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Intergenerational Income Mobility in Spain

Territorial breakdown

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Abstract

This paper has the objective to analyse the intergenerational mobility of income in Spain and its different regions. For this, the Atlas of Opportunities 2020 database has been used, which links the tax returns of two generations, and provides information on intergenerational mobility in Spain based on income data from the State Tax Administration Agency. The real incomes compared are those of the years 1998 for parents and those of 2016 for the sons and daughters.

The results confirm that Spain is a society with upward intergenerational income mobility for individuals who file the personal income tax. The expected percentile of children born to parents with incomes below the median is around 47. Upward mobility is greater for sons than for daughters in the lowest incomes, but the gap decreases as income increases. There are substantial geographic differences in income mobility between generations. The Spanish northwest shows a greater and more uniform mobility than the southern provinces of Spain.

The Great Gatsby Curve shows the position of the regions considering the intergenerational mobility of income and the inequality of each region. Canarias is the one that shows the most disadvantageous situation.

Keywords: intergenerational income mobility, Great Gatsby Curve, equal opportunities.

Number of words: 10759

Resumen

Este trabajo tiene como objetivo analizar la movilidad intergeneracional de la renta en España y sus diferentes regiones. Para ello se ha utilizado la base de datos Atlas de Oportunidades 2020, que enlaza las declaraciones de impuestos de dos generaciones, y proporciona información de la movilidad intergeneracional en España en base a datos de ingresos de la Agencia Estatal de Administración Tributaria. Los ingresos reales comparados son los de los años 1998 para los padres y los de 2016 para los hijos e hijas.

Los resultados confirman que España es una sociedad con movilidad intergeneracional de la renta ascendente para los individuos que presenta declaración de la renta. El percentil esperado de hijos nacidos de padres con ingresos por debajo de la mediana es alrededor del 47. La movilidad ascendente es mayor para los hijos que para las hijas en los ingresos más bajos, pero la brecha disminuye a medida que aumenta la renta. Existen diferencias geográficas sustanciales en la movilidad de ingresos entre generaciones. El noroeste español muestra una movilidad mayor y más uniforme que las provincias del sur de España.

Curva del Gran Gatsby muestra la posición de las regiones considerando la movilidad intergeneracional de la renta y la desigualdad de cada región. Canarias es la que muestra la situación más desventajosa

Palabras clave: movilidad intergeneracional de la renta, Curva del Gran Gatsby, igualdad de oportunidades.

Número de palabras: 10759

Resumo

Este traballo ten como obxectivo analizar a mobilidade interxeracional de ingresos en España e as súas diferentes rexións. Para iso, utilizouse a base de datos Atlas de Oportunidades 2020, que vincula as declaracións de dúas xeracións e ofrece información sobre a mobilidade interxeracional en España a partir dos datos de ingresos da Axencia Estatal de Administración Tributaria. Os ingresos reais comparados son os dos anos 1998 para os pais e os de 2016 para os fillos e fillas.

Os resultados confirman que España é unha sociedade con mobilidade interxeracional de ingresos á alza para os mozos que presentan declaracións da renda. O percentil esperado de nenos nados de pais con ingresos inferiores á mediana rolda os 47. A mobilidade ascendente é maior para os fillos que para as fillas con ingresos máis baixos, pero a brecha diminúe a medida que aumenta a renda. Hai diferenzas xeográficas substanciais na mobilidade de ingresos entre xeracións. O noroeste español presenta unha mobilidade maior e máis uniforme que as provincias do sur de España.

A Curva do Gran Gatsby mostra a posición das rexións considerando a mobilidade interxeracional de ingresos e a desigualdade de cada rexión. Canarias é a que presenta a situación máis desfavorable.

Palabras clave: mobilidade interxeracional de ingresos Curva do Gran Gatsby, igualdade de oportunidades.

Número de palabras: 10759

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Introduction

In recent years, economists have become interested in knowing and explaining the persistence of family wealth through generations, this is known as intergenerational social mobility. Economic mobility across generations, also known as intergenerational mobility of income (IGM) is a key socio-economic indicator. Despite its centrality in academic and political debate, the body of empirical evidence on intergenerational mobility that economists have compiled over the years is not very widespread. The reason is the difficulty to access to data that link the income of parents and children since these data are separated by several years. Very few publicly available datasets around the world have information to link parents and children and, at the same time, build reliable measures of income for both cohorts (Acciari et al., 2019).

Spain is no exception in this case. Over the last decade, the empirical literature on mobility across generations has been increased due to the fact that economists and sociologists can access large administrative data in a different countries for example United States, Canada, Australia, Denmark, Sweden, Italy... thanks to these huge datasets the researchers have been possible to calculate estimates of mobility indexes and have opened the possibility to analyse upward mobility patterns, within countries, at a very disaggregated geographical level. From this, it has been possible to know that socio-economic factors such as employment, education level, family size or religion are correlated with upward mobility between regions (Acciari et al., 2019).

The interest of the study of intergenerational mobility is that income inequality is transmitted between generations, affecting equal opportunities between individuals. "The degree of intergenerational mobility is an important indicator of the health and success of a society" (Berhrman & Taubman, 1990). Equality of opportunity is a desirable characteristic for a society. By equal opportunities we mean that individuals from families of different income levels maintain the same options regarding their income and training (Sánchez, 2003).

The main objective of this paper is to analyse the intergenerational income mobility in Spain, for this we will use the database of the Atlas of Opportunities 2020. This set of data allows us to analyse national and regional mobility measures for the Spanish

population born between 1984 and 1990. The Opportunity Atlas is a useful database due to the degree of detail it offers. It provides data by gender, by autonomous community, city and neighbourhood. But it has certain limitations. In the dataset, only young people who presented personal income tax are present, therefore the part of the population with the lowest income is not considered. Moreover, a part of the Spanish population is left out since the communities of the País Vasco and Navarra are not part of the dataset since they have their own Treasury. Furthermore, the age of the children in 2016 is between 26 and 32 years old, therefore young people are at the beginning of their working careers. Comparing young professionals who have just started their working careers with less qualified workers of the same age we will find very few differences in income between them (Polavieja, 2020). Therefore, we are going to measure the intergenerational mobility of income of the people who present the personal income tax return and they are between 26 and 32 years old.

We calculate national and regional measures of intergenerational income mobility based on income ranges. These measures are based on the denominated rank-rank slope, which is calculated by a regression of the position (expressed in percentile ranks) of each member of the infant generation in the position of the parents in their income distribution. (Heidrich, 2017).

The measures of intergenerational mobility of income that we calculate in this paper are based on the study carried out by Chetty et al. (2014). Also, the dataset we use is based on another of the Chetty project, "The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility" (Chetty et al., 2018). To calculate the indices and organize the data, we have used R programming software.

We calculate relative mobility, which is obtained by increasing the estimated rank-rank slope by a factor of 100. "Relative mobility shows the strength of the association between the income range of parents and children" (Heidrich, 2017). The income data provided by the Opportunity Atlas 2020 is expressed over 100 percentiles, therefore relative mobility measures the difference in the median income range between children with parents at the top and children with parents at the bottom of parents' income distribution. Taking this into account, relative mobility provides us with information about the average income gap between children born to high-income families and those born to low-income families (Heidrich, 2017). Another way to measure the relative mobility is intergenerational income elasticity (IGE) that is “the elasticity of the expectation of the children’s income or earnings with respect to their fathers’ earnings or their parental income” (Mitnik & Grusky, 2020). Therefore, the closer the IGE is to zero, the more mobile the sample will be.

We also calculate absolute mobility measures that "informs us about the average income rank a child who grew up in a certain region attains as an adult, given that her parents are located at a specific point in the parent income distribution" (Heidrich, 2017). Absolute mobility can be calculated for any percentile, in this case we will use the 25th percentile since in this way we will be able to know where the children who come from households with lower income are located.

This paper is based on the work carried out by Acciari et al (2019) and Erisen & Munk (2020). These authors analyse the regional intergenerational mobility of income in Italy and Denmark respectively based on the estimators of Chetty et al. (2014).

The income of young people cannot depend only on their personal characteristics and the income of their parents, but should also be related to the environment in which they develop. To verify this, we analyze the relationship that exists between intergenerational mobility of income and inequality. We represent the Great Gatsby curve for the different Spanish autonomous communities. Great Gatsby curve shows a negative relation between income inequality and intergenerational mobility (Narayan et al., 2018).

The rest of the paper is organized as follows: Section 1 reviews the basics and literature about social mobility. Section 2 defines the measures of intergenerational mobility used in the analysis. Section 3 describes the dataset, explains the sample selection procedure, and discusses the limitation of the Atlas. Section 4 presents the results of the calculation and interprets the indicators on IGM at the national level. Section 5 documents the patterns of geographical variation in upward mobility across autonomous communities and provinces in Spain and it explains the Great Gatsby Curve. Section 7 concludes.

1 Theoretical framework and literature

1.1 Theory and concepts

"Social mobility refers to the changes experienced by members of a society in their position in the socioeconomic distribution" (Vélez et al., 2015). To achieve a mobile society, it is necessary to guarantee equality in the conditions of competition. Therefore, it is necessary to provide individuals with the basic tools and conditions such as education and health and guarantee equal conditions of competition in the labour market too. If the above is fulfilled, the evolution in the lives of individuals will depend to a greater extent on their own talent and effort. There is a lower probability the evolution of life is predetermined by your personal or physical characteristics hence, the evolution of the life of individuals depends less on personal, physical, or home characteristics and more on the talent and effort of the people, it will be an indicator of the right performance of the redistributive policies implemented by the State (Vélez et al., 2015).

There are multiple reasons to promote social mobility. Serrano and Torche (2010) consider that the most relevant can be classified by three criteria: regulations, efficiency, and social integration. With regulations, the authors refer to the rules that ensure that individuals get the benefits they deserve for their effort. Efficiency is understood as not wasting resources that could contribute to development and social integration, it is based on the fact that the social system would separate to a minor degree if individuals could exchange positions on the socioeconomic scale.

There are different levels and types of social mobility. Intergenerational mobility focuses on the change that an individual experiences in relation to the home of origin. On the other hand, intragenerational mobility is the changes throughout the life cycle. In addition, there is horizontal mobility, which analyzes the “changes in the position of an individual within the same socioeconomic stratum” (Vélez et al., 2015) and vertical mobility measures the upward or downward change of an individual.

Social mobility can be measured in absolute and relative terms. Absolute mobility refers to the transformations of the class structure, because of exogenous factors such

as technological advances, economic and demographic changes, among others while relative mobility is the change in an individual's position on the socioeconomic scale with respect to her home of origin (Vélez et al., 2015). Relative mobility measures the degree of association between parents and children.

Social mobility can be measured in different ways The principal are: income, education, wealth and subjective social mobility.

Income mobility "is about how much income each recipient receives at two or more points in time" (Fields, 2008). The author considers the income as all its possible sources. Other authors such as Mazumder (2005) use only labour income since it cannot be transferred from parents to children as an inheritance or an asset. According to this author, the use of labour income exposes in a better way the opportunities that an individual has according to its effort and abilities. This author also considers that the use of total income provides a broader measure due to it consider other income apart from labour. On the other hand, to get the data from only labour income presents certain complications and challenges.

Education has a fundamental role in socioeconomic mobility due to the formation of human capital can increase the chances of rise in intergenerational mobility, but there are access restrictions for the poorest households, therefore education can also generate intergenerational inequality permanent in general, the analysis of educational mobility focuses on the association between the educational level of parents and children. (Vélez et al., 2015). Free access to education allows equalizing or balancing opportunities because access to education is independent of the individual's social origin (De Hoyos, et al., 2010).

Wealth is a means to increase consumption in the long term and safeguards households from unexpected situations. In addition, family wealth can influence the level of education that child can achieve. Therefore, parents can interfere in the well-being of their children by investing in their education, or through the direct transfer of resources in the form of financial support and inheritance. The analysis of the intergenerational influence of wealth makes it possible to assess its relevance in the process of social stratification. (Torche & Spilerman 2010)

Subjective social mobility shows the perception that a person has of her current situation with respect to her parents' home. Perceived social mobility matters, since it is psychological and not economic factors that influence people's welfare state (Huerta-Wong, 2010). The perception of positive intergenerational mobility can constitute a mechanism for social integration.

There are several dimensions of social mobility, therefore the policies that will be applied will be different depending on the type of mobility. To increase intergenerational

educational mobility, the policies that will be affected will be those related to education, it is a more direct action, therefore it is expected to achieve results with more certainty. On the other hand, the policies applied for the. intergenerational mobility of income will be more varied and should be he resorted to a mixture of economic and social policies. Taking this into account, intergenerational income and educational mobility is related, since educational mobility has an important role in positively expected permanent income mobility, it is expected that the higher the educational level, the higher the expected income of the individual (Sánchez, 2003).

The study of intergenerational mobility complements studies of income inequality and intragenerational mobility. While the study of income inequality of individuals can tell us about how unequal income is distributed in a state or region. The study of intergenerational mobility tells us who and how much economic level has changed (Sánchez, 2003).

1.2 Literature review

The different studies in the literature on intergenerational income mobility have the aim, usually, to determine the degree of mobility in a certain country or region. However, there are studies that compare income mobility between countries. Empirical studies on intergenerational mobility have been using intergenerational elasticity, or statistical correlation, between income, education or occupation of parents and children, as an indicator of mobility. A high elasticity implies that people born in disadvantaged families are less likely to occupy high socioeconomic positions than those born in privileged families, while a low elasticity implies a greater degree of mobility. The literature on intergenerational income mobility has been mainly concentrated in the United States,

Canada and some European countries such as the United Kingdom or Germany. There are fewer empirical studies of intergenerational mobility in southern European countries, probably due to the lack of sufficiently long panels (Cervini-Plá & Ramos, 2013) However, nowadays it is easier to access this type of data, therefore the studies in these countries have increased but based on the methodology of authors from countries such as the USA.

The principal researcher of mobility in the USA is Raj Chetty, a professor of economics at Harvard University, in recent years he has published several papers analysing Intergenerational Mobility and Inequality in the United States. One of his main works “Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States” (Chetty et al., 2014) where he analyzes mobility analyzes the income of children and their parents to discover characteristics of intergenerational

mobility in the United States. First, the conditional expectation of children's income given parental income is linear in percentile ranges. Second, intergenerational mobility varies substantially between areas within the US Many other authors took this test as a reference to produce one from their own country, as is the case for Accaiari et al (2019) that does an analysis of the IGM for Italy. The databases we use for this paper are based on one of his most relevant projects "The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility" (Chetty et al., 2018).

Acciari et al. (2019) create a dataset that link tax returns across two generations to provide one of the first estimate of intergenerational mobility in Italy based on administrative income data. The authors find differences in intergenerational mobility from a geographical point of view, the northern part of the country shows higher levels of mobility than the south. This variation is correlated with the quality of school life and labour market conditions. Eriksen & Munk, (2020) estimate intergenerational income rank mobility within Denmark. They find that there is greater intergenerational income mobility in middle-income rural municipalities and less intergenerational income mobility within poor urban and rural municipalities. In addition, they also study the correlation that exists between intergenerational mobility with inhabitants who are married and employed of working age, this correlation is positive. On the other hand, Danish international mobility has a negative correlation with single parents, teenage children, non-Western immigrants, and inhabitants outside the labour force.

Both documents are based on Chetty et al. (2014) to estimate intergenerational mobility within countries and uses pre-tax income data.

Narayan et al (2018) compares economic mobility across generation around the world. It analyzes the different pathways to intergenerational mobility in education and income of different countries, equal opportunities for children to achieve fair progress and the promotion of intergenerational mobility through the role of factor markets and policies.

Intergenerational mobility in Spain in the early 2000s has been studied mainly by sociologists as Sánchez-Hugalde (2004) analyzes the intergenerational transmission of income and mobility in education using the Family Budget Survey for the years 1980 and 1990. In his work, he finds that income mobility increases, going from an elasticity of 0.64 in 1980 to an elasticity of 0.44 in 1990, while the interdependence between the education of parents and children is low. However, this work only estimates the elasticity for parents and children who live together, therefore there is a problem of bias.

Nowadays economists also research on intergenerational mobility, María Cervini-Plá (2015) estimates the earnings and income elasticity for Spain. She finds that the elasticity for sons is around 0.42, she compares this result with other countries such as

France, United Kingdom, Nordic countries. “Compared to other developed countries, Spain is relatively immobile, but it is more mobile than Italy, the only other southern European country for which we have evidence.” (Cervini-Plá, 2015.). According to the author, there are several reasons that explain this persistence in income between parents and children. First, Spanish children leave the parental home at a late age, which increases the influence of parents over their children. On the other hand, there is a strong persistence in occupations and many jobs are filled through social referral. The last factor is related to the educational system and its expansion in recent years that encourages intergenerational mobility, may be the reason why there is greater mobility in Spain than Italy.

Bruna et al (2021) analyzes intergenerational mobility in Spain. They conclude that the place where you grow up is also related to the opportunities you will have in the future using data from municipalities, it concludes that “The higher the average income of the municipality in which boys and girls are raised, the more income opportunities they have as adults, even when they are young” (Bruna et al, 2021).

2 Measures of intergenerational mobility

In this section, we explain the measures of intergenerational mobility we use in the paper. No single measure is perfect. Each one has advantages and deficiencies over the others, and each one tries to answer a specific question.

2.1 Relative mobility

Relative mobility shows the strength of the association between child and parent income rank. Furthermore, the income from the Atlas of Opportunities is expressed over 100 percentiles, relative mobility measures the difference in mean income rank between children with (Heidrich, 2017).

Parents in the top, an children in the bottom of the parent income distribution (Heidrich, 2017).

A measure of relative mobility is the correlation between child and parent income ranks, in other words an index of positional mobility (Acciari et al., 2019).

$$R_i = \alpha + \beta R_i^P + \varepsilon_i \qquad \textit{Equation 1}$$

Where R_i is the child i's percentile rank in the income distribution of children (from 0 to 99) and R_i^P is the percentile rank of i's parents in the income distribution of parents. The constant α measures the expected rank of child born from parents at the bottom of the income distribution (R_i^P = 0), and the rank-rank slope (RRS) or rank-rank persistence coefficient) and β measures the strength of the correlation between a child's position and her parents' position (Acciari et al., 2019).

This regression with national data has only one free parameter being, therefore, it must be true, by taking averages of both sides, that $50 \cdot (1 - \beta) = \alpha$. If the values of β are close to zero, this means a very mobile society where the expected rank of children is always around the median independently of parental rank. However, if the values are close to one denote a society with high persistence in relative positions across

generation, meaning high relative mobility corresponds to a low value of β (Acciari et al., 2019).

The difference in expected rank between two children with parents who are Δ percentiles apart in the national income distribution can be calculated by $\Delta \cdot \beta$. Therefore, we can know by simple iteration how many generations it would take, on average, for descendants of families originally Δ percentiles apart to belong to the same percentile of the income distribution that is the value of N that solves $\beta^N \Delta = 1$ (Acciari et al., 2019).

It is interest to know who the mobility differs from the top from the rest of the distribution. To know if by being born in the upper part of the society there is more opportunities to maintain the social status Acciari et al (2019) created the top mobility ratio (TMR). First it is necessary to calculate the RRS by running the rank-rank regression on the top decile of the parental distribution (β^{91-100}), then it run it on the bottom 90 pct and calculate β^{1-90}.

$$TMR \equiv \frac{\beta^{91-100}}{\beta^{1-90}} \qquad \textit{Equation 2}$$

The higher the ratio, the greater the permanence of the ranks among the generations with higher incomes compared to the rest of the distribution (Acciari et al., 2019).

The intergenerational income elasticity (IGE) is the most common index used to measure the relative mobility. The IGE is "the slope parameter of a regression of log lifetime income of generation t on log lifetime income of generation $t-1$. The closer the IGE is to zero, the more mobile the sample under consideration is said to be" (Heidrich, 2017). Usually, IGE is estimated using the following benchmark equation:

$$y_f^c = \alpha + \beta y_f^P + \varepsilon_f^c \qquad \textit{Equation 3}$$

Where β is the elasticity between parent and child income, y_f^P and y_f^c are the log of parent and child lifetime earning in family f, respectively, and ε_f^c is an independent and identically distributed error term representing all other influences on child income nor correlated with parental income.

The higher the value of β, the more it tells us where we can expect the child's place to be by knowing a parent's place in the income distribution, the lower the value, the less stickiness, so that a parent's relative income is a weak predictor of where their child will be on the next-generation income scale (Corak, 2013).

2.2 Absolute mobility

"Absolute mobility is defined as the mean adult rank of children with parents located at a certain percentile p in the parent distribution." (Heidrich, 2017).

Following Chetty et al. (2014), the average absolute mobility for children from families with below-median parent income in the national distribution is called absolute upward mobility (AUM):

$$R^{50} = E\left[R_i | R_i^P \leq 50\right] \qquad \textit{Equation 4}$$

Due to, "the rank-rank relationship is linear, the average rank of children with below-median parental income equals the average rank of children with parents at the 25th percentile of the national income distribution" (Chetty et al., 2014), that can be calculates from (Equation 1) as $\alpha + 25 \cdot \beta = 50 - 25 \cdot \beta$.

2.3 Indicators for within-country comparisons across regions

Apart from analysing intergenerational mobility at the national level, we are also interested in analysing the geographical heterogeneity in intergenerational mobility within Spain. R_{ir} denote the rank in the national income distribution of children for a child i who grew up in the region r. R_i^P is the rank of the parents in the national distribution of parental income.

$$R_{ir} = \alpha_r + \beta_r \cdot R_i^P + \varepsilon_{ir} \qquad \textit{Equation 5}$$

We continue to rank both children and parents based on their positions in the national income distribution (rather than the distribution within their region), we obtain estimates of the region-specific indicators of relative (β_r) mobility.

It is important to clarify that, in the linear national rank-rank relation (Equation 1) there is only one free parameter, and a one-to-one mapping between absolute upward mobility (AUM) and rank-rank slope (RR), this does not happen for the regional regressions, since the average national rank of residents of a specific region needs not be the median. (Acciari et al., 2019).

To compare the autonomous communities and provinces of Spain in terms of absolute mobility we choose the percentile 25th to learn about the situation for children

from low-income families.Absolute mobility at p = 25 is calculated according to the following formula:

$$\bar{R}_{25,r} = \alpha_r + \beta_r \cdot 25 \qquad \textit{Equation 6}$$

Where $\bar{R}_{25,r}$ is the average child rank at percentile 25 in region r and β_r is the RRS parameter from region r .

3 Data and Methodology

In this section, we describe our dataset and outline the sample selection procedure. Our data source is the electronic database named Atlas of Opportunities 2020 created by Felipe Gonzalez Foundation with the collaboration of COTEC Foundation.

3.1 Description and methodology of the dataset

The Atlas of Opportunities is an individualized and anonymized database that relates the income of parents and children. It also includes information of location, gender, and different incomes (individual and household). The objective of the Atlas of Opportunities 2020 project is to collect the data and display it. The database compares the gross income (before taxes) children in 2016 with the income of their parents' household in 1998 these data are provided by Spanish State Tax Administration Agency.

The Atlas of Opportunities 2020 was one of the 14 projects selected as the winner of the COTEC Open Innovation Program, to which 734 applications were submitted.
The data have been obtained through an individualized database that is not public. To generate this database, three steps have been followed:

Firstly, it is identified the children in the 2003 declarations (Model 100) born between 1980 and 1990, which are 2.7 million. Children born between 1984 and 1990 (they were between 13 and 19 years old in 2003) are selected as they are more likely to still live with their parents. There are 1.6 million children out of the 3 million registered.

Secondly, the income statements of the parents for the year 1998 are searched. For each household, the location and the zip code are considered, in addition the gross income the parents there is only access to household income, not individually.

Thirdly, the gross income of the children in 2016(and their household) is sought. Different from the parents, in this case children's data it has access to the net and gross income. of each individual separately and by household. Gross income is used for the analysis, with results at household level.

The methodology that was used to build the dataset was divided into different parts:

First, a cleaning of the household data for 1998 and 2016 is carried out, removing households without information, and adding auxiliary data. Households from 1998 (2.011.825) include identifiers, income data, geographic data (postal code, municipal code, finance delegation, among others) and income data (individual or joint). Household in 2016 (2.712.065) include household identifiers, individual and household income, marital status, sex, and geographic information and information on the income statement as the model used.

The data for 1998 and 2016 (parents and children) are joined from the household identifier. And the data of the children born between 1984 and 1990 are selected. At this time, the centiles of income are calculated following the methodology of Chetty et al. (2018). For each child they calculate their income percentile in 2016, relative to the rest of the children of that age. The same is done with parents (Llaneras et al., 2020).

The rents are expressed in centiles. Centiles are used to compare incomes regardless of age, since we have data on children born between 1984-1990 who in 2016 are between 26 and 32 years old. In Chetty et al. (2014) show that measuring income using centiles produces more robust estimates, because it reduces the influence of anomalous data and mitigates lifecycle bias.

Tables are created where the average centile of the child appears from both the mean and the median for each percentile of the parents' income, the sample size is also included. These data are available by sex (total, male, and female) and income (individual and household). The data are available at four different levels: national, autonomous community, province, and large cities (any municipality in the database that has more than 5000 children born between 1984 and 1990).

A dataset is created with estimates by municipality and postal code following the methodology of Chetty et al (2018). Although in this work we will only use data at the national level, autonomous communities, and provinces.

Data on the distribution of income by quintiles are also available.

In addition, there is a centile to euro converter, to be able to convert the data from income centiles to euros. Three tables are generated for the percentiles of parents, for the percentiles of children (divided by age) and at the regional level.

3.2 Limitations of the dataset

The Opportunity Atlas only includes the communities covered by the general scheme, which is why the communities of Pais Vasco and Navarra are not included since they have their own Treasury There are also no data for Ceuta and Melilla due to data sample limitations.

Moreover, removals are not considered since the address and income of household in 1998 is taken, there is no way to know if they have moved or are staying there.

Older children are missing; therefore, it cannot be made comparisons between siblings. They have a coverage of 60% for children of 13 or 14 years (in 2003) and 65% for those of 15 to 18. But then it worsens and is only 32% for children of 23 years since they surely leave home. For this reason, the analysis is limited to those born between 1984 and 1990 (who were between 13 and 19 in 2003). The percentage of girls should be 48.7% and it is 48.4%, but above all there is a bias due to the age and income: there is a lack of young girls and older boys especially in the poorest families (Llaneras et al., 2020).

Young people whose parents did not file income tax returns in 1998 are not found. It is a serious limitation because it excludes from the analysis precisely the decentralized of the poorest household (Polavieja, 2020). They have 2.7 millon children, but according to the INE in 2003 there were 5.2 million people of those ages. In 1998, people who obtained an income of more than 550,000 pesetas per year (LIRPF 40/1998, December 9) it must present the tax return.

In addition, the children's income tax returns are used to calculate income in 2016, therefore the Atlas of Opportunities would leave out those young people who do not accumulate enough income to make the income tax returns. In 2016 they were required to file income tax return for full income from work, generally those who obtained an income of more than 22000 euros (sole payer) or 12,000 (more than one payer) (O. HFP/255/2017, March 21). Therefore, many young people between 26 and 32 years old whose parents filed the personal income tax return in 1998 would be exempt from filing in 2016. Young Spanish people are seriously affected by unemployed and job insecurity. The average youth unemployment rate in 2016 was approximately 40% and the temporary rate was around 60% (Felgueroso, 2018).

Furthermore, if we compare the data from Llanaras et al. (2020) with other sources of income we find discrepancies. The average income of young people in the Atlas is about 19,000 euros per year, while according to the 2016 Salary Structure Survey, the average salary of workers between 25 and 34 years old is around 1,700, on the other hand, the Survey of life conditions shows that the average net annual income per person for young people of that age would be around 11,000 euros. Therefore, we can conclude that the young people that appear in the Atlas are richer on average than the Spanish youth really are, since the young people with lower incomes have been left out (Polavieja, 2020). When we interpret the results, we cannot forget that a part of the

population is not considered, specifically the one with the lowest income, to interpret the results correctly.

As we know the age of the children in 2016 is between 26 and 32 years old, therefore young people are at the beginning of their working careers, this is a problem for the Atlas since the age-income profiles of the most qualified workers are positive (older leads to higher income), while the profiles of the less skilled workers are fundamentally flat and much more sensitive to the economic cycle. Comparing young professionals who have just started their working careers with less qualified workers of the same age we will find very few differences in income between them (Polavieja, 2020). These biases in the Atlas data inevitably lead to an overestimation of the degree of income mobility that exists in Spain, so if we do not make an adequate interpretation of the results, we could end up committing errors of bulk in our conclusions conclusions.

3.3 Dataset management

To offer a quality quantitative study, we have used the software R which is a free software environment for statistical computing and graphics.

The Opportunity Atlas is made up of a large data set that is difficult to handle if you do not have some basic programming concepts. We opted for the R software since it is a language quite suitable for statistics since it allows us to manipulate the data quickly and precisely.

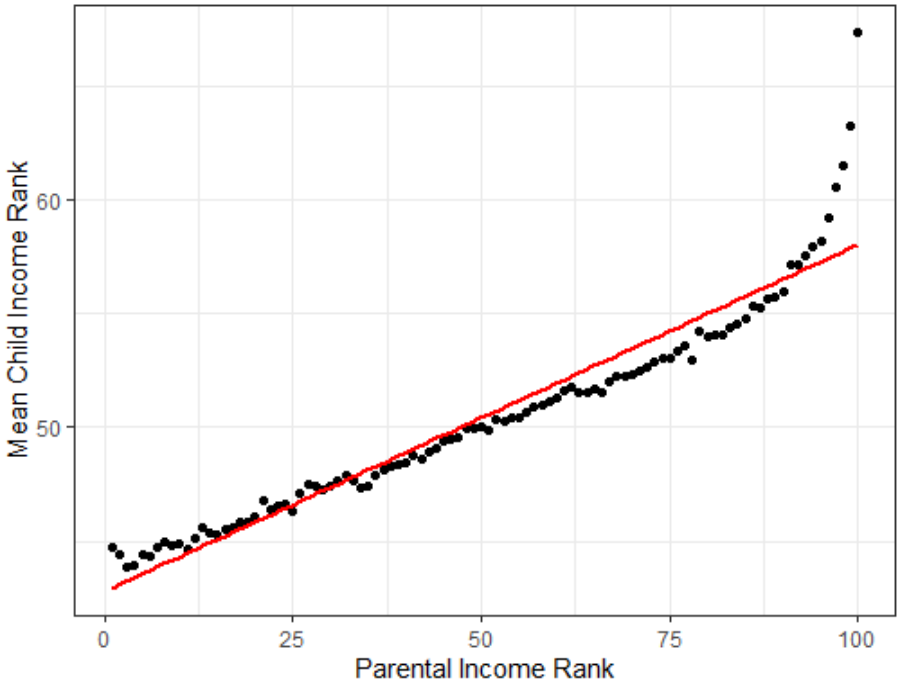
Using R, we have divided the dataset to obtain the information in which we were interested and thus proceed to the analysis of the data. In addition, R has advanced graphics capabilities, so it allows us to make graphics that we can present the results in a showy way. On the other hand, many times it is necessary to perform the same process repeatedly but, it can easily automate, thanks to the creation of scripts that automate processes, for example, reading data or doing operations with data, and always doing it automatically. Furthermore, it can read practically any type of data. and the Atlas files are in .csv format.

4 Overview of Intergenerational mobility in Spain

4.1 Intergenerational mobility of income at national level

We begin the empirical analysis at the national level, studying the relationship between child and parental income. Remember that the database uses gross income, parental and child income is the sum of total pre-tax income.

Figure 1 Mean Child Rank vs. Parental Rank.



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020). Black dots: data. Red line: linear fit. The constant of the red line is 42.8 and the slope 0,1521

The Figure 1 plots the child mean rank conditional on parental income rank. Applying the OLS regression (Equation 1), it estimates that one percentage point (ppt) increase in parental rank is associated with a 0.1521 percentage point in the child's mean rank. This estimate of the ran-rank slope (RRS) an index of relative mobility. RSS means that, if we

have two families one in the top decile of the income distribution and one in the first decile, the next generation of children from the last decile is expected to be still, approximately, two deciles above the child from the child of the first decile. For these two families to belong to the same percentile, it will take at least two generations.

As can be appreciated in the Figure 1 in the last decile the dots are adopting a more vertical shape, the slope if we only consider those percentiles (90-100) are 0.99. Therefore, two children from the top decile but who belong to families that are at the extremes a generation later will remain separated.

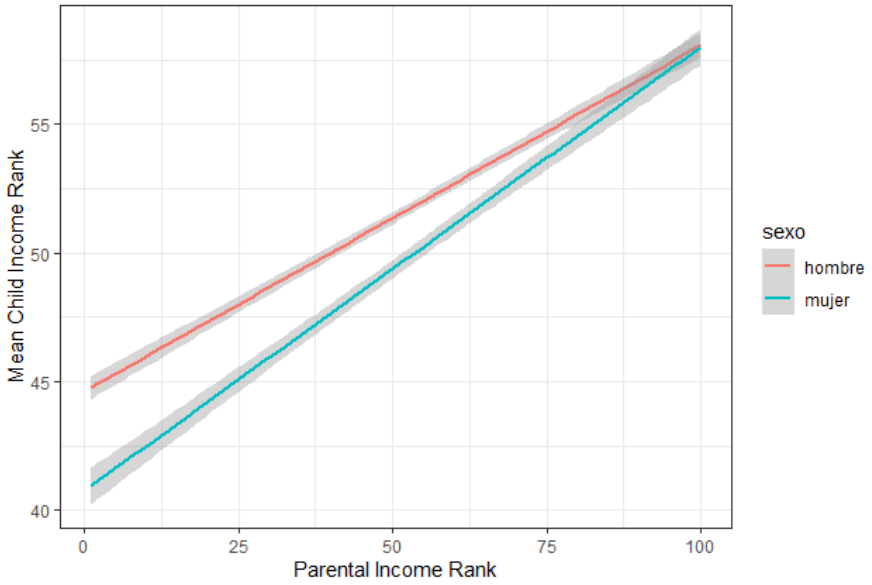
The top mobility ratio (TMR) is 7,62. Consequently, there is a great persistence of the ranges between generations in the upper part of the income distribution in relation to the rest of the distribution, it is more difficult to move to another centile among the families with higher incomes.

Absolute upward mobility (AUM) index is 46,6 meaning that a child of parents with incomes below the median is expected to finish in the 47th percentile of their income distribution.

4.2 Intergenerational mobility of income and gender

The Atlas of Opportunities 2020 has data separated by gender, therefore we will analyse the differences between men and women at the national level to be able to check if there is a gap between the two genders.

Figure 2 Mean Child Rank vs. Parental Rank by Gender



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020).

Studying the difference by gender (Figure 2), a clear difference is observed, especially in the lower centiles, but as income increases, the two curves tend to converge. Therefore, there is a gender difference in intergenerational income mobility among poor families. The male gender shows greater mobility than the female gender. OLS regression (Equation 1) for male it estimates that one percentage point increase in parental rank is associated with a 0.134233 percentage point in the child's mean rank while female for a one percentage point increase in parental rank is associated with a 0.17216 percentage point in the child's mean rank. the relevance of the parents' income rank is much higher daughters than for sons.

The male absolute upward mobility (AUM) index is 47.99 meaning that a son of parents with incomes below the median is expected to finish in the 48th percentile of their income distribution while the female AUM index is 45.07, daughters of parents with incomes below the median is expected to finish in the 45th percentile of their income distribution.

4.3 Intergenerational income elasticity.

The intergenerational income elasticity (IGE) is the most common index used to measure the relative mobility.

The dataset used in this work, as we have explained previously, are expressed in percentiles or quintiles (we have worked with percentiles), therefore we do not have the income that is necessary to calculate the IGE (Equation 3). The atlas of opportunities has a converter to be able to calculate the income from the national centiles.

Using the Equation 3 we calculate that the Spanish IGE is 0.8714. Therefore, if the parents' income is increased by 1%, it is estimated that the children's income will increase by 0.871%. This means that in Spain almost a ninth of the observed individual income would be determined by the parental income. This result draws us a lot of attention because it differs from the calculated in other studies and is also very far from that of other countries that have characteristics similar to Spain as the Mediterranean countries. Narayan et al. (2018) estimated that the IGE of Spain is approximately 0.3, this result is far from the one we have obtained with our calculations. Moreover, if we compare the IGE of Spain, for example, with Italy there is also a big difference, and we suppose that this should not happen since both are countries that share certain characteristics. Corak (2013) calculates that the Italian IGE is 0.25, therefore this does not give another indication that something is wrong. Our initial hypothesis based on these

results, it is to assume that there is some type of error in the converter. On the other hand, to calculate the elasticities, individual data are but in the Atlas of Opportunities the data is grouped, so we must assume that this also affects the calculation of the intergenerational income elasticity.

5 Geographical variation

5.1 Intergenerational mobility of income at regional level

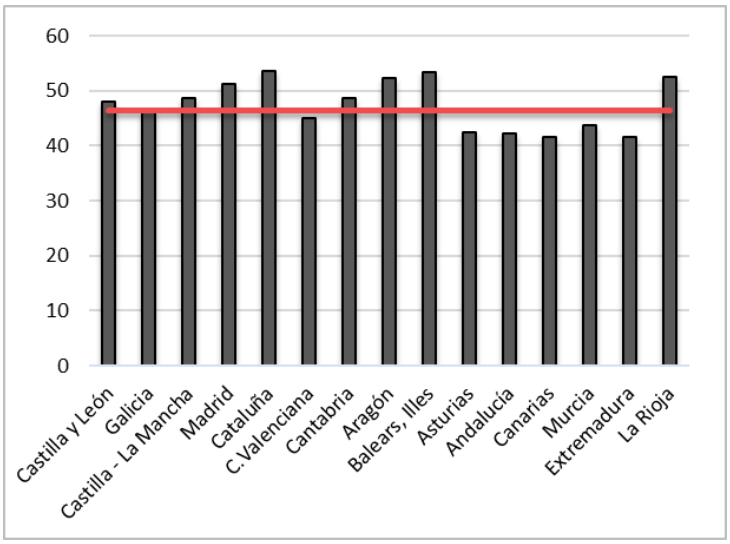
To study the geographical variation in intergenerational mobility within the country, we focus on autonomous communities and provinces. An autonomous community is made up of different provinces with specific territorial limits within Spain, which is endowed with legislative autonomy and executive powers in everything that is not common with the rest of the State. The Atlas of Opportunities (Llaneras et al., 2020) has data for fifteen autonomous communities of the seventeen that exist and data for forty-six provinces of the fifty that are. The largest autonomous community, Castilla and Leon, has over 2,454 million residents. The smallest region, Balearic Islands, has less than 1,136 million.

To analyse the variation at the autonomic level in the mobility measures, each child is assigned the province that their parents indicated as the province of residence in their own 1998 tax return, therefore, removals are not considered. This community is interpreted as the area where the children grew up, therefore it does not mean that they continue to live in the same place.

We will begin with community-level analysis to find out how the children with parents who are in the 25th and 75th centiles are. We have chosen these centiles because 25^{th} is the families with the lowest income and 75^{th} is those with the highest income.

The Figure 3 shows the mean child rank when the parental rank is $25^{th.}$ There is upward mobility in this case since in all autonomous communities the children are above the parents' centile (25th). Catalonia, Aragon, or La Rioja are the ones with the greatest mobility they are the communities where the children of parents located in the poorest 25% of the income bracket are the furthest away. On the contrary, the Canary Islands, Andalusia and Extremadura would be those with the least intergenerational income mobility. Canary Islands are the one with the least mobility, children are in the 41,54 centil, Catalonia is the one with the highest mobility, children are in the 53,62.

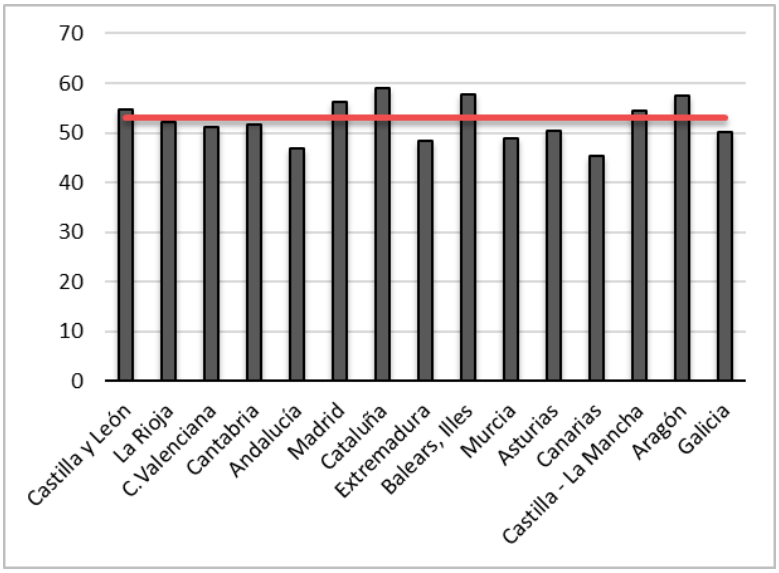
Figure 3 Mean Child Rank (25th Parental Rank)



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020). The redline represents the nacional mean child rank (25th parental rank).

On the other hand, the Figure 4 shows the mean child rank when the parental rank is 75th. In this case, the mean child rank of all the autonomous communities is below the 75th centile of the parents, there is no upward mobility. The children in 2016 have a lower income than their parents in 1998. Canary Islands are once again in the position with less mobility, children are in the and 45,24. Balearic Islands are the ones that are closest to reaching the parents since the children are in the centile 57,61.

Figure 4 Mean Child Rank (75th Parental Rank)



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020). The redline represents the national mean child rank (75th parental rank).

Applying the OLS regression (Equation 5) in the different autonomous communities, we obtain that the region with the lowest rank-rank slope (RRS), that measures the strength of the correlation between a child's position and her parents' position, is Galicia and Extremadura with the highest. That is, it estimates that an increase of one percentage point (ppt) in the parental rank is associated with a 0.098 (0.149) percentage point in the mean rank of the Galicia (Extremadura) child. Most of the absolute upward mobility (AUM) indices of the autonomous communities are between 44 and 50. The community with the highest is Catalonia with 54.09 and the one with the lowest is the Canary Islands (41.30), meaning that a Catalan (canary) child of parents with incomes below the median is expected to finish in the 54^{th} (41^{st}) percentile of their income distribution.

Table 1 shows the results of the difference in relative and absolute mobility for the top and bottom ten provinces from the point of view of the AUM index among the forty-six provinces in Spain.

There is substantial heterogeneity in upward mobility across provinces. Upward mobility has a clear North-South gradient and is highest in the North-East of the country (towards the Mediterranean Sea), especially in the regions of Cataluña and Aragón.
The province with the highest AUM is Barcelona (Catalunya), with a value of 54.55 and the one with the lowest AUM index is Jaen (Andalucía), with a value of 43.31 (Table 1)
There is a territorial imbalance in relation to intergenerational income mobility from the territorial point of view.

For children growing up in Parencia (Castilla y Leon), being born to a family at the bottom of the national income distribution translates into only 6 percentiles of rank difference compared to someone born to parents at the top of the line. distribution. In the case of children growing up in Cadiz (Andalusia), the one with the highest RRS among the provinces, this translates into a gap of 14 percentiles.

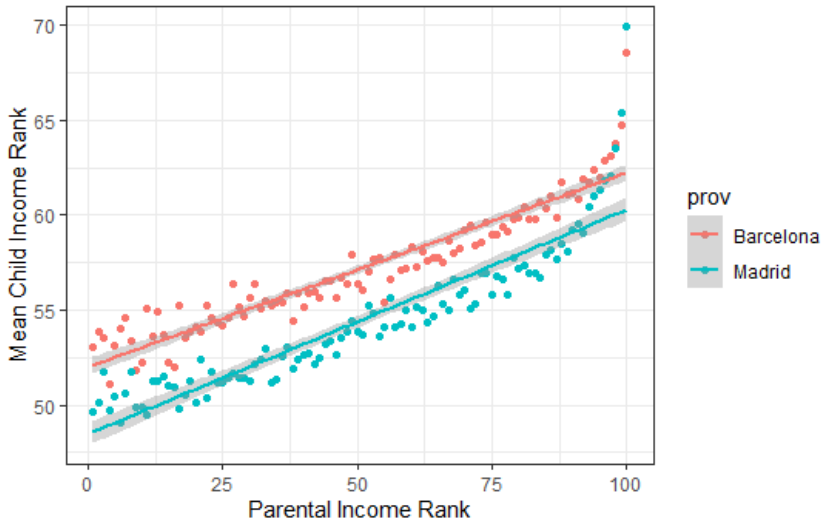
Table 1 Top and Bottom 10 provinces by Absolute Upward Mobility

Bottom	RRS.	α.	AUM.	Top	RRS	α	AUM
Jaén	0.161	39.28	43.305	Barcelona	0.102	52.00	54.550
Córdoba	0.148	39.27	42.970	Lleida	0.105	51.61	54.235
Granada	0.132	38.82	42.120	Zaragoza	0.091	51.35	53.625
Málaga	0.133	38.56	41.885	Palencia	0.071	51.61	53.385
Cáceres	0.149	38.16	41.885	Girona	0.134	49.38	52.730
Badajoz	0.150	38.13	41.880	Guadalajara	0.087	50.45	52.625
Las Palmas	0.101	39.26	41.785	Tarragona	0.122	49.24	52.290
Santa Cruz de Tenerife	0.109	37.96	40.685	Burgos	0.090	50.03	52.280
Sevilla	0.141	36.78	40.305	Rioja, La	0.105	49.26	51.885
Cádiz	0.162	35.95	40.000	Huesca	0.125	48.29	51.415

Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020).

Fugure 5 plots the full rank-rank relation in two of Spain's largest metropolitan areas and with the higher GDP, Madrid and Barcelona.Barcelona (shown in red) shows a ranking ratio that is higher compared to Madrid (shown in blue). Barcelona shows greater intergenerational mobility of income than Madrid, moreover children who grow up in Barcelona fare uniformly better throughout the income distribution (slope equal to 0.1). As we previously stated, Barcelona is the province with the higher AUM index (54.56) while Madrid is ranked 11/46, its AUM is 51.43.

Figure 5 Mean Child Rank vs. Parental Rank



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020).

5.2 The Great Gatsby Curve

Countries with greater inequality of incomes also tend to be countries in which a greater fraction of economic advantage and disadvantage is passed on between parents and their children. Alan Krueger has referred to this relationship as The Great Gatsby Curve[1].

The IGM has a mutual reinforcing relationship with income inequality. Lower IGM is associated with greater income inequality, as depicted by the Great Gatsby curve (Narayan et al., 2018), a relationship that has been noted by numerous studies using cross-country variation and often interpreted as the outcome of different institutions. Therefore, the curve shows a negative relation between income inequality and intergenerational mobility.

The original Great Gatsby curve compared different countries. However, some authors have questioned the results due to the poor comparability of the data between countries (Leone, 2020; Chetty et al. 2014). The Great Gatsby illustrated in this paper would not have this problem as we analysed the correlation between income inequality and intergenerational mobility in different regions within a single country, using observations recorded and consolidated in a single database. To create our Great Gatsby Curve, we are going to use the different Spanish autonomous communities, in this way we can see if more inequality is associated with less mobility across generations, it is also true among the Spanish regions.

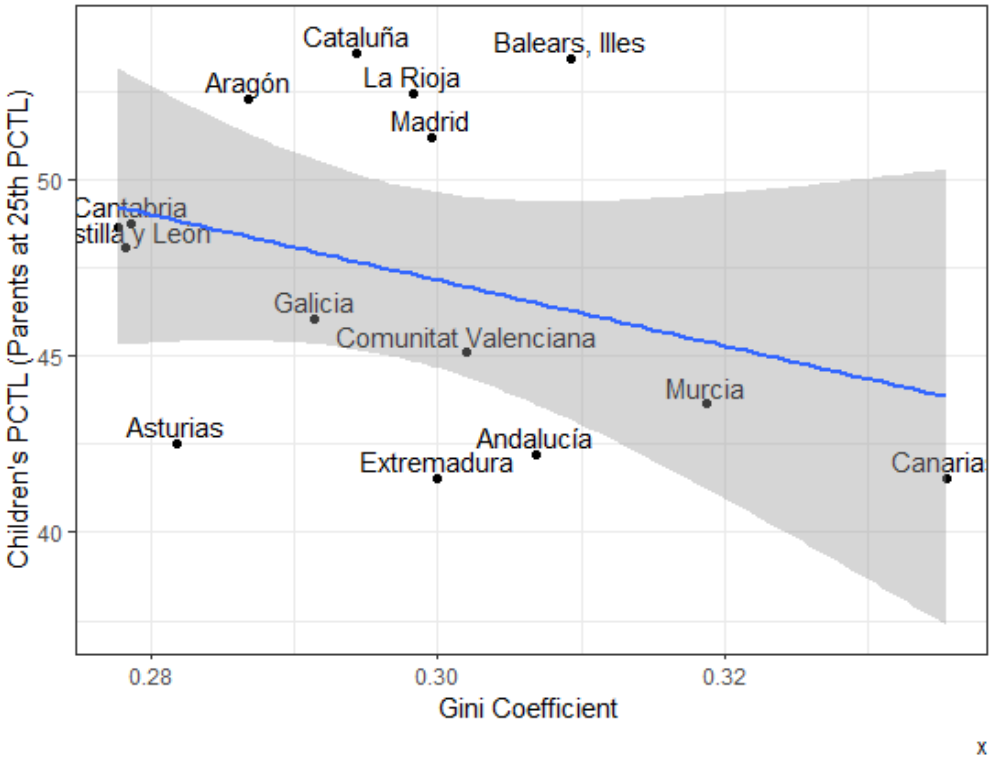
As a measure of income inequality, we are going to use the Gini coefficient of each autonomous community calculated by Herrero et al (2013). Although there are other inequality indices, we have opted for this one since it is one of the best known today, because it is the main inequality indicator used in the empirical literature. To understand Gini coefficient, we must first explain the Lorenz curve, which is a graphic representation of the income distribution, on the horizontal axis is the percentage of the population and the vertical axis shows the portion of total income accumulated by the total population. therefore, total equality would correspond to a 45º curve. From the Lorenz curve, the Gini coefficient is the ratio of the area between the 45º line of perfect equality and the resulting Lorenz curve for the distribution in analysis, and the area of the triangle below the 45º. It is ease to interpretate since it takes values between 0 (perfect equality) and 1 (perfect inequality) (Fellman, 2012.)

[1] The curve's name refers to Jay Gatsby, F. Scott Fitzgerald's character from his novel The Great Gatsby since Jay shows a high degree of mobility throughout the book starting as a smuggler and ending as the leader of the Long Island North Shore Society (Lenzner, 2012.)

As a measure of IGM choose the percentile of the children when their parents are at the 25th percentile since we are interested in studying the relationship with the lowest income families within the dataset.

The Figure 6 ranks autonomous communities along two dimensions. The horizontal axis shows income inequality in a country as measured by the Gini coefficient in 2011and in the vertical axis there is an index of intergenerational economic mobility. As can appreciate, the slope of the regression is negative, thus fulfilling the principle on which the curve is based, more inequality is associated with less mobility across generations.

Figure 6 Great Gatsby Curve



Source: Prepared by author based on Atlas of Opportunities (Llaneras et al., 2020) and (Herrero et al., 2013.)

Most of the regions have a Gini coefficient very close to 0.3 and their IGM index also has close values, for example Madrid, Catalonia, Valencia Community. But what we are concerned about are the regions that are in the middle of the graph. In the lower right-hand corner are the regions with the lowest IGM and the most unequal, such as the Canary Islands. On the other hand, in the upper right corner are the communities with the lowest inequality and the highest IGM (Aragon).

The Figure 6 shows us of the position of each region in order to apply socio-economic measures that help the regions in a less advantaged situation to be closer to the other regions and thus end the differences within the country.

The Great Gatsby Curve has been studying from different perspectives. One of them focuses on the heritability of traits between parents and their children.

Therefore, if these characteristics are strongly transmitted across generations, and assuming they are valued by labour markets over time, then there will also be an intergenerational association of incomes that would affect the IGM and inequality.

Another perspective would be the one studied by Solon (2004) that suggests that public policy can either accentuate or dampen the influence of labour market inequality. Therefore, intergenerational mobility is promoted by "progressive" public programs so families with the lowest income are the most benefited (Corak, 2013).

6 Conclusions

The objective of this paper is to study the intergenerational mobility of income in Spain using the data provided by the Atlas of Opportunities, a database based on the analysis of the income of ascendants and their descendants declared to the Spanish State Tax Administration Agency.

As rich as they are, the data are not perfect and thus our analysis is not without caveats. The most relevant may be that a proportion of the population with the lowest incomes is not included since this leads to the average income of the Atlas youth (19,000€) being higher than those calculated by other surveys as such as the survey on living conditions (11,000€) Therefore, the indicators obtained will be biased in favour of upward mobility due to it is the children born in the poorest households who have the greatest difficulties in social advancement.

We must interpret the results keeping in mind the population that has been used to calculate them. We cannot extrapolate these results for the entire Spanish population, but we can for a large part of it, as is the case of those who file personal income tax. A part of the Spanish population is left out since the communities of the País Vasco and Navarra are not part of the dataset. Furthermore, the age of the children in 2016 is between 26 and 32 years old, therefore young people are at the beginning of their working careers. Comparing young professionals who have just started their working careers with less qualified workers of the same age we will find very few differences in income between them. Therefore, we have measured the intergenerational mobility of income of the people who present the personal income tax return and they are between 26 and 32.

Faced with this, international comparison is ruled out since the lack of poorer households increases mobility indices, showing that Spain's position is better, since studies on other countries take these households into account when presenting their indicators. The Spanish absolute upward mobility (AUM) is 0.466 while that of countries like Italy is 0.44 (Acciari et al., 2019), Denmark has AUM index of 0.46 (Boserup et al., 2017). Deutscher and Mazumder (2019) measures that AUM index for Australia is 0.45. Corak (2017) calculated the AUM index of Canada is 0.44. The United States has an

AUM index of 0.41 (Chetty et al., 2014). That Spain has the highest AUM index is surprising, therefore it makes us think that something is happening with the data used and this can lead us to make misinterpretations. Therefore, if we use the results of this paper to compare the Spanish intergenerational income mobility (IGM)with the rest of the world, we would be committing an important error because these results cannot be extrapolated for the entire population and Spain would be classified as a country with great intergenerational income mobility. On the other hand, although we have ruled out international comparison, at the national level it is possible to compare the different Spanish regions without falling into overvaluation problems, always remembering that we are analysing the results of the families that declare personal income tax.

Our findings contain both good and bad news. From a national point of view, Spain presents an upwards IGM, a child of parents with incomes below the median is expected to finish in the 47th percentile of their income distribution. Moreover, there is also a difference by gender of the child that as the amount of income increases, this gap decreases. On the other hand, they reveal acute inequality in the degree of upward mobility within the country: the northeast shows greater and more uniform mobility than the southern provinces where the ranks of society last from generation to generation.

Great Gatsby Curve helps us to know which are the regions that are in the best (Aragon) and worst (Canary Islands) situations considering the IGM and inequality, hence the living conditions of young people not only depend on their personal attributes and family characteristics, also of the environment in which they develop and which, it should be the object of attention of policies aimed at equal opportunities.

This paper analyzes the intergenerational mobility of income in Spain at a national and regional level. In future works it would be interesting to study this mobility but at a more disaggregated level such as neighbourhoods and the relationship between intergenerational income mobility and other indicators such as unemployment, education, religion, family size…

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