth and income distribution. As we have said, the assets poverty rate in Spain reached 41.58% while the income poverty rate in the same year was situated at 21.6% according to the INE. However, the distribution of income does not differ significantly from the representation in figure 5.1 of the Spanish asset poverty rate. This implies that income and wealth are distributed in a similar way between the Spanish household. However, we need to take into account that although the asset poverty rate distribution is close to the income poverty rate distribution, the poverty rates are much higher if we analyse the liquid asset than if we analyse the incomes. The similarities between both distributions reaffirm that income and wealth are correlated. In this way, households with a high level of income will tend to have more levels of net wealth than those households which are poor in terms of incomes. In other words, we can understand the poverty rates in terms of income as a measure of the short term and the poverty rate in terms of wealth as a measure that includes the long term.

As wealth and income are distributed in the same way, it is logical to think that both play an important role in the definition of inequality. A measure of inequality that joins wealth and income should be a starting point to understand the causes and consequences of inequality.

5.2. Asset poverty rate variation with household's characteristics

Following the logic of the income distribution, we would expect that households with all their members unemployed will have a higher asset poverty rate. At the same time, having university studies could mean reducing this rate as the wage is expected to be higher, and having a lower income can imply an asset poverty rate higher. The table 5.2 presents the weighted mean according to these subsets.

By classifying the households into these subsets according to the previous characteristics we can observe how much the assets poverty rates are reduced or increased if we consider incomes, education, and labour market situation. To do so,

we consider having lower incomes if this is lower than the 60% of the median income.

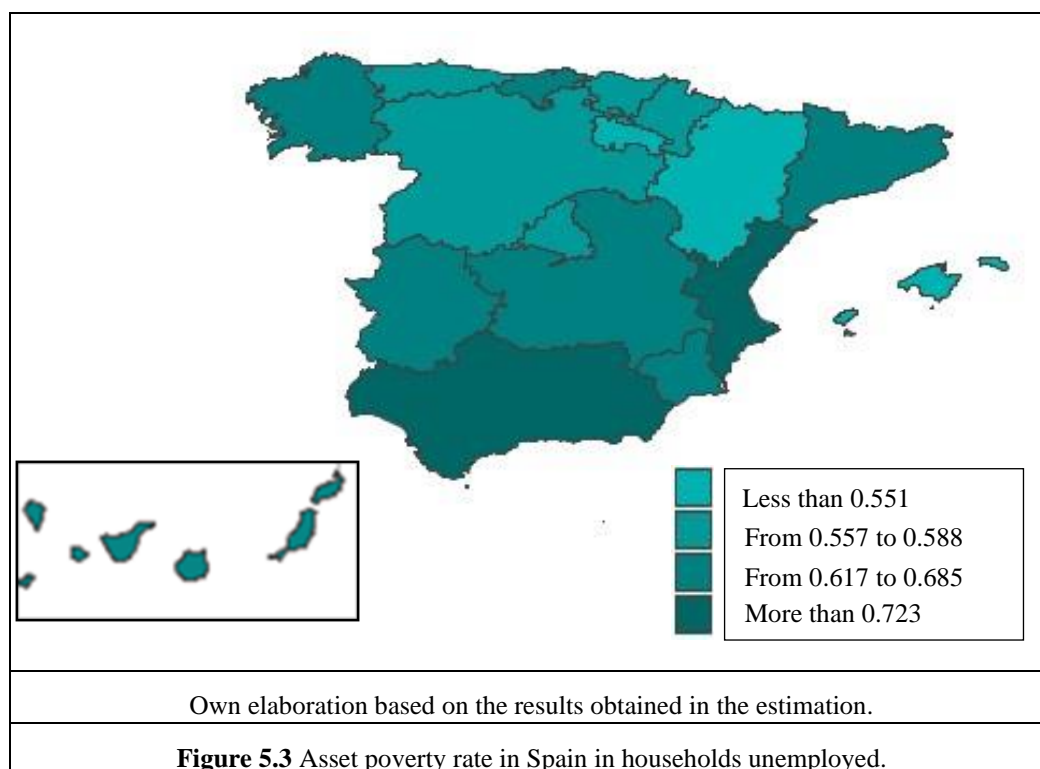
Table 5.2 Descriptive statistic on asset poverty rate according to the characteristics in the households.

	Weighted mean in asset poverty rate
Full sample	0.4158
Unemployed	0.6575
With college studies	0.1829
Low income	0.6320

Own elaboration based on the results obtained in the estimation.

The results suggest that, as was expected, the asset poverty rates turn out higher with the members of the household without employment and with lower incomes. On the contrary, the asset poverty rate is reduced if the household has members with college studies.

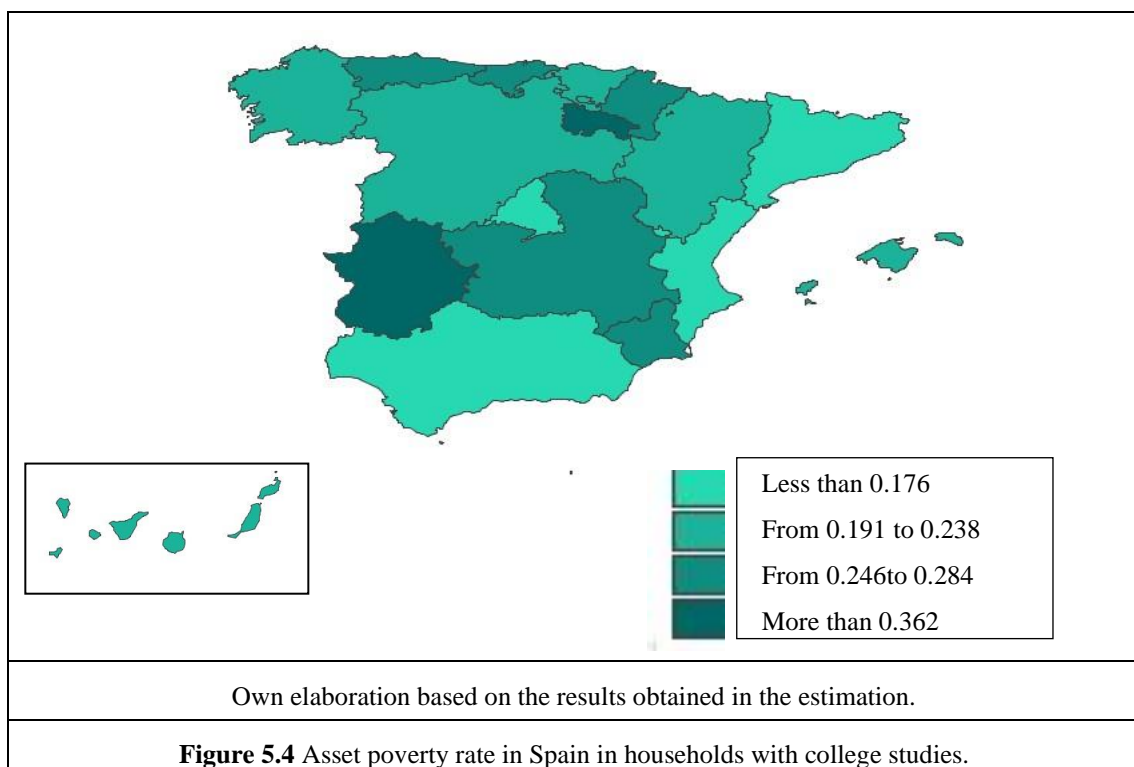
If we only consider the households whose members are unemployed, we can observe in figure 5.3 that the distribution is much more homogeneous than in the analysis of the complete sample. On the other hand, the poverty rates turn out much higher, underlying regions such as Valencia and Andalucía whose rates are above 0.723.



The main conclusion of this map is the worrying poverty rates. It is important to highlight that the minimum poverty rate is 0.496 and the maximum value grows up to 0.735 which are considerably alarming data. The fact that unemployment aggravates the asset poverty rates stresses the relation between income and liquid assets. This suggests that those households with instability in incomes will have too vulnerability in terms of liquid assets, which will make it difficult to reach resiliency against a crisis.

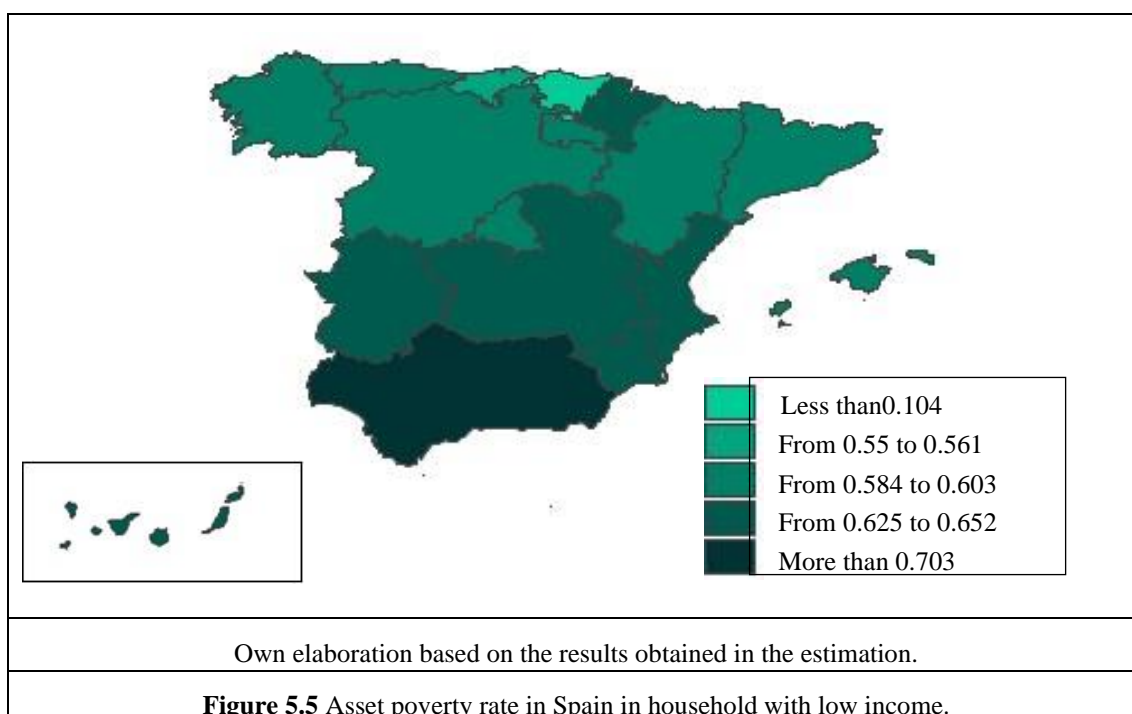
In the next figure, we can observe the distribution of the wealth poverty rate in Spain if we consider only the households whose members have college studies. While the rates turn out higher if we analyse the households without employed members, the contrary happens if we look at the households whose members have college studies. We found a negative correlation between having college studies and higher asset poverty rates. As we have seen before in the weighted mean, it is much more reduced with this kind of study.

As was expected, the poverty rates are much lower than in the previous case with the households with unemployed members, and that in the complete sample too. However, there are more things to observe, one of them is the change in Andalucía: while in the previous maps the poverty rates were higher than the mean of the regions, now it has one of the lower poverty rates.



On the contrary, we can observe rates above 0.246 in regions as Castilla la Mancha, Navarra, Asturias, and Murcia. However, La Rioja and Extremadura surpassed all these regions with a rate higher than 0.362.

In the next figure, we show the distribution of the poverty rates between the Spanish regions considering only those households which have lower incomes. The low income, as was expected, increase notably the asset poverty rate. In this subset, the region with the higher rate is Andalucía as it was in the case of households with unemployed members. In this line, we can observe the clear distinction between north and south. Specifically, the poverty rates are higher in the south.



6. Conclusions and policy implications

This research estimates the poverty rates for the Autonomous Communities in Spain for 2017 by developing a method based on an info-metric approach following the steps of Bernadini-Papalia & Fernández-Vázquez (2018), and Fernandez-Vazquez et al. (2020). This method, consisting of an alternative version of the GME estimator, has the advantage of producing estimations consistent with the observable aggregates.

The analysis of asset poverty has shown the vulnerability of the Spanish household. We have found that although the poverty rate is much higher in the southern regions

than in the north of Spain, all the regions have asset poverty rates above 0.366. This implies that a great part of the Spanish population would not have enough sources of revenue to cover their essential needs if their incomes stopped. This is highly worrying because the economic cycle implies periods of great recessions with alarming losses of jobs and our households are not prepared to overcome its consequences.

Considering only those households whose members are unemployed the asset poverty rates reach alarming figures in all the regions. Something similar occurs if we talk about the asset poverty rates estimated for households which has lower incomes. The distribution established a clear difference between south and north as in the previous analysis. On the other hand, the contrary happens if we look at the households whose members have college studies where the rates are much lower. However, it is important to highlight that, in this case, Andalucía which has had one of the higher asset poverty rates in the previous analysis now has one of the lower poverty rates. This could open a line of research to understand why education affects in a different way in some regions.

Overall, we can observe a heterogeneous distribution of the liquid assets which causes asset poverty rates too high. This means that wealth, specifically liquid assets play an important role in inequality. In order to reduce the high degree of inequality, it would be necessary to pay attention to this problem and focus our efforts to reduce wealth inequality.

The procedure used in this research needs more information comparatively than other methodologies. Although it means that we can obtain estimation more precise since we use more information, it can be seen as a higher requirement of information. The process described demands two sources of data since it needs a source as a household's survey with information about the variable of interest, but in addition, other surveys with more geographical detail are needed.

This paper established a path to follow in regional politics to diminish the mentioned differences. First, the noticeable difference between north and south in the analysis of asset poverty rates will be necessary to analyse. Specially, not only the causes but also the consequences of this alarming vulnerability of the southern households. Secondly, it will be important to solve the divergence between the regions in net

wealth distribution too. An analysis needs to be done in southern regions at the same time, where the position changes depending on if we are talking about the complete sample or only the households with college studies.

Many objectives related to face inequality have been set by the European Commission. Article 3 of the Treaty on European Union (TEU), which is related to the social convergence; The European Social Charter, and even the agenda 2030 includes the aim to reduce inequality in the sustainable development goals, to name a few. This research provides an analysis of the divergences in wealth on a regional scale. Related to this, policies and instruments such as the development banks in cooperation with some

European Institutions such as the European Investment Fund are working to diminish the higher heterogeneity between the European regions. For these goals, it is necessary to have an indicator that measures poverty in terms of wealth.

Finally, we provide an analysis of the divergences in wealth on a regional scale. However, for future investigations, these kinds of indicators may also help us to understand differences in development or economic structure. In this sense, one of the main indicators used in this kind of research such as AROPE do not have this measure included.

This research aimed to obtain estimated poverty rates for each autonomous community in Spain, however, as we have said before, is important to analyse the causes and consequences of the Spanish wealth distribution to provide a guide for political policies. Much can be done to understand the problem of inequality we are facing but trying to reduce wealth inequality is an important first step to make.

ANNEX

The following table presents the weighted mean of the asset poverty rate with a double classification: according to regions and the previous mentioned subsets.

Table A1 Asset poverty rate by regions and by subsets

Region	Full sample	Unemployed	College studies	Low Incomes
Galicia	0.4146	0.6370	0.2107	0.6032
Asturias	0.4352	0.5830	0.2609	0.5981
Cantabria	0.4319	0.6388	0.2660	0.5605
País Vasco	0.3662	0.5651	0.2017	0.6018
Navarra	0.4252	0.5567	0.2837	0.6249
La Rioja	0.4720	0.5407	0.3656	0.5970
Aragón	0.4205	0.5508	0.2340	0.5968
Madrid	0.3430	0.5879	0.1318	0.5976
Castilla y León	0.4245	0.5782	0.2333	0.5837
Castilla La Mancha	0.4752	0.6764	0.2461	0.6248
Extremadura	0.5441	0.6707	0.3625	0.6298
Catalunya	0.3455	0.6165	0.1356	0.5976
Valencia	0.4410	0.7228	0.1758	0.6336
Illes Balears	0.4111	0.5448	0.1913	0.5902
Andalucía	0.4673	0.7352	0.1432	0.7026
Región de Murcia	0.4811	0.6852	0.2831	0.6307
Ceuta	0.5076	0.5690	0.4267	0.5503
Melilla	0.4875	0.4958	0.4225	0.5505
Canarias	0.4800	0.6455	0.2381	0.6518

Own elaboration based on the results obtained in the estimation.

References

- Adiego, M., & Ayala, L. (2006) Factores determinantes de la desigualdad en la distribución de la renta en España, 1990-2008.
- Alvaredo, F., Piketty, T., Chancel, L., Saez, E., Zucman, G., Perrotini, I., & Muller, N. (2018). *Informe sobre la desigualdad global 2018*. Grano de Sal
- Aratani, Y., & Chau, M. M. (2010). Asset poverty and debt among families with children.
- Ayala, L., & Palacio, J. I. (2000). Hogares de baja renta en España: caracterización y determinantes. *Revista de Economía Aplicada*, 8(23), 35-70.
- Azpitarte, F. (2008). The household wealth distribution in Spain: The role of housing and financial wealth. In *XV Encuentro de Economía Pública: políticas públicas y migración* (p. 38).
- Azpitarte, F. (2011). Measurement and identification of asset-poor households: A cross-national comparison of Spain and the United Kingdom. *The Journal of Economic Inequality*, 9(1), 87-110.
- Brandolini, A., Magri, S., & Smeeding, T. M. (2010). Asset-based measurement of poverty. *Journal of Policy Analysis and Management*, 29(2), 267-284.
- Caner, A., & Wolff, E. N. (2004). Asset poverty in the United States, 1984–99: Evidence from the panel study of income dynamics. *Review of Income and Wealth*, 50(4), 493-518.
- Cartone, A., Díaz-Dapena, A., Langarita, R., & Rubiera-Morollón, F. (2021). Where the city lights shine? Measuring the effect of sprawl on electricity consumption in Spain. *Land Use Policy*, 105, 105425.
- Clifton, J., Díaz-Fuentes, D., & Revuelta, J. (2020). Falling Inequality in Latin America: The Role of Fiscal Policy. *Journal of Latin American Studies*, 52(2), 317-341.
- Dabla-Norris, M. E., Kochhar, M. K., Suphaphiphat, M. N., Ricka, M. F., & Tsounta, M. E. (2015). *Causes and consequences of income inequality: A global perspective*. International Monetary Fund.
- Davies, J. B., Lluberas, R., & Shorrocks, A. F. (2017). Estimating the level and distribution of global wealth, 2000–2014. *Review of Income and Wealth*, 63(4), 731-759.
- Davies, J. B., Sandström, S., Shorrocks, A., & Wolff, E. N. (2011). The level and distribution of global household wealth. *The Economic Journal*, 121(551), 223-254.
- Davies, J. B., & Shorrocks, A. F. (2000). The distribution of wealth. *Handbook of income distribution*, 1, 605-675.
- De Nardi, M. (2004). Wealth inequality and intergenerational links. *The Review of Economic Studies*, 71(3), 743-768.
- Elbers, C., Lanjouw, J. O., & Lanjouw, P. (2003). Micro-level estimation of poverty and inequality. *Econometrica*, 71(1), 355-364.

- Elinder, M., Erixson, O., & Waldenström, D. (2018). Inheritance and wealth inequality: Evidence from population registers. *Journal of Public Economics*, 165, 17-30.
- Fernandez-Vazquez, E., Dapena, A. D., Rubiera-Morollon, F., & Viñuela, A. (2020). Spatial Disaggregation of Social Indicators: An Info-Metrics Approach. *Social Indicators Research*, 152(2), 809-821.
- Fernández Vázquez, E., Dapena, A. D., E., Rubiera Morollón, F., & Viñuela, A. (2021). Mapping poverty at the local level in Europe: A consistent spatial disaggregation of the AROPE indicator for France, Spain, Portugal and the United Kingdom. *Regional Science Policy & Practice*, 13(1), 63-81.
- Gibson-Davis, C., Keister, L. A., & Gennetian, L. A. (2020). Net Worth Poverty in Child Households by Race and Ethnicity, 1989–2019. *Journal of Marriage and Family*.
- Golan, A. (2018). *Foundations of info-metrics. modeling, inference, and imperfect information*. Oxford:Oxford University Press.
- Greenwood, D. T., & Wolff, E. N. (1992). Changes in wealth in the United States, 1962–1983. *Journal of Population Economics*, 5(4), 261-288.
- Guadarrama, M., Molina, I., & Rao, J. N. K. (2016). A comparison of small area estimation methods for poverty mapping. *Statistics in Transition new series*, 1(17), 41-66.
- Hagenaars, A., K. de Vos & Zaidi M.A. (1994), *Poverty Statistics in the Late 1980s: Research Based on Micro-data*, Office for Official Publications of the European Communities. Luxembourg.
- Haveman, R., & Wolff, E. N. (2004). The concept and measurement of asset poverty: Levels, trends and composition for the US, 1983–2001. *The Journal of Economic Inequality*, 2(2), 145-169.
- Hoffmann, F., Lee, D. S., & Lemieux, T. (2020). Growing income inequality in the United States and other advanced economies. *Journal of Economic Perspectives*, 34(4), 52-78.
- Jenkins, S. (2017). The measurement of income inequality. In *Economic Inequality and Poverty* (pp. 3-38). Routledge.
- Melo, P. C., Copus, A., & Coombes, M. (2016). Modelling small area at-risk-of-poverty rates for the UK using the World Bank methodology and the EUSILC. *Applied Spatial Analysis and Policy*, 9(1), 97-117.
- McKernan, S. M., Ratcliffe, C., & Vinopal, K. (2009). Do assets help families cope with adverse events? *Washington, DC: Urban Institute*.
- Modrego, F., & Berdegué, J. A. (2015). A large-scale mapping of territorial development dynamics in Latin America. *World development*, 73, 11-31.

- Molina, I., & Rao, J. N. K. (2010). Small area estimation of poverty indicators. *Canadian Journal of Statistics*, 38(3), 369-385.
- Molina, I., Nandram, B., & Rao, J. N. K. (2014). Small area estimation of general parameters with application to poverty indicators: a hierarchical Bayes approach. *The Annals of Applied Statistics*, 8(2), 852-885.
- Morales, D., del Mar Rueda, M., & Esteban, D. (2018). Model-assisted estimation of small area poverty measures: an application within the valencia region in Spain. *Social Indicators Research*, 138(3), 873-900.
- Ohlsson, H., Roine, J., & Waldenström, D. (2014). *Inherited wealth over the path of development: Sweden, 1810–2010*.
- Ostry, M. J. D., Berg, M. A., & Tsangarides, M. C. G. (2014). *Redistribution, inequality, and growth*. International Monetary Fund.
- Pfeffermann, D. (2013). New important developments in small area estimation. *Statistical Science*, 28(1), 40-68.
- Piketty, T. (2014). Capital in the 21st Century.
- Piketty, T. (2015). About capital in the twenty-first century. *American Economic Review*, 105(5), 48-53.
- Piketty, T., & Zucman, G. (2014). Capital is back: Wealth-income ratios in rich countries 1700–2010. *The Quarterly Journal of Economics*, 129(3), 1255-1310.
- Pratesi, M. (Ed.). (2016). Analysis of poverty data by small area estimation.
- Rao, J. N. K. (2003). Some new developments in small area estimation.
- Rao, J. N., & Molina, I. (2015). *Small area estimation*. John Wiley & Sons.
- Saez, E., & Zucman, G. (2016). Wealth inequality in the United States since 1913: Evidence from capitalized income tax data. *The Quarterly Journal of Economics*, 131(2), 519-578.
- Sánchez-Cantalejo, C., Ocana-Riola, R., & Fernández-Ajuria, A. (2008). Deprivation index for small areas in Spain. *Social Indicators Research*, 89(2), 259-273.
- Sologon, D. M., Van Kerm, P., Li, J., & O'Donoghue, C. (2021). Accounting for differences in income inequality across countries: tax-benefit policy, labour market structure, returns and demographics. *The Journal of Economic Inequality*, 19(1), 1343
- Solt, F. (2009). Standardizing the world income inequality database. *Social Science Quarterly*, 90(2), 231-242.
- Suisse, C. (2020). The Global Wealth Report 2020. *Credit Suisse Research Institute*.
- Suisse, C. (2021). Credit Suisse global wealth report.

Tarozzi, A., & Deaton, A. (2009). Using census and survey data to estimate poverty and inequality for small areas. *The review of economics and statistics*, 91(4), 773-792.

Tselios, V. (2009). Growth and convergence in income per capita and income inequality in the regions of the EU. *Spatial Economic Analysis*, 4(3), 343-370.

Tzavidis, N., Zhang, L. C., Luna Hernandez, A., Schmid, T., & Rojas-Perilla, N. (2018). From start to finish: a framework for the production of small area official statistics. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 181(4), 927-979

Weon, S. (2020). The condition of asset poverty of the elderly In South Korea. *Asian Social Work and Policy Review*, 14(3), 158-171.

Yang, Y., Jun-Hong, C., & Jin, M. (2019). Who is the Asset-Poor in China: A Comprehensive Description and Policy Implications. *Journal of Social Policy*, 48(4), 765-787.

INEbase / Nivel y condiciones de vida (IPC) /Condiciones de vida /Encuesta de condiciones de vida/Metodología.(2020).INE

https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176807&menu=metodologia&idp=1254735976608

Banco de España - Estadísticas - Estadísticas por temas - Encuestas a hogares e individuos - Encuesta Financiera de las Familias. (2020). Banco de España.

https://www.bde.es/bde/es/areas/estadis/estadisticas-por/encuestashogar/relacionados/Encuesta_Financi/

Banco de España - Estadísticas - Estadísticas por temas - Encuestas a hogares e individuos - Encuesta Financiera de las Familias. (2020). Banco de España.

<https://www.ine.es/dyngs/IOE/es/operacion.htm?numinv=37143>