# DEBT, GROWTH AND INCOME CONCENTRATION:
## Evidence from Spain

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# Summary

This study analyzes the impact of top income shares on both private credit acquisition and GDP/income per capita. It bases its analysis on Spain between 2002 and 2009, and it takes a regional perspective, which allows overcoming some of the key problems found in similar settings in the international literature. The main findings are two. On the one hand, it finds a strong, positive and causal relationship between income concentration and credit acquisition, both when changes happens at the same time and when changes happen with one period of difference. On the other hand, it finds a strong, positive and causal relationship between income concentration and subsequent GDP/income per capita growth. However, this same relationship does not show up when changes happen at the same time. These findings are explained by different theories, and they are robust to a large set of sensitivity analyses.

# Chapter 1

# Introductory

## 1.1 Introduction

The question of how inequality and economic performance are related is natural given that market economies have shown to be able of generating growth, though sometime at the expense of important differences in how this growth reaches the distinct socioeconomic levels of a society.

The mechanics generating distributional differences are related to numerous factors such as the natural resources of an economy (see Egermann and Sokoloff 2000), its historical past (e.g. colonial institutions) or the legislation (e.g. labor market institutions). Recent studies have shown for the US context that, at least during the last decades, a big part of the labor income inequality could be due to "a race between education and technology" (see Goldin and Katz 2009), where technology increasingly demands high skilled workers while the highly educated population does not grow enough to compensate this demand. In addition to this theory, which deals with long run or structural inequality, other studies have emphasized the role of taxation, especially in determining the evolution of top income shares (see Piketty, Saez and Stantcheva 2014).

Nonetheless, the direction of the relationship matters (e.g. from growth to inequality or from inequality to growth) and, particularly since the nineties, an abundant literature has tried to analyze the effect that different levels of inequality have on economic performance. The perspective adopted to face this question varies given that inequality may affect many characteristics of the economy. The most traditional approach has focused on the direct relationship between inequality and income per capita growth. In this field, theoretical works have found opposed predictions depending on which components of the model are affected by inequality. In concrete, some models point to inequality as a slowing factor for income per capita growth if governments respond to higher levels of inequality with anti-growth policies (e.g. Alesina-Rodrick 1993 and Petersson-Tabellini 1994) or if credit constraints prevent those at the bottom of the distribution to invest either in education or in entrepreneurship (see Perotti 1996). At the same time, other models predict a positive effect on growth, for example if the higher propensity for savings at the top of

the distribution leads to innovation and entrepreneurship (see Kaldor 1957) or if higher wage gaps end up being an incentive for workers to increase their effort (see Lazear and Rosen 1981). However, the empirical evidence in this field remains inconclusive due to the lack of definitive evidence (see the work by Banerjee-Duflo 2003 for a revision of this area) even if recent studies suggest that a negative relationship is more plausible (Ostry et al 2014).

The most recent line of analysis has tried to address whether inequality has a defining effect on the stability of the business cycle and hence, on economic and financial crises (see Atkinson-Morelli 2011 for a general description). This latter line of analysis has been motivated by the coincidence of very high levels of income inequality preceding both the Great Depression and the current economic crisis in many countries. On the one hand, there exists a line of research based on a political economy analysis where inequality interacts with politics generating economic outcomes. The two most debated theses are posed by Raghuram Rajan (2010) and by Daron Acemoglu (2011). For Rajan it is inequality what determines political responses that could lead to financial crisis whereas for Acemoglu politics determine the state of finance which ultimately generates both inequality and financial crisis. In addition to these political economy analyses, very recent works attempts to assess if the financial fragility that prompted the current crisis could be partially a consequence of a rise in indebtedness due to increasing levels of top income concentration. The main idea is that middle income classes, to maintain their level of consumption with respect to upper classes, drawn upon debt which ultimately determined the fragility of the financial system. Currently, there exists a body of literature that tackles this matter both from a theoretical perspective (Kumhof-Ranciere-Winant 2013) and from an empirical approach (Bordo 2011; Carr et al. 2013). Empirical studies, however, have found mixed evidence and have so far failed in establishing a causal impact.

In general, the absence of definitive evidence in inequality studies is mainly related to four problems:

1. There is a lack of a set of harmonized statistics. This deficiency stems from the fact that specialized literature is generally based in international comparisons of inequality indexes obtained mainly from three sources: the World Income Inequality Database, the Luxembourg Income Studies, and the Luxembourg Wealth Studies. The main drawback with these inequality measures is that they are based on surveys carried out by different authorities using a diverse methodology in each country. Hence, comparing these indicators fundamentally undermines the validity of empirical results, producing what in econometrics is known as measurement error.

2. International comparisons use a very limited number of observations in their analysis given that there are very few countries with long time series in inequality. This limited number of observations affects the econometrical studies because they cannot apply asymptotic properties (e.g. good quality studies hardly use more than 150 observations, for example, 3 observations for 50 countries).

3. This literature generally compares GINI indexes. However, this measure of inequality has the inconvenient of being a synthetic index and changes in its value could

correspond with very different changes in the distribution of the underlying population. Thus, it is hard to compare changes in this index when it is not clear how inequality evolves.

4. As pointed out by Roodman (2009) many of the previous studies in this area, when using panel data, have been driven by wrong specifications, especially when using the Arellano-Bond estimator (details on this issue are given in Section III).

The present study is designed to overcome this set of problems. To do this I calculate regional top income shares in a single country (Spain), and I analyze the evolution of top income shares in relation with GDP/income per capita and credit acquired by the private sector. This setting allows me to overcome the problems listed above. Firstly, I use a single source of statistics for each of my variables, hence avoiding the measurement problems from comparing very different sources. Second, I analyze 46 provinces evolving along 8 years (2002 to 2009) which allows me to count with 368 observations more than twice the number of observations generally used in the literature. Third, I compute top income shares. The advantage of using top shares is that I can understand what is driving my index. In addition, top share itself may be a much more interesting measure of inequality as the dynamics of the economy may be very influenced by the specific behavior followed by top income population (i.e. they have very different income sources, savings behavior, politic relations, etc.). Forth, I am able to correct previous problems in the econometrical setting following the new evidence posed by Roodman on this type of estimations.

However, all these advantages have the drawback of being specific to a context: the Spanish economy during 2002 to 2009. Therefore, it is not possible to quickly generalize the results as they could be particular in time and place to the Spanish economy.

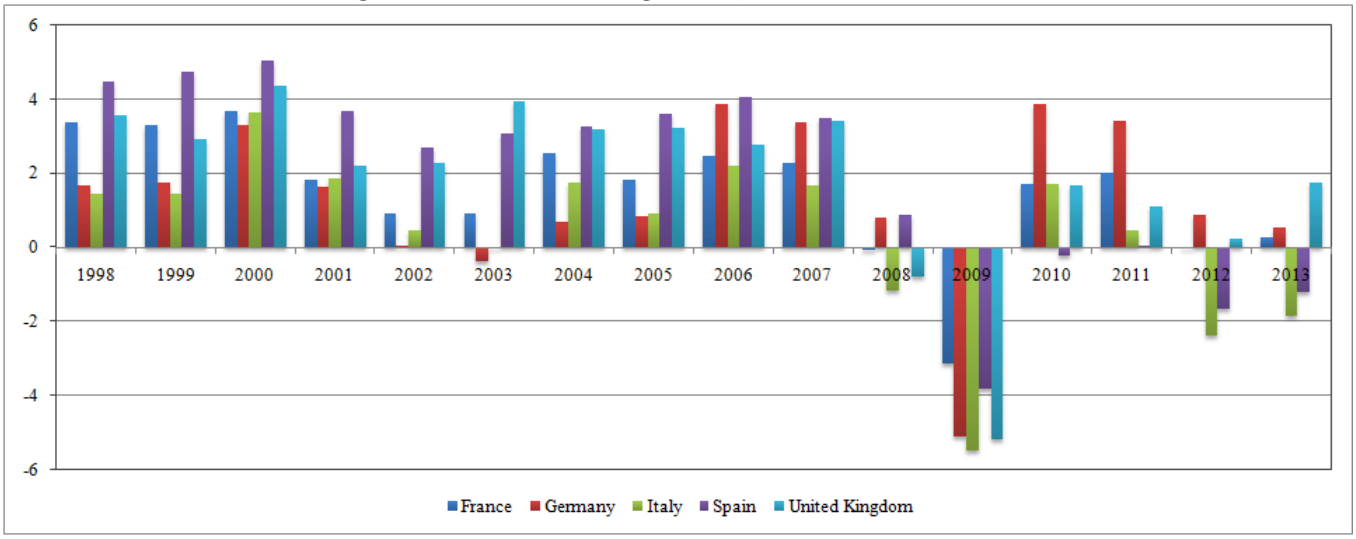
The present study is structured as follows. In section II, I present a brief analysis of the Spanish economy during and around the period 2002-2009 in order to understand the specific context of this study. Section III describes the methodology followed in the econometrical setting while section IV presents the data. In Section V, I present the econometrical results, followed by a careful sensitivity analysis (robustness checks) and by an interpretation of the results. Section VI concludes.

## 1.2 The Spanish context

This study is focused on a single country, Spain, using as units of observation its provinces (NUTS 3 EU classification) and in a very specific period: 2002-2009. Given that the results hereby obtained are linked to the specifities of Spain during this period, in what follows I present a brief analysis of the Spanish context in which these results take place.

The first thing to note is that the real GDP in Spain grew very rapidly during the 2000s. As it is shown below, when comparing Spanish real GDP growth between 1996 and 2009 to the largest 4 EU countries, it turns that the Spanish GDP grew faster in average than in the other economies.

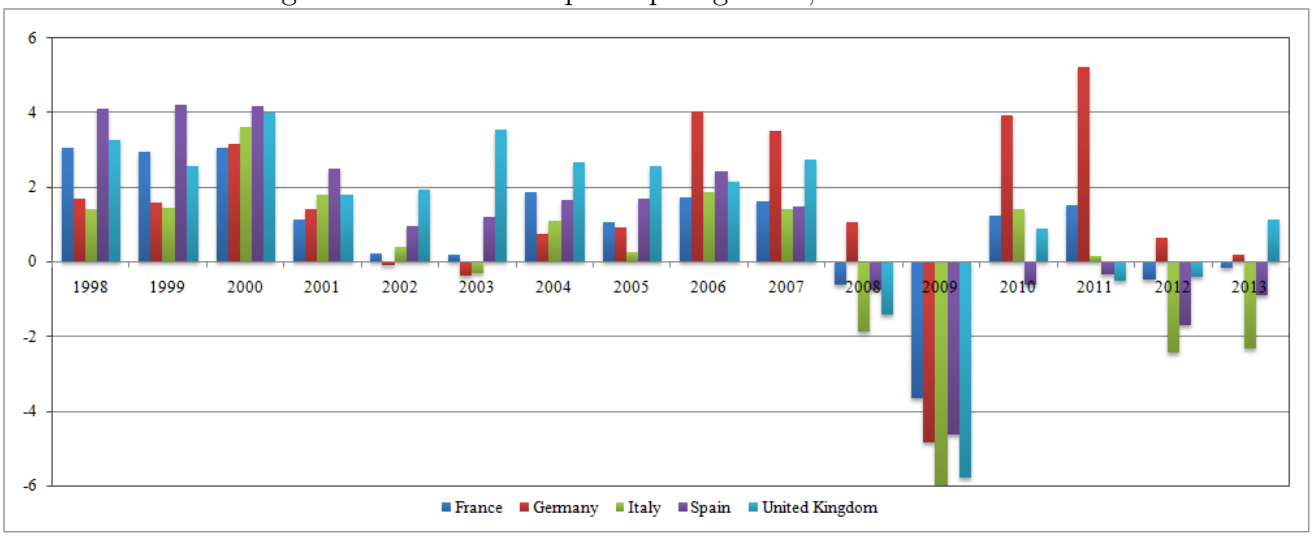
Figure 1.1: Real GDP growth, 1998-2013




Source: IMF, World Economic Outlook, April 2014

For instance, between the years 2002 and 2007, the Spanish GDP grew about 20% in real terms. However, it should be noted that during the same period (2002 to 2007) the population of Spain increased about 10% due to an impressive process of immigration, which led to a 10% per capita real GDP growth in the same years. This increase in per capita real GDP growth during the pre crisis period is remarkable, but closer to other countries (see table below).

Figure 1.2: Real GDP per capita growth, 1998-2013




Source: IMF, World Economic Outlook, April 2014

The immigration process mentioned above is summarized in the next table. It covers the period 1997 to 2011, and it shows two key indicators. On the one hand, it shows the proportion of foreign born residents over the total Spanish population. While in 1997 the

foreign-born residents represented 1.6% of the total population by 2008 they accounted for 12.1%. Afterwards, the process of immigration stopped and started to slightly reverse the trend with some foreign born residents leaving the country and some natives starting to migrate abroad. The second indicator captures the share of foreign born residents coming from countries with a per capita income in PPP below that of Spain over the total population of Foreign born residents. This indicator shows that most of the immigration came from "low income" countries. Indeed, while these "low income" country's foreign-born residents represented 56% of the total foreign-born residents in 1997, in 2008 they represented 80%. This fact, jointly with the magnitude of the immigration process should be taken into consideration when analyzing the Spanish economy during this period as it should had affected some economic dynamics (e.g. favouring the increase of economic sectors intensive in low-skilled labor force).

Figure 1.3: Foreign born residents, 1997-2011

| | Share Foreign born on total Spanish population | Share "low income" country's Foreign born resident over total Foreign born residents |
|---|---|---|
| 1997 | 1,6% | 57,3% |
| 1998 | 1,9% | 56,6% |
| 1999 | 2,3% | 60,0% |
| 2000 | 3,3% | 70,1% |
| 2001 | 4,7% | 75,6% |
| 2002 | 6,2% | 78,1% |
| 2003 | 7,0% | 80,9% |
| 2004 | 8,5% | 81,2% |
| 2005 | 9,3% | 80,4% |
| 2006 | 10,0% | 79,9% |
| 2007 | 11,4% | 80,7% |
| 2008 | 12,1% | 80,8% |
| 2009 | 12,2% | 80,5% |
| 2010 | 12,2% | 80,4% |
| 2011 | 12,1% | 80,0% |

Source: National Statistics Institute, Spanish Municipal Registry

In addition to the immigration process, the period under analysis also coincides with a huge housing bubble that, with no doubts, affected almost every aspect of the Spanish economy. To illustrate this phenomenon Figure 1.4 shows the annual real increase in credit acquired by the private sector. In particular, it shows that between the years 1997 and 2006 the annual average real increase in credit acquired by the private sector was above 10%. Starting 2007 this trend is slowed, showing real negative growth rates in some of the years since 2009.

To put this numbers in context, figure 1.5 shows the ratio between the credit acquired

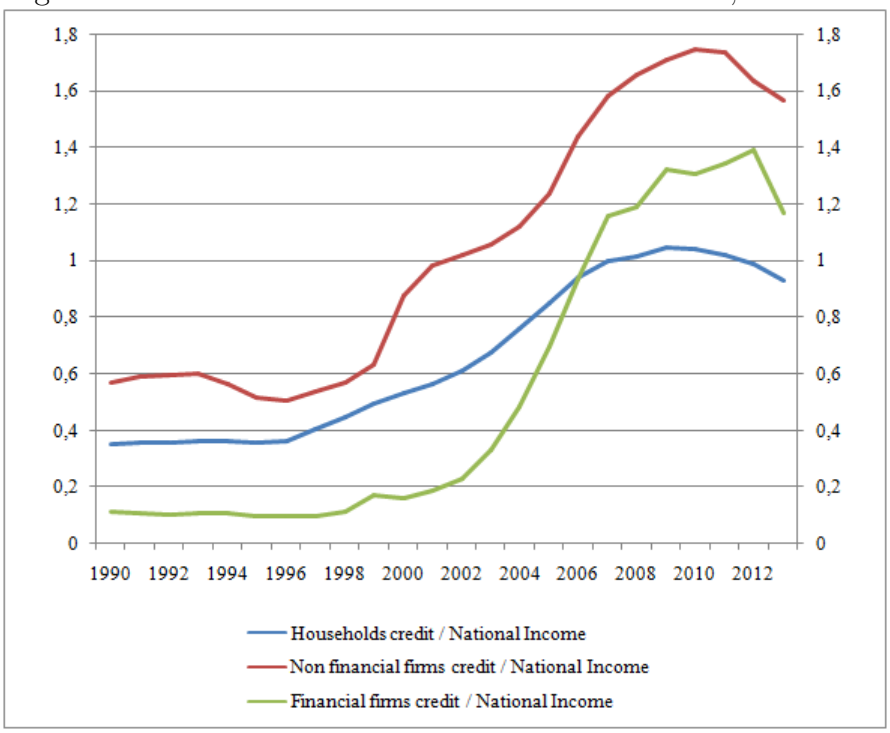
Figure 1.4: Annual real credit growth, 1990-2013

| | Households credit real growth rate | Non financial firms credit real growth rate | Financial firms credit real growth rate | Total Private sector credit real growth rate |
|---|---|---|---|---|
| 1990 | 0,050 | 0,076 | 0,029 | 0,062 |
| 1991 | 0,018 | 0,030 | -0,055 | 0,017 |
| 1992 | 0,000 | -0,011 | 0,024 | -0,004 |
| 1993 | 0,006 | -0,064 | 0,041 | -0,030 |
| 1994 | 0,035 | -0,036 | -0,088 | -0,017 |
| 1995 | 0,059 | 0,010 | 0,039 | 0,031 |
| 1996 | 0,113 | 0,071 | 0,004 | 0,080 |
| 1997 | 0,171 | 0,116 | 0,242 | 0,149 |
| 1998 | 0,170 | 0,168 | 0,573 | 0,210 |
| 1999 | 0,140 | 0,485 | 0,023 | 0,292 |
| 2000 | 0,092 | 0,166 | 0,192 | 0,143 |
| 2001 | 0,127 | 0,078 | 0,295 | 0,117 |
| 2002 | 0,158 | 0,078 | 0,495 | 0,156 |
| 2003 | 0,169 | 0,104 | 0,539 | 0,195 |
| 2004 | 0,172 | 0,151 | 0,506 | 0,231 |
| 2005 | 0,160 | 0,220 | 0,412 | 0,249 |
| 2006 | 0,095 | 0,135 | 0,284 | 0,166 |
| 2007 | 0,001 | 0,030 | 0,012 | 0,017 |
| 2008 | -0,004 | -0,005 | 0,071 | 0,019 |
| 2009 | -0,022 | 0,006 | -0,028 | -0,012 |
| 2010 | -0,062 | -0,046 | -0,014 | -0,040 |
| 2011 | -0,067 | -0,092 | 0,002 | -0,055 |
| 2012 | 0,000 | 0,000 | 0,000 | 0,000 |
| 2013 | 0,000 | 0,000 | 0,000 | 0,000 |
| Average annual growth 2002-2006 | 0,15 | 0,14 | 0,45 | 0,20 |
| Average annual growth 2007-2009 | -0,01 | 0,01 | 0,02 | 0,01 |

Source: Bank of Spain, Financial Accounts

by the private sector (households, Non financial institutions and financial institutions) and the national income of Spain. It shows a dramatic increase in the value of private debt relative to income, particularly concentrated in the years 1999 and 2007 (this ratio still increased after 2007 but not due to further indebtedness but to the slow increase or reduction in the national income in the following years).

Figure 1.5: Private credit relative to national income, 1990-2013

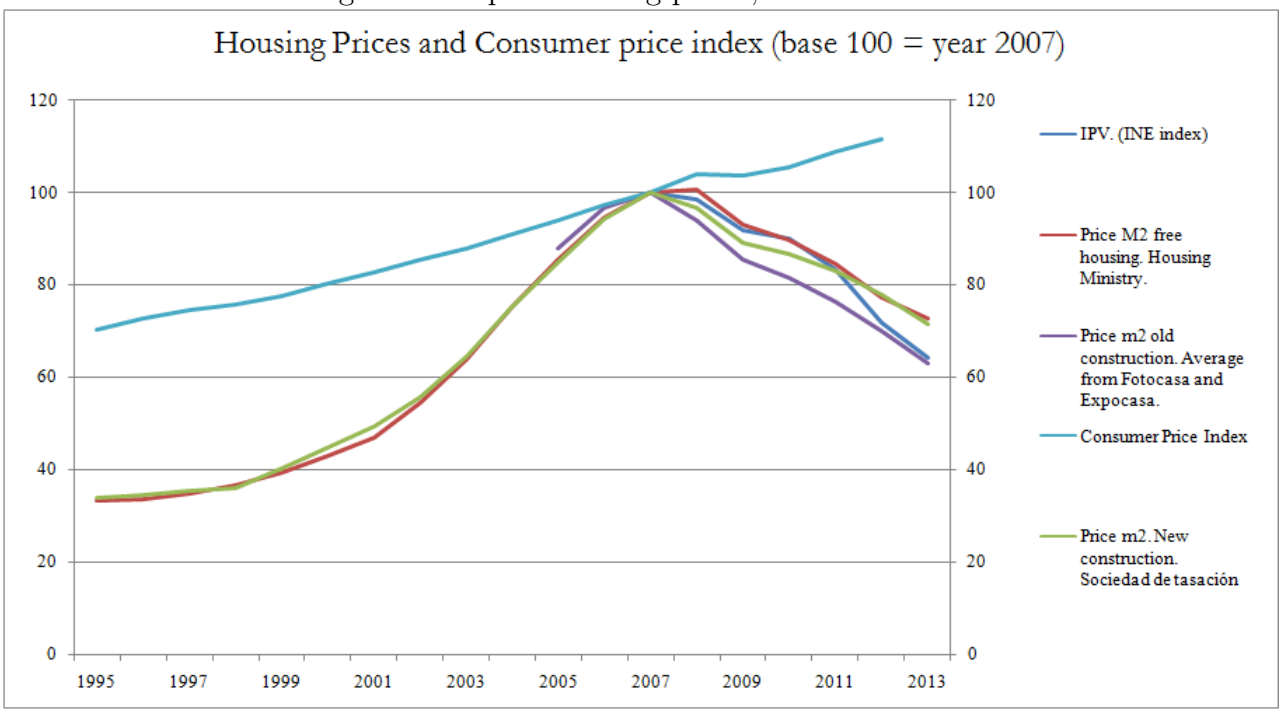



Source: Bank of Spain, Financial Accounts

The increase in private debt goes hand by hand with the increase in housing prices. Figure 1.6 shows the evolution of different indexes of housing prices in nominal terms together with the Consumer Price Index. All the variables use the year 2007 as base year, when housing prices reached its maximum. It clearly shows the impressive increase on the value of housing relative to the CPI. For example, between 2002 and 2007 housing prices almost doubled (they increase in a 84%) while the CPI in this same period just increased by 17%. After the peak year, housing prices show a strong correction, close to a 40% decrease in value since 2007.

As shown by Piketty (2014), the huge increase in housing prices in Spain evidenced in a sharp increase in total wealth in the country, which peaked close to a 800% ratio of private wealth relative to national income, where wealth is defined as total assets minus liabilities. Figure 1.7 shows the same wealth to income ratio updated with two more years (2011 and 2012). In addition to the wealth to income ratio, the graph also incorporates the ratio of financial assets to financial liabilities held by households (therefore leaving aside the non financial side, such as housing value of houses). This second ratio clearly shows that during this same period financial liabilities increased much faster than financial assets, meaning that Spanish households worsened their financial position. This worsening of the

Figure 1.6: Spain housing prices, 1995-2013



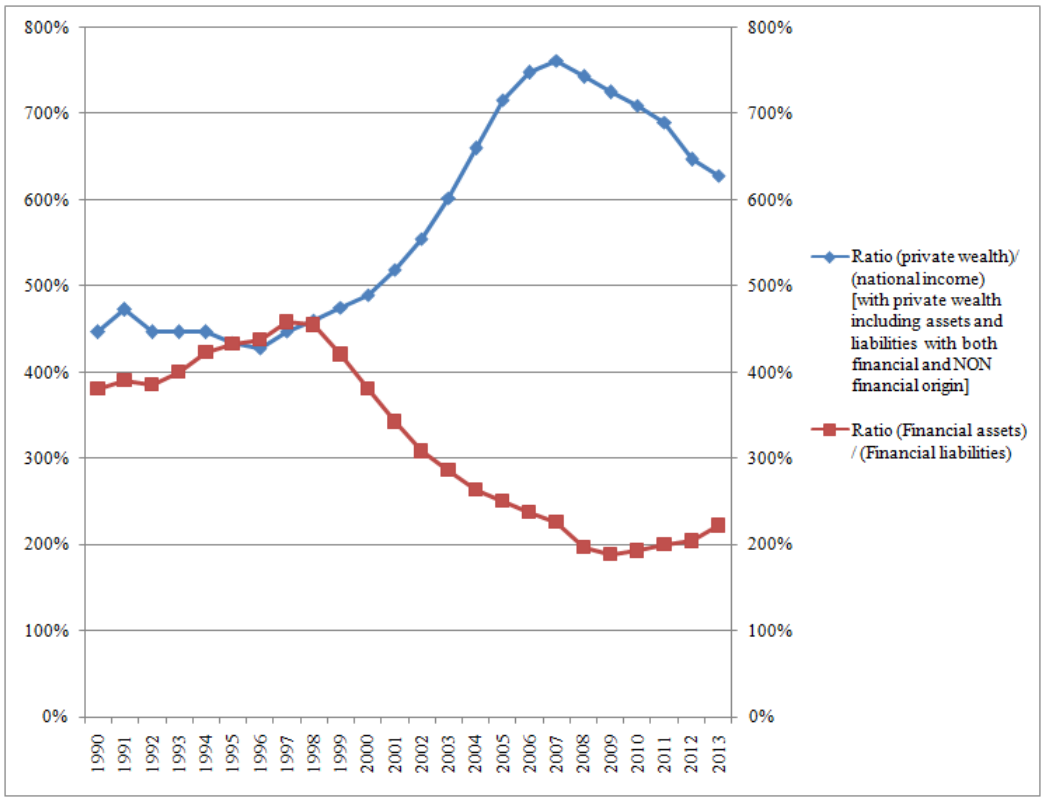

Source: Bank of Spain, Financial Accounts

financial position impacted more negatively the welfare of the households when housing prices went down given that the financial burden, by definition, cannot react in the short run (unless there is some class of default).

Furthermore, during the period 2002 to 2009, the distribution of income in Spain, when measured by the GINI index, seemed to have increased as Figure 1.8 evidences. From all the different causes determining the short run evolution of the GINI index in Spain two should be highlighted: unemployment and immigration. The GINI measured inequality in Spain is very cyclical and highly correlated with unemployment rate. Therefore, the rise in inequality during the 2002-2007 expansion time should be driven by the strength of factors other than unemployment because unemployment systematically decreased during this same period (i.e. unemployment rate fell from 11.5% in 2002 to 8.3% in 2007), and this fall in unemployment happened in all the Spanish territory (see graphs and tables with unemployment rate at the province level in the Appendix 3 and 4). As already mentioned, immigration in Spain during the 2000s was mainly from "low income" countries. Overall, "low income" country's Foreign-born residents represented 8% of the Spanish population in 2008, while they represented less than 1% of total population in 1997. This increase should had a positive impact on the GINI index and could very likely drove the resulting evolution in the index.

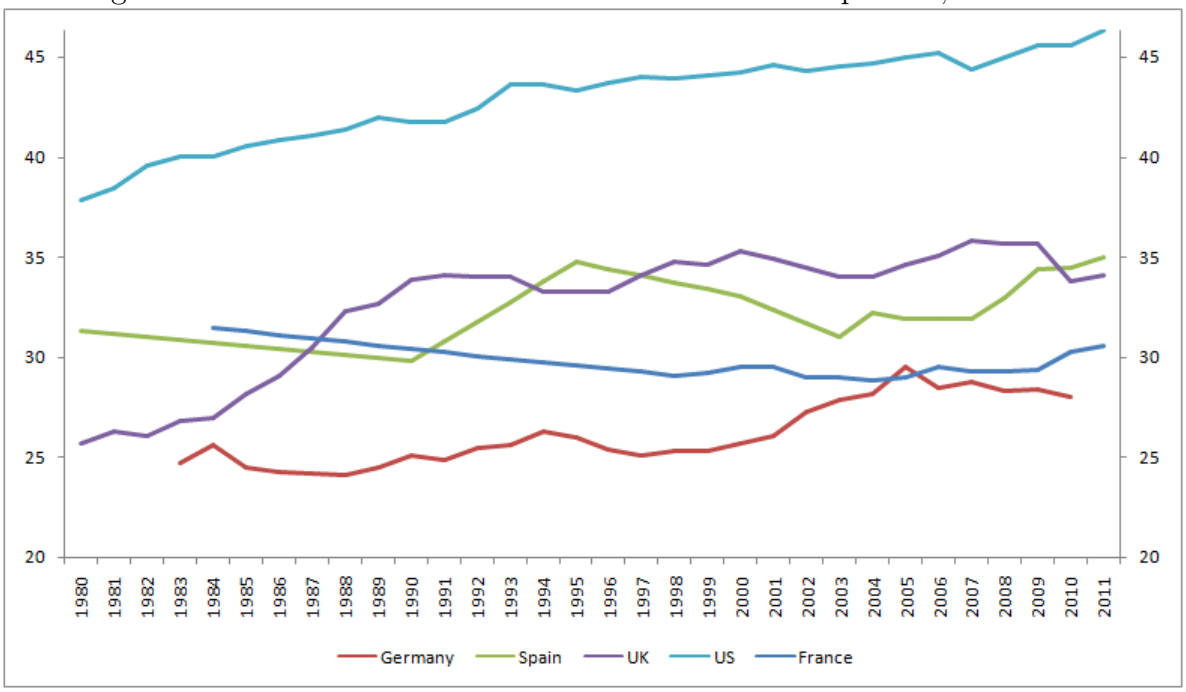
In addition, this general increase in inequality coincides with a rise in top income shares, at least during 2002 to 2006, which should have affected overall inequality as well (although it is not clear whether the effect is positive or negative in the GINI index. It depends on how the rest of the distribution behaves at the same time). Figure 1.9 plots

Figure 1.7: Private wealth to income ratio and financial asstets to financial liabilities ratio, 1990-2013




Source: Bank of Spain, Financial Accounts

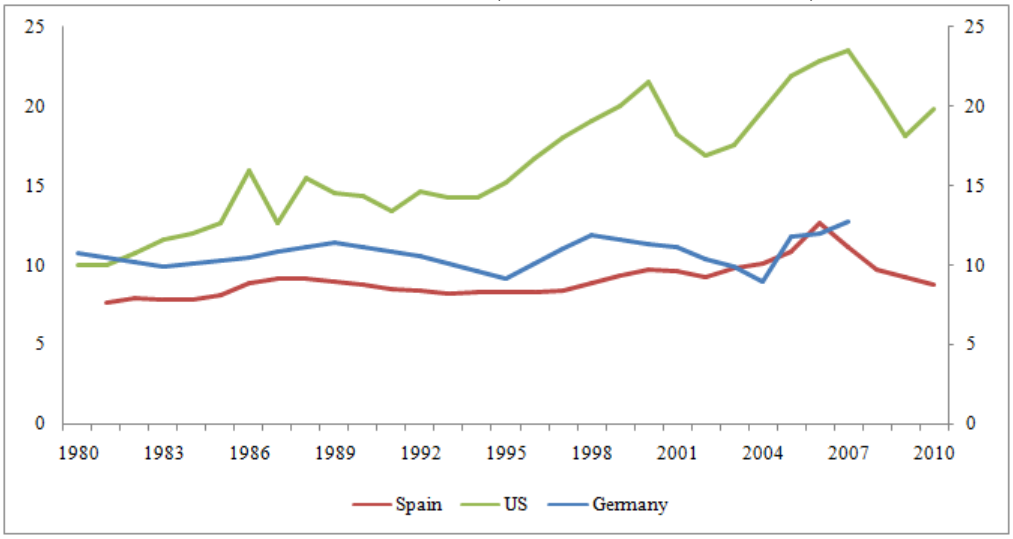
Figure 1.8: Evolution of GINI index. International comparison, 1980-2011.




Source: Chartbook of Economic inequality, Atkinson and Morelli.

the evolution of the top1% income share including capital gains for Spain, Germany and the US (the three countries for which I found comparable series in time). Data is taken from the World Top Income Database, and given that Germany data is provided every three years, I assume a linear evolution between available years.

Figure 1.9: Top 1% income share (including capital gains), 1980-2010




Source: World Top Income Database

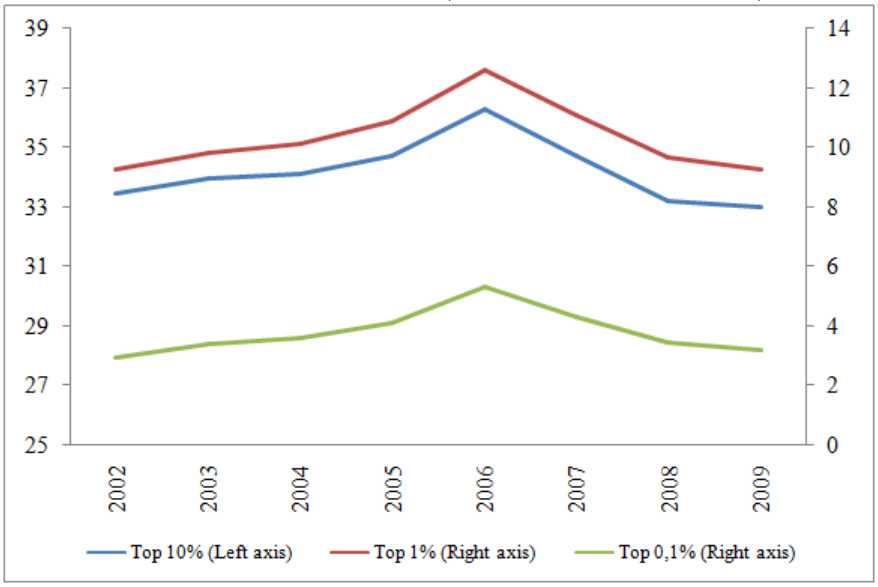
The graph shows that Spain is far from the level of income concentration present in the US (or, in general, the anglo-saxon countries, see Atkinson, Piketty and Saez 2007) but still there exists a notable upward trend in the early 2000s, during the expansion period. After 2007 there is a drop in the shares of the top 1% in Spain and in the US, likely due to the crash of financial markets. When decomposing the top incomes share in Spain between the top 10%, the top 1% and the top 0.01% for the period 2002 to 2009, it can be easily identified that movements of these groups are due to the "top of the top" (i.e. the top 1% and the top 0.01%), as the increase in the share gained by the top 10% merely reflects that of the other groups (see figure 1.10).

Given that the present study adopts a regional perspective (the unit of analysis are the Spanish provinces), it is interesting to check the evolution of both inter-regional inequality and intra-regional inequality. Regarding the first dimension, there is a constant long run reduction of inequality across regions. To measure this dimension I only found an analysis at the Autonomous Community level (NUTS 2 in the EU classification) rather than at the province level that I use in this study (NUTS 3). I borrow Figure 1.11 from the book "Estadísticas Históricas de España" by Fundación BBVA:

This graph shows a long run reduction in regional disparities, with a slight stagnation from 1995 to 2000. As explained in the book, the largest part of this reduction should be the consequence of intraregional migrations, which were severely reduced from the 80s. Indeed, since then, Spain has been one of the OECD countries with the lowest regional mobility rates (see OECD 2005).

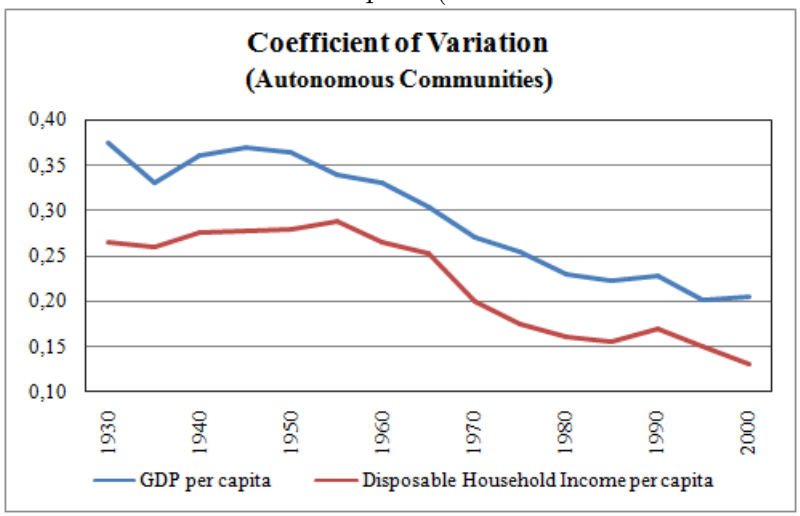
Regarding intraregional inequality, there are few analyses, probably due to the absence

Figure 1.10: Top 10%, top 1% and top 0.1% (including capital gains) in Spain, 2002-2009




Source: World Top Income Database

Figure 1.11: Coefficient of variation in Spain (Autonomous Communities ), 1930-2000



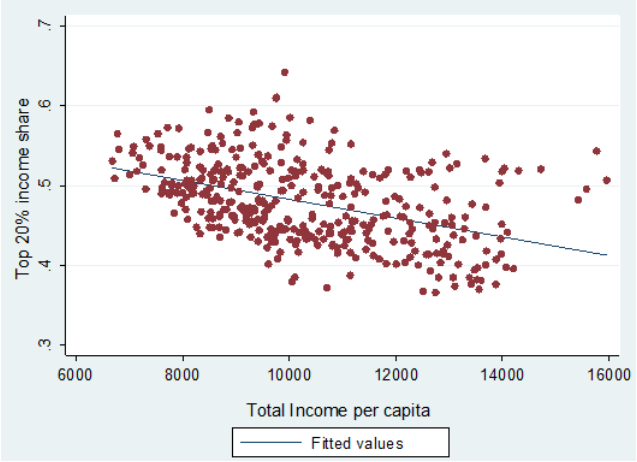

Source: "Estadísticas Históricas de España", Fundación BBVA

of data at the regional level. An exception is "Desigualdad y bienestar social: de la teoría a la práctica", published by IVIE (Instituto Valenciano de Investigaciones Económicas), in which inequality is measured at the Autonomous Community level (NUTS 2 level) in 4 moments of time: 1973/1974, 1980/1981, 1990/1991 and 2003. Using survey data (the "Family Budget Survey") they found a falling trend in inequality in time, with, more inequality in less developed areas. The general finding is, however, that relative positions of inequality remain in time (i.e. those communities less unequal tend to remain less unequal).

Even though the IVIE study allows getting a big picture of intraregional inequality, the data used is not very good and so is not the precision. In addition, the sample size does not allow for decomposition at an inferior regional level. Indeed, in the inequality literature there are no studies at the provincial level, hence this study represents a contribution in this regard. In doing so, I calculate provincial top income shares indexes. In concrete, I compute the share of total income going to the top 5, 10 and 20 per cent incomes. Tables and graphics with these results are shown in Appendix 3 (tables) and Appendix 4 (graphs). These graphs and tables confirm the aggregate behavior showed by top incomes shares in Spain in the previous graph: a rise in top income shares between 2002 and 2006 followed by a rapid fall. It should be noted that those graphs for top 5% show this effect more strongly, suggesting again that movements at the top were mostly driven by the "top of the top" of the income distribution.

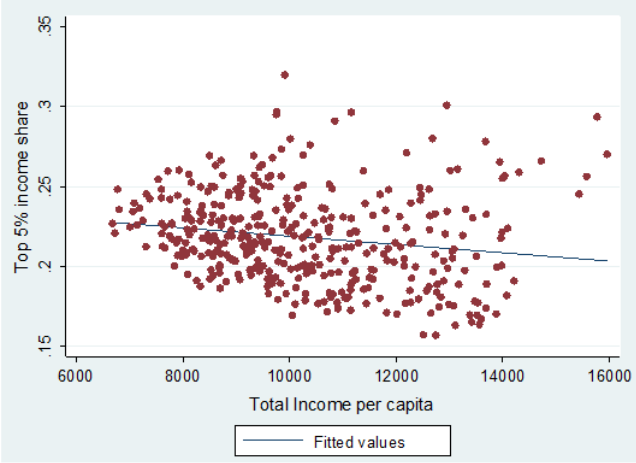
In general, there is a strong negative association between top income share and income per capita (also with GDP per capita) at the province level of analysis. This association is stronger for broader measures of income concentration (such as top 20% income share) than for narrower measures (like top 5% income share). Simple graphs plotting this relationship for the years 2002 to 2009 are presented below:

Figure 1.12: Top 20% and income per capita in Spain, 2002-2009




Source: Author's computation.

Figure 1.13: Top 5% and income per capita in Spain, 2002-2009

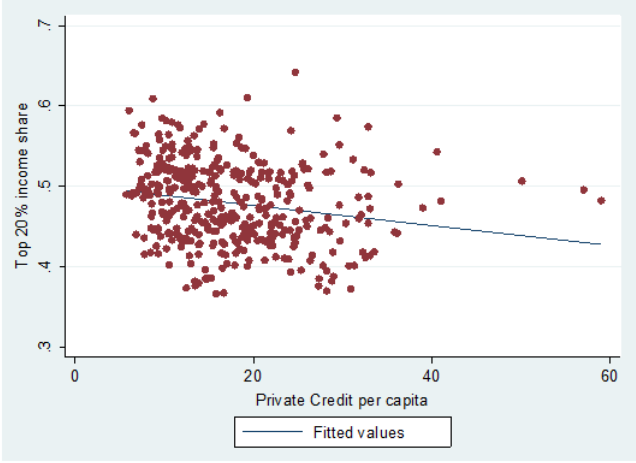



Source: Author's computation.

This same relationship shows up when plotting a single year (i.e. 2002), indicating that in general, those provinces with higher income per capita tend to be more equal, which probably reflects a structural or long run trend.

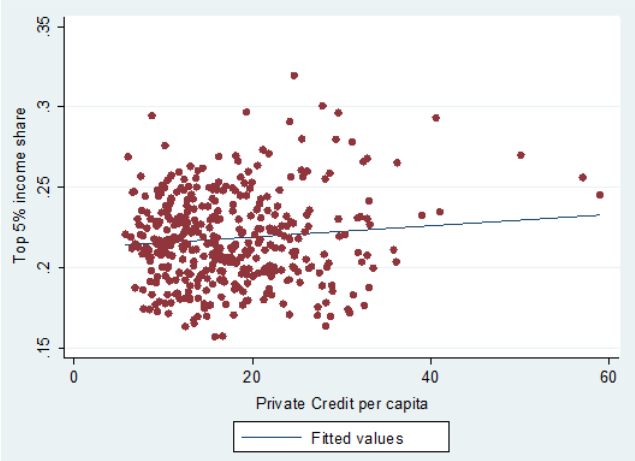
When top incomes shares are associated with credit per capita at the province level, it turns that 20% top incomes show a slightly negative relationship whereas top 5% incomes show a slightly positive relationship. Of course, these are simple correlations difficult to interpret. Nevertheless, they show that top 5% and broader measure of income concentration such us top 20% may have different behaviors and composition, affecting differently the economy.

Figure 1.14: Top 20% and credit per capita in Spain, 2002-2009




Source: Author's computation.

Figure 1.15: Top 5% and credit per capita in Spain, 2002-2009




Source: Author's computation.

Overall this section attempted to show the specific conditions under which the relationship between income concentration and both credit and economic growth is tested. Of course, any context could be insufficient and many other factors were at play at the moment. However, the figures shown above provide central elements driving the Spanish economy and I hope they will help the reader to understand the situation in which the following econometric setting takes place.

## 1.3 Methodology

The research presented in this document closely follows modern econometric specifications applied in the growth literature and in particular the work by Forbes (2000), in which the author used for the first time panel data to test the impact of inequality on subsequent economic growth.

With this study I add, to the existing literature, especially to the work by Forbes, the impact of inequality (measured by the concentration of income at the top of the distribution) on credit acquired by the private sector. I use yearly data (2002 to 2009) instead of averaged periods (5, 10, 20 years) as in most of the literature. In addition to testing how inequality affects subsequent evolution of economic growth and credit acquisition, I also present a specification in contemporary timing, relating current changes in inequality with current changes in economic growth and credit acquisition.

The main specification relating income concentration with subsequent economic growth is:

$$GrowthIncome_{it} = \delta_1 \left(income_{t-1}\right) + \beta_1 \left(topshare_{i,t-1}\right) + X_{i,t-1}\gamma + \alpha_i + \eta_t + u_{i,t} \quad (1.1)$$

$$GrowthCredit_{it} = \delta\left(income_{t-1}\right) + \alpha Credit_{i,t-1} + \beta\left(topshare_{i,t-1}\right) + X_{i,t-1}\gamma + \alpha_i + \eta_t + u_{i,t} \tag{1.2}$$

Where i represents each Spanish province (excluding the Basque Country, Navarra and Ceuta and Melilla) and t represents each time period (with t=2002,2003,...,2009). Growth is the growth rate of income (measured as Gross Domestic Product per capita or as National Income per capita) between $t-1$ and $t$. $income_(t-1)$, $topshare_(t-1)$ and $X_{i,t-1}$ represent respectively the log of income per capita, the share of income going to the top of the distribution (top 20%, top10% or top5%) and a set of covariates: unemployment rate, total population, share of foreign born population, in province $i$ and time $t-1$. Alpha i represents province's invariant factors (province fixed effect), nhu t are time dummies capturing time shocks affecting all the observations in time $t$ and $u$ $i$,$t$ is the (time variant) error term.

This specification attempts to capture the effect that income concentration has on subsequent economic growth and on private indebtedness growth. The advantage of using panel data is twofold:

- On the one hand, it allows using a larger sample than the same population observed only in one period as in a cross section study, getting closer to the necessary econometric asymptotic properties. For instance, if we define T as the number of periods and N as the number of units of observation, we result in a sample of TxN observations. However, it would be misleading to think of this sample in the same terms as in a cross sectional study given that the panel sample cannot represent as much variation as in the cross section because part of the variation is within the same unit of observation.
- On the other hand, panel models allow eliminating unobserved variables that may have a constant effect over time within a unit of observation, what is called unobserved fixed effects (alpha $i$). In what follows, we refer to those fixed factors in the error term, $u_{i,t}$ , as correlated individual fixed effects.

To deal with those correlated individual fixed effects the literature has generally used the Fixed Effect estimators and the First Difference estimators. However, the presence of lagged terms of the dependent variable in the regressor may lead to inconsistent estimates when using these two methods. Checking this issue is straightforward in the case of the First difference estimator which estimates $\beta$ after first differencing equation 1.1

$$\Delta Growth_{it} = \delta\Delta\left(income_{i,t-1}\right) + \beta\Delta\left(topshare_{i,t-1}\right) + \Delta X_{i,t-1}\gamma + \left(\eta_t - \eta_{t-1}\right) + \Delta u_{i,t} \tag{1.3}$$

This differenced equation 1.3 in order to yield consistent estimates needs to have zero covariance between the error term and the other regressors, which clearly is not the case here as $cov(income_{i,t-1} - income_{i,t-2}, u_{i,t} - u_{i,t-1})$ contains $cov(income_{i,t-1)}, u_{i,t-1})$ which

should be different from zero. In addition, if the number of time periods do not tend to infinity, which clearly is not the case in the present study where $T = 8$, Fixed Effects estimates are also inconsistent.

This problem could be solved using the Chamberlain matrix method if the covariates included in the model were exogenous. However, given that the covariates in this model are unemployment rate, total population and share of foreign born population at each province i in time $t-1$, it is very likely that they are endogenous regressors, being inadequate to employ the Chamberlain matrix method. To solve this issue, Caselli, Esquivel and Lefort (1996) firstly adapted the Arellano – Bond (1991) differenced Generalized Method of Moments (GMM) estimator to the growth regressions setting, followed by Forbes (2000) who applied this framework to the inequality-growth regressions. The mechanism of the Arellano-Bond GMM estimator is the following. In equation (1) growth of income (credit) per capita is captured as the difference in the logarithms of income (credit) per capita between $t$ and $t-1$:

$$growthIncome_{i,t} = logIncome_{i,t} - logIncome_{i,t-1} = \log\left(\frac{Income_{i,t}}{Income_{i,t-1}}\right) = log(1+g) \approx g$$

Where $g$ represents the growth rate of income (credit). Naming $income_{i,t} = Y_{i,t}$, equation 1.1 can be rewritten as:

$$Y_{i,t} - Y_{i,t-1} = \delta_1 Y_{i,t-1} + \beta_1 \left(topshare_{i,t-1}\right) + \alpha_i + \eta_t + u_{i,t} \tag{1.4}$$

Where we omit the set of covariates $Xi, t-1$ as they are not important to the exposition (they follow the same operations than top share $i$,$t-1$ and can be added at the end of the proof). Taking period averages in equation 1.4 we get:

$$Y_t - Y_{t-1} = \delta_1 Y_{t-1} + \beta_1 \left(topshare_{t-1}\right) + \alpha + \eta_t + u_t \tag{1.5}$$

Demeaning equation 1.4 with equation 1.5 leads to:

$$(Y_{i,t}-Y_t)-(Y_{i,t-1}-Y_t) = \delta_1 \left(Y_{i,t-1} - Y_t\right)+\beta_1 \left(topshare_{i,t-1} - topshare_{t-1}\right)+(\alpha_i - \alpha)+(u_{i,t}-u_t)$$

Rewriting each of the deviations from the mean in the following way: we get the following equation

$$\widehat{Y_{i,t}} - \widehat{Y_{i,t-1}} = \sigma_1 \widehat{Y_{i,t-}} + \beta_1 (\widehat{topshare}_{i,t-1} + \widehat{\alpha_i} + \widehat{u_{i,t}} \tag{1.6}$$

Taking first differences in equation 1.6 we get:

$$(\widehat{Y_{i,t}}-\widehat{Y_{i,t-1}})-(\widehat{Y_{i,t-1}}-\widehat{Y_{i,t-2}}) = \sigma_1(\widehat{Y_{i,t-1}}-\widehat{Y_{i,t-2}})+\beta_1(\widehat{topshare}_{i,t-1}-\widehat{topshare}_{i,t-2})+(\widehat{u_{i,t}}-\widehat{u_{i,t-1}})$$

Which can be rewritten as:

$$(\widehat{Y_{i,t}} - \widehat{Y_{i,t-1}}) = \Theta(\widehat{Y_{i,t-1}} - \widehat{Y_{i,t-2}}) + \beta_1(\widehat{topshare}_{i,t-1} - \widehat{topshare}_{i,t-2}) + (\widehat{u_{i,t}} - \widehat{u_{i,t-1}})$$

With $\Theta = 1+\sigma_1$ Including the covariates omitted at the beginning of the proof we obtain the following equation, which would be estimated by the Arellano-Bond mechanism:

$$(\widehat{Y_{i,t}} - \widehat{Y_{i,t-1}}) = \Theta(\widehat{Y_{i,t-1}} - \widehat{Y_{i,t-2}}) + \beta_1(\widehat{topshare}_{i,t-1} - \widehat{topshare}_{i,t-2}) + (\widehat{X_{i,t-1}} - \widehat{X_{i,t-2}})\gamma + (\widehat{u_{i,t}} - \widehat{u_{i,t-1}})$$

This estimator yields estimates of $\beta_1$ using $Y_{i,t-2}$, $topshare_{i,t-2}$and $X_{i,t-2}$ and earlier lags of these variables as instrumental variables for $(\widehat{Y_{i,t-1}} - \widehat{Y_{i,t-2}})$, $(\widehat{topshare}_{i,t-1} - \widehat{topshare}_{i,t-2})$ and $(\widehat{X_{i,t-1}} - \widehat{X_{i,t-2}})$. This method would lead to consistent estimates under two conditions; if there is no autocorrelation in the error term with more than one period of difference: $cov(u_i, t, u_i, t+s) = 0$ if $s >= 2$, and if the set of instruments are considered as predetermined to the model. Both requirements may be tested.

The first condition uses the "Arellano-Bond test for AR(2)" and the second condition use a set of tests derived from the Hansen test for over-identifying restrictions. Other works in the literature have focused in the Sargan test to validate the set of instruments identifying the regressors. However, the Sargan test in this context needs to have non-heteroskedastic error term. As I do not have evidence to believe error terms are homoskedastic, I would require robust estimates in my regressions, dealing then with the mentioned set of Hansen tests.

The three methods: Fixed Effects, First Difference and Arellano and Bond would still lead to inconsistent estimates if there exist time-varying omitted effects included in the error term. It is also worth noting that these three estimators have different interpretations. The Fixed Effects estimator directly estimates equation (1). Hence, the interpretation of the parameter could be approximated as the average effect that increasing one unit of the variable of interest (e.g. "topshare") has on the growth rate of income (credit).

As previously explained, the First Difference and the Arellano-Bond estimators are a modified version of equation (1) taking differences. Therefore, the interpretation for the First Difference and the Arellano-Bond estimator would rather be how changes in the regressors impact, on average, the growth rate of income (credit). As we can see, both interpretations are interesting but different.

In addition to the previous model, this work presents a specification intended to capture a contemporaneous relationship between income concentration and income (credit) per capita, rather than with a period of difference. This relationship is captured in the following equation:

$$Y_{i,t} = \sigma_1 Y_{i,t-1} + \beta_1(topshare_{i,t}) + X_{i,t}\gamma + \alpha_i + \eta_t + u_{i,t}$$

where, $Y_{i,t}$ represents the logarithm of income (credit) in period $t$ and province $i$. Two are the differences with respect to equation (1). On the one hand, the dependent variable is the logarithm of income (credit) rather than the difference in logarithms between period $t$ and $t-1$. On the other hand, all the regressor but the log of income in $t-1$ are considered in period t rather than in $t-1$. The reason to use the logarithm of income (credit) and not the difference in logarithms is strictly linked to the central question of this work: how income concentration affects economic or credit growth. Therefore, in contemporary timing it is not possible to regress the growth of a variable on a variable in levels, as it does the Fixed Effects estimator. Otherwise the variable in levels would be measured at the moment from which the growth rate is calculated (i.e. in $t$ when the growth rate is measured between $t-1$ and $t$), been meaningless. Hence, this model (9) would only use the First Difference and the Arellano-Bond estimators, estimators that in both cases take the difference in all the variables of the model. As such, when differencing the dependent variable: the log of income (credit); it will represent growth rates, as explained before. Therefore, using these two estimators in equation (9) is equivalent to regressing the growth rate of income (credit) on the change of the other variables. Basically, these estimators would calculate the following equation:

$$(Y_{i,t}-Y_{i,t-1}) = \sigma_1(Y_{i,t-1}-Y_{i,t-2})+\beta_1(topshare_{i,t}-topshare_{i,t-1})+(X_{i,t}-X_{i,t-1})\gamma+(_t-_{t-1})+(u_{i,t}-u_{i,t-1})$$

If well specified, the Arellano-Bond estimator would yield consistent estimates, as in the previous model. However, the First Difference model would suffer from reverse causality, in addition to the previously pointed issues with this estimator. Nevertheless, both estimations are presented to make them comparable.

Finally, it is important to recall, as David Roodman warns in his paper "Practicioners corner: a note on the theme of too many instruments" (2009), that many studies in the growth literature have failed to test the validity of the Arellano-Bond estimator. In particular, Roodman shows that the inclusion of many instruments may lead to artificially fail to reject the null hypothesis of instruments validity of the Hansen test. The advice given by Roodman is to reduce the inclusion of instruments, and to provide the Arellano-Bond test of AR(2) in addition to all the Hansen tests. And so I do in my study.

The paper by Roodman shows that Forbes' study (2000) did include too many instruments, invalidating her results when correcting for this issue. In the case of Forbes, her paper used 80 instruments for 45 countries (the groups) and 135 observations. In the present study, I work with 48 provinces (the groups) and I count with 276 observations in the Arellano-Bond estimations. All my results are provided with the number of instruments used. This number ranges from 32 to 43 and is bellow the rule of thumb of not including more instruments than groups.

## 1.4 Data

I use data for Spain in an annual basis from 2002 to 2009 at the province level. There are 50 provinces in Spain plus two Autonomous cities: Ceuta and Melilla. The provinces in Spain correspond with the NUTS 3 regional classification developed by Eurostat. I exclude from the analysis the three provinces of the Basque Country (Alava, Guipuzkoa and Vizcaya) and Navarra as these territories have their own treasury and do not release the tax return data necessary to construct top income shares. Ceuta and Melilla are also discarded because of their reduced size and their completely different characteristics to the rest of Spain.

Top income shares at the province level are constructed for each year between 2002 and 2009 using the Annual Sample of Income Tax Return, micro data provided by the Institute for Fiscal Studies ("Instituto de Estudios Fiscales" in Spanish). I follow the methodology of Alvaredo and Saez (2010) in which they use a similar database, but in panel and with less representation, to calculate the top income shares in Spain between 1982 and 1998. The advantage of the tax return income sample I use for the years 2002 to 2009 is that it provides, on average, one million observations per year, making this source very adequate to estimate regional top shares.

This methodology divides the population in fixed groups (5, 10, 20, 100), and calculates how much income (including capital gains) is concentrated at the top of this distribution. To calculate the ratio, I use as denominator (the numerator is the income going to the top group) the value of income used by Alvaredo et al. in the World Top Income Database for Spain, and assign this income value to each province and year following the share the GDP of each province represents in the total GDP of Spain. I based the estimation of the share each province has on total GDP on the Regional Accounts provided by the National Statistics Institute (INE).

The real Gross Domestic Product per capita is calculated from the same Regional Accounts provided by the INE. I deflate the nominal GDP in each province by the provincial Consumer Price Index, an index prepared by the INE, using as a year base 2002. To find the GDP per capita, I divide the real GDP by the population residing in each province and year. The statistics for population are obtained from the Spanish Municipal Registry ("Padrón Municipal"), a compulsory registry for people residing in Spain. Since this registry data is given the first of January of each year, I assign to year t-1 the data corresponding to the first of January of year t (i.e. the population of January 1st of 2002 in INE's data is assigned as the population of 2001). Many international institutions use this database for computing population statistics (e.g. the OECD in the International Migration Database).

The real income per capita is calculated in a similar way to the real GDP per capita. However, in this case I deflate the nominal income at the province level after estimating the province nominal income obtained from the income denominator of Alvaredo et al.

Data for Private Credit at the province level is taken from the Bank of Spain Statistical Bulletin ("Boletín Estadístico" in Spanish), and deflated by the regional Consumer Price

Index to obtain a serie in real terms with base 2002. This data corresponds to the credit given to other resident sectors in each province and year ("Crédito a Otros Sectores Residentes"), so it aggregates data on households, firms and financial sector but not on the public sector. It would have been better, and it would have contributed to more precision, to count with private credit for households, but this data does not exist for Spain.

The covariates in the regressions include the Unemployment rate, the total number of inhabitants and the share of foreign-born residents over the total population in each province and year. The last two figures are taken from the same Spanish Municipal Registry explained before, which includes the nationality of the residents. Data for the unemployment rate is taken from the Economically Active Population Survey (EAPS) provided by the INE. This survey follows the indications of Eurostat and the data is provided quarterly. I calculate a province index averaging the four quarters of each year.

The present study tried to introduce an instrument for top income shares in the main specifications. Although it resulted weakly correlated with these top shares it can still be useful in the Arellano-Bond estimations complementing the other instruments, and as such I use it here. The instrument generates exogenous predictions of foreign-born inflows in Spain (details are given in Appendix II). The sources to construct this instrument are the following: for the number of foreign-born residents in Spain in each province between 1997 and 2009 I use data from the Spanish Municipal Registry and data from the Spanish Census for the year 1991. Both databases are provided by the INE. In addition, it was used the World Bank Economic Indicators to get data on economic factors from the countries of origin of the foreign-born residents. It was used data on invariant factors of each country (e.g. latitude, longitude, language, colonial origin, etc.) which was taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

### 1.4.1 Desctiptive Statistics

Figure 1.16: Summary statistics 2002-2009

**Summary statistics 2002-2009**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Top 20% share | 368 | .476 | .049 | .366 | .642 |
| Top 10% sahre | 368 | .325 | .036 | .243 | .451 |
| Top 5% share | 368 | .217 | .028 | .157 | .319 |
| Unemployment Rate | 368 | 11.16 | 4.89 | 3.03 | 27.78 |
| GDP per capita | 368 | 17,112 | 3,183 | 11,151 | 26,506 |
| Income per capita | 368 | 10,324 | 1,933 | 6,684 | 15,953 |
| Population | 368 | 914,937 | 1,139,812 | 90,954 | 6,458,684 |
| Private credit | 368 | 2.09e+07 | 4.42e+07 | 951831 | 3.81e+08 |
| Private credit per capita | 368 | 17,843 | 7,904 | 5,718 | 58,99 |
| Share foreign born residents | 368 | .080 | .055 | .010 | .242 |

Source: Author's computation

Figure 1.16 provides summary statistics for the variables involved in the analysis. The number of observations in the data is 368, which is equivalent to multiplying 46 provinces by 8 periods of time. It summarizes the information for the years 2002 to 2009. Given that this period covers a boom and a crisis in the economy, this single table cannot capture the dynamics of the period. For this reason, I provide data for each variable, year and province in appendix III.

It is interesting to check that the average credit per capita is slightly superior to the average GDP per capita, and much larger than the average income per capita. This reflects the large level of indebtedness of the Spanish private sector in relation to its income. In addition, it is also interesting to check the high variation of unemployment rate (from 3.03% to 27.78%) and of the share of foreign born residents on total population (1% to 24.2%), both very indicators very linked to the boom period (and posterior crash) of the Spanish economy. Top shares seem to have a relatively low standard error (about one third of the mean), reflecting that these shares have no great variance over time, at least when compared to other variables.

# Chapter 2

# Analysis of results

## 2.1 Results

### 2.1.1 Lagged regressors and subsequent growth

Table 1 presents the results from estimating the effect of lagged top income concentration on the subsequent growth of four variables: real Gross Domestic Product per capita, real (pre tax) income per capita, real aggregate credit growth and real credit per capita growth. In concrete, the main specification uses the top 5% income share as its favourite indicator. As explained in the previous section, all the dependent variables are expressed in real terms, using 2002 as its year base (the starting period) and being deflated by the provincial Consumer Price Index (IPC). Table 1 presents the results of using three estimators: Fixed Effects, First Differencing and Arellano-Bond.

These results shows for each regression the number of observations, the $r^2$, the standard error, the $t$ statistic and the $p - value$. In addition, and following Roodman's (2009) recommendation, I include in the Arellano Bond estimations the number of instruments included, the Arellano-Bond $AR(2)$ test for error serial correlation and all the Hansen tests for the validity of the instruments. In all the cases the null hypothesis of the tests should not be rejected. Therefore, confidence in the consistency of the estimates is directly proportional to the value of these tests. In particular, a satisfactory test should be over the threshold of 0.1, better if larger.

#### Fixed Effects

Results for fixed effects regressions show a strong and positive relationship between income concentration (top 5% income share) in period t-1 and growth in t for the four dependent variables. In all the cases the p-value is below the 1% level. These estimates suggest a positive relationship between concentration of income and GDP/Income per capita growth. They also suggest the same type of positive relationship between income concentration and both, aggregate and per capita credit growth. In concrete, an increase

Figure 2.1: Main Specification for top 5%. Lagged time

| Dependant Variable | GrowthGDPpc | | | GrowthIncomePC | | | GrowthCredito | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top5t10 | 0.355*** | 0.209** | 0.563*** | 0.446*** | 0.130 | 0.528 | 1071*** | 0.770*** | 1.145*** | 0.847*** | 0.564*** | 0.820** |
| Standard Error | (0.108) | (0.098) | (0.153) | (0.153) | (0.115) | (0.326) | (0.245) | (0.193) | (0.364) | (0.248) | (0.186) | (0.378) |
| p-value | 0.002 | 0.039 | 0.001 | 0.006 | 0.266 | 0.827 | 0.000 | 0.000 | 0.003 | 0.001 | 0.004 | 0.035 |
| t-stat | 3.28 | 2.12 | 3.69 | 2.91 | 1.13 | 0.16 | 4.37 | 3.99 | 3.15 | 3.42 | 3.04 | 2.17 |
| Number of instruments | | | 33 | | | 33 | | | 38 | | | 38 |
| AR(2) | | | 0.735 | | | 0.297 | | | 0.891 | | | 0.982 |
| Hansen | | | 0.643 | | | 0.149 | | | 0.183 | | | 0.124 |
| Hansen test excluding groups | | | 0.540 | | | 0.294 | | | 0.324 | | | 0.102 |
| Difference in Hansen | | | 0.636 | | | 0.118 | | | 0.133 | | | 0.401 |
| R2 | 0.828 | 0.727 | | 0.675 | 0.623 | | 0.887 | 0.829 | | 0.870 | 0.819 | |
| Number observations | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

of 1 percentage point of income share going to the top 5% leads, on average, to: an increase of 0.35 percent in the growth rate of GDP per capita, an increase of 0.45 percent in the growth rate of income per capita, an increase of 1.145 percent in the aggregate credit growth, and an increase of 0.82 percent in the per capita credit growth.

For example, if the top 5% income share increases (exogenously) their share in total income from 20% to 21%, the predicted increase in the growth of GDP per capita for the next period is 0.35%.

However, despite the positive and significant relationship between income concentration and the variables of interest, the inclusion of a lagged value of the dependent variable causes inconsistency in Fixed Effects estimates and make them not fully reliable, as explained clearly in section III.

### First Differencing

With respect to Fixed Effects estimation, First Differencing shows a positive and significant relationship between changes in top 5% income concentration and subsequent changes in GDP per capita growth, aggregate private credit growth and per capita private credit growth. Nevertheless, the coefficient on income per capita growth is no longer significant, suggesting that changes in income concentration affect GDP but not income. This discrepancy between Fixed Effects and First Differencing estimations in relation to income per capita growth would be confirmed with the Arellano-Bond estimations.

The point estimates in First Differences are in all the cases below those of Fixed Effects. In addition, the positive impact on GDP per capita growth is significant at the 5% level but not at the 1%. The estimates for credit growth, both aggregate and per capita, remain significant at the 1% level. Compare to Fixed Effects, in the First Differences estimation there is a loss of one observation per unit of analysis and this might affect the efficiency of the overall estimation. Nonetheless, given that the number of observations finally used (276 vs 322) is still quite numerous, the issue of losing one observation per unit of analysis does not seem to be critical in this case. This loss of one observation is present in the

Arellano-Bond estimator as well, since it also first differences the data, as explained in section III.

### Arellano-Bond

Under a set of assumptions already explained in the methodology, the Arellano-Bond (AB) estimation is adequate to solve the endogeneity problem present in Fixed Effects and First Difference methods when applied to the type of data analyzed in this study (in particular, the inclusion of a lag of the dependent variable as a regressor). Therefore, the analysis of AB estimates is the most relevant for the present work. At this stage I advance to the reader that all the robustness checks carried out later, with minor differences, will confirm the results obtained with AB estimations.

With regard to the impact of top 5% income share concentration on subsequent per capita GDP growth, AB estimates show a positive and very significant coefficient of about 0.56. This estimation is larger than the one obtained with Fixed Effects and First Differences, and is also very robust to all the tests for both serial correlation and instrument validity (p-values are above 0.5 in all the cases, far above the 0.1 threshold). In addition, the estimations provide a positive but not significant coefficient of income per capita growth, a similar finding to the one obtained with First Differencing. As it will be shown in the robustness checks, once the year 2009 is eliminated from the sample (2009 is the year of deepest crisis in Spain, as shown in Section II) the coefficient becomes positive and very significant. Since the validity test performed for this estimate (even if all the tests are above the threshold of 0.1) is not as high as the one found in the GDP estimations, the results for income per capita growth should be interpreted cautiously.

Arellano-Bond estimates confirm the results found by Fixed Effects and First Differencing regarding the impact of top 5% concentration on credit acquisition. In this case the point estimates of AB are very close to the point estimates obtained by Fixed Effects and above those found by First Differencing. In both cases, aggregate and per capita credit growth, the estimates are positive and significant at the 1% level. However, the tests that validate these estimates have a different performance for each variable of credit acquisition. In concrete, the results of the Hansen tests for aggregate credit growth are better than those for credit per capita growth. For the latter, the Hansen tests for the validity of instruments are only slightly above the 0.1 threshold. Thus, the interpretation of the coefficient of credit per capita growth should be done more carefully.

Overall, the findings of this specification (lagged regressors on subsequent growth) are the following: there is a strong and robust effect of income concentration on both subsequent GDP per capita growth and subsequent aggregate private credit growth. However, there is an insignificant impact on income per capita growth (this finding is reversed dropping the year 2009). Regarding private credit per capita growth, the estimates suggest a positive and very significant impact of income concentration, in line with the aggregate behavior.

### 2.1.2 Current changes in regressors and current growth

The estimates of this subsection correspond to equations for current changes (i.e. changes in t in both sides of the regression). Hence, this framework is designed to capture effects in contemporary time. Results are the following:

Figure 2.2: Main Specification for top 5%. Current time

| Dependant Variable | logGDPpc | | logIncomePC | | logCredito | | logCreditoPC | |
|---|---|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B | F.D. | A-B |
| top5 | -0.357** | 0.344* | -0.720*** | -0.160 | 0.086 | 0.927*** | 0.068 | 0.650** |
| Standard Error | (0.137) | (0.182) | (0.184) | (0.333) | (0.157) | (0.331) | (0.141) | (0.283) |
| p-value | 0.012 | 0.064 | 0.000 | 0.633 | 0.585 | 0.007 | 0.632 | 0.026 |
| t-stat | -2.61 | 1.90 | -3.90 | -0.48 | 0.55 | 2.80 | 0.48 | 2.29 |
| Number of instruments | | 32 | | 32 | | 43 | | 43 |
| AR(2) | | 0.242 | | 0.140 | | 0.519 | | 0.264 |
| Hansen | | 0.277 | | 0.208 | | 0.457 | | 0.400 |
| Hansen test excluding groups | | 0.096 | | 0.107 | | 0.509 | | 0.217 |
| Difference in Hansen | | 0.889 | | 0.651 | | 0.331 | | 0.868 |
| R2 | 0.7593 | | 0.6241 | | 0.8224 | | 0.8416 | |
| Number observations | 276 | 276 | 276 | 276 | 276 | 276 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In what follows a similar analysis to the one made in the previous subsection, by method and estimator, is done.

#### First Differencing

Although warned in section III, the problem of the First Differencing estimator when used in current time is that it suffers from a new source of endogeneity, reverse causality, if the relationship between the dependent and the explanatory variable is bidirectional, biasing further the results. Nonetheless, in what follows, I present these estimations for the sake of gaining some insight and for comparing them to previous results.

The impact suggested from current changes in income concentration at the top over GDP per capita growth is negative and significant at the 5% level. The point estimate is -0.36, which taken at face value would be read as if an increase in one per cent point in the income concentration of the top 5% share would lead, on average, to a simultaneous decrease in per capita GDP growth of about 0.36 percent. Regarding income per capita, results show an even stronger negative relationship with a point estimate of -0.72 at the 1% significance level. Both estimates, with a period of difference, were estimated with opposite sign in the previous subsection.

In the same line of finding different results depending on the time lag, First Differencing estimates a positive but not significant relationship between changes in income concentration and credit acquired by the private sector. In the previous subsection, however, First Difference estimates of these same variables in a lagged relationship were very positive and significant at the 1% level. These results could be driven by different sources of endogeneity or, by the contrary, they could point out that the temporal dimension in

this relationship matters. The next section, with the results of the AB estimators, tests the predictions offered by the First Differencing estimator.

### Arellano-Bond

The estimated impact of income concentration on growth of GDP per capita is positive and slightly significant. The coefficient estimated is 0.34. In the robustness checks this result only holds when I use population aged 20 and more (rather than total population) to calculate GDP per capita. These results do not hold and become insignificant when, as robustness checks, I change the temporal dimension or the concentration definition variable (i.e. I use top 10% or top 20% instead of top 5% income share). It should be highlighted that under the present specification, tests for serial correlation are very satisfactory (the p-value in AR(2) is 0.242 and this is 0.242¿0.1) but still the Hansen test for excluding groups falls below the 0.1 threshold, suggesting that these results could be partially inconsistent.

In addition, AB estimations for income per capita growth are negative and not significant, with tests over the 0.1 threshold, though again, the Hansen test for excluding groups is close to be rejected. These results, seem to indicate a different relationship, in contemporary time, between income concentration and per capita economic performance: in lagged time the relationship pointed to positive, significant and robust (at least in the evolution of GDP per capita) but in contemporary changes, the impact is not significantly different from 0 and it is slightly positive only in one specification (see next section with the robustness checks).

The estimates for aggregate and per capita private credit growth obtained with the AB specification indicate a positive and significant relationship. In the case of aggregate credit, the point estimate is 0.92, implying that a one percentage point increase in the concentration of income by the top 5% leads to an increase of 0.92 percent in the rate of growth of this aggregate variable. The estimate is significant at the 1% level and all the tests yield very high p-values indicating high reliability. In addition, the point estimate for per capita credit growth is estimated to be about 0.65, significant at the 5% level, almost one third smaller than the coefficient of aggregate credit, and with all the validity tests yielding very high values.

These results, compared to the results of the previous section (lagged regressors on subsequent changes), show a different effect coming from income concentration. On the one hand, the estimates for growth in GDP per capita changed drastically, from being positive and very significant to insignificant or just slightly significant. Results for income per capita are not significant either in contemporary time (however they are very significant with one lag of difference once the year 2009 is dropped from the analysis). The impact of income share concentration on credit acquisition, when looking at both aggregated and per capita credit, is estimated to be positive, very significant, and very similar in both contemporary and lagged time. However, results for the validity tests are better in contemporary case.

## 2.2 Robustness Checks

One concern regarding the results presented in this study, and which I cannot test, is whether population in provinces changed over years due to internal migrations. I do think this is not driving the results for two reasons. In the first place, as already noted, despite it is true that Spain had an important process of immigration during the analyzed years, I control for that when I include the share of foreign-born residents in each province and year in the econometric regressions. In the second place, as mentioned in section II, Spain has one of the lowest internal migration rates of all the OECD countries (see for example OECD 2005), in part due to the high reliance of Spanish population on property housing tenure rather than renting. Among OECD countries, Spain has one of the highest rates of housing tenure. Hence, the strikingly low native mobility supports the assumption that the units under analysis have a similar native composition, with notable changes coming from inflows of foreign-born residents, which are controlled for in the regression.

In addition, to check the validity obtained in the main results (table 2.1.1 and table 2.1.2), I estimate the same specifications with some changes in the data and the temporal dimension, to check if results hold or by the contrary could be driven by some type of the selectivity. Three are the changes introduced. First, I change the variable capturing the concentration of income. In doing so, I use the two other measures I could calculate: top 10% income share and top 20% income share. Second, I calculate the per capita variables (GDP, income, credit) using the population over 20 years rather than the total population, as it is done to calculate top income shares. Third, I drop the year 2009, clearly an outlier given the strength of the current crisis during this year.

### 2.2.1 Changes in the definition of Top income

Figure 2.3: Main Specification for top 10%. Lagged time

| Dependant Variable | GrowthGDPpc | | | GrowthIncomePC | | | GrowthCredito | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top10t10 | 0.336*** | 0.225** | 0.519*** | 0.448*** | 0.156 | 0.314 | 0.969*** | 0.765*** | 1.046*** | 0.756*** | 0.565*** | 0.795** |
| Standard Error | (0.105) | (0.0941) | (0.152) | (0.148) | (0.117) | 0.327 | (0.222) | (0.187) | 0.317 | (0.226) | (0.180) | (0.339) |
| p-value | | | 0.001 | | | 0.924 | | | 0.002 | | | 0.024 |
| t-stat | | | 3.42 | | | 0.10 | | | 3.29 | | | 2.34 |
| Number of instruments | | | 33 | | | 33 | | | 38 | | | 38 |
| AR(2) | | | 0.648 | | | 0.286 | | | 0.979 | | | 0.942 |
| Hansen | | | 0.637 | | | 0.134 | | | 0.159 | | | 0.103 |
| Hansen test excluding groups | | | 0.498 | | | 0.254 | | | 0.300 | | | 0.072 |
| Difference in Hansen | | | 0.694 | | | 0.127 | | | 0.120 | | | 0.461 |
| R2 | 0.829 | 0.729 | | 0.678 | 0.624 | | 0.887 | 0.830 | | 0.869 | 0.820 | |
| Number observations | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 2.4: Main Specification for top 10%. Current time

| Dependant Variable | logGDPpc | | logIncomePC | | logCredito | | logCreditoPC | |
|---|---|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B | F.D. | A-B |
| top10 | -0.463*** | 0.255 | -0.891*** | -0.279 | 0.0755 | 0.749*** | 0.0533 | 0.494** |
| Standard Error | (0.126) | (0.161) | (0.171) | (0.298) | (0.140) | (0.275) | (0.127) | (0.222) |
| p-value | | 0.121 | | 0.354 | | 0.006 | | 0.031 |
| t-stat | | 1.58 | | -0.94 | | 2.91 | | 2.22 |
| Number of instruments | | 32 | | 32 | | 43 | | 43 |
| AR(2) | | 0.197 | | 0.087 | | 0.420 | | 0.210 |
| Hansen | | 0.274 | | 0.208 | | 0.400 | | 0.423 |
| Hansen test excluding groups | | 0.095 | | 0.093 | | 0.488 | | 0.220 |
| Difference in Hansen | | 0.886 | | 0.723 | | 0.266 | | 0.905 |
| R2 | 0.772 | | 0.671 | | 0.842 | | 0.822 | |
| Number observations | 276 | 276 | 276 | 276 | 276 | 276 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The last two tables show the results when using the top 10% income share rather than the top 5% income share as a concentration measure. Results are almost identical in both cases, in point estimates, significance and robustness to different tests of validity. The unique remarkable difference is that in current time, when using the top 10% the impact on GDP per capita growth is no longer significant (as it was at the 10% level when using the top 5% income share). In addition, it should be noted that the point estimates with top 10% are slightly below those of the top 5%.

Figure 2.5: Main Specification for top 20%. Lagged time

| Dependant Variable | GrowthGDPpc | | | GrowthIncomePC | | | GrowthCredito | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top20t10 | 0,29*** | 0,24*** | 0,45*** | 0,42*** | 0,19 | -0,02 | 0,88*** | 0,76** | 0,87** | 0,69*** | 0,58*** | 0,77** |
| p-value | 0,007 | 0,010 | 0,006 | 0,004 | 0,125 | 0,957 | 0,000 | 0,000 | 0,002 | 0,001 | 0,002 | 0,013 |
| t-stat | | 2,70 | 2,86 | | 1,56 | -0,05 | 4,45 | 4,23 | 3,33 | 3,39 | 3,32 | 2,580 |
| Number of instruments | | | 33 | | | 33 | | | 38 | | | 38 |
| AR(2) | | | 0,526 | | | 0,277 | | | 0,867 | | | 0,803 |
| Hansen | | | 0,588 | | | 0,127 | | | 0,150 | | | 0,086 |
| Hansen test excluding groups | | | 0,509 | | | 0,288 | | | 0,251 | | | 0,041 |
| Difference in Hansen | | | 0,578 | | | 0,095 | | | 0,149 | | | 0,628 |
| R2 | 0.828 | 0.730 | | 0.679 | 0.625 | | 0.887 | 0.831 | | 0.869 | 0.822 | |
| Number observations | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 | 322 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 2.6: Main Specification for top 20%. Current time

| Dependant Variable | logGDPpc | | logIncomePC | | logCredito | | logCreditoPC | |
|---|---|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B | F.D. | A-B |
| top20 | -0,51*** | 0,16 | -0,96*** | -0.37 | 0,06 | 0,57*** | 0,04 | 0,36** |
| p-value | 0,000 | 0,224 | 0,000 | 0,131 | 0,607 | 0,005 | 0,723 | 0,039 |
| t-stat | -5,07 | 1,23 | -7,38 | -1,54 | 0,52 | 2,96 | 0,36 | 2,13 |
| Number of instruments | | 32 | | 32 | | 43 | | 43 |
| AR(2) | | 0,156 | | 0,049 | | 0,327 | | 0,174 |
| Hansen | | 0,264 | | 0,186 | | 0,295 | | 0,393 |
| Hansen test excluding groups | | 0,110 | | 0,075 | | 0,370 | | 0,213 |
| Difference in Hansen | | 0,803 | | 0,75 | | 0,248 | | 0,864 |
| R2 | 0.789 | | 0.731 | | 0.842 | | 0.822 | |
| Number observations | 276 | 276 | 276 | 276 | 276 | 276 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

These tables present the results for the top 20% income share as a concentration measure. The tables show the same picture that the results for top 10%. Again, the point estimates, the significance levels and the robustness tests are very similar to those of the top 5% and top10% income share. If anything, the level of significance of the impact on aggregate credit growth in lagged time is lower than it was with the two previous measures, being now this relationship significant at the 5% level, instead of at the 1% like in the other two specifications. Similarly, the point estimates are slightly below those of top 10%, which were already below those of top 5% income share. Interestingly, these results from table 3 to 6 indicate that the impact of income concentration on the other variables comes from the very top of the distribution (the top 5 %) rather than from broader measures.

### 2.2.2 Changes in the calculation of per capita values: population 20 or over.

Figure 2.7: Specification of top 5% for population aged 20+. Lagged time

| Dependant Variable | GrowthGDP20pc | | | GrowthIncome20PC | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top5t10 | 0.338*** | 0.171** | 0.551*** | 0.272*** | 0.027 | 0.154 | 0.878*** | 0.585*** | 0.876** |
| Sd | (0.087) | (0.084) | (0.161) | (0.0674) | (0.123) | (0.331) | (0.247) | (0.188) | (0.376) |
| p-value | 0 | 0.047 | 0.001 | 0,000 | 0.828 | 0.643 | 0.001 | 0.003 | 0.024 |
| t-stat | 3.89 | 2.04 | 3.43 | 4.04 | 0.22 | 0.47 | 3.55 | 3.11 | 2.33 |
| Number of instruments | | | 33 | | | 33 | | | 38 |
| AR(2) | | | 0.628 | | | 0.512 | | | 0.970 |
| Hansen | | | 0.519 | | | 0.072 | | | 0.115 |
| Hansen test excluding groups | | | 0.424 | | | 0.164 | | | 0.090 |
| Difference in Hansen | | | 0.586 | | | 0.095 | | | 0.414 |
| R2 | 0.256 | 0.730 | | 0.195 | 0.618 | | 0.870 | 0.821 | |
| Number observations | 322 | 288 | 288 | 322 | 288 | 288 | 322 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 2.8: Specification of top 5% for population aged 20+. Current time

| Dependant Variable | logGDPpc | | logIncomePC | | logCreditoPC | |
|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B |
| top5 | -0.312** | 0.378** | -0.725*** | -0.259 | 0.512 | 0.622** |
| Sd | (0.125) | (0.162) | (0.167) | (0.341) | (0.145) | (0.290) |
| p-value | 0.016 | 0.024 | 0,000 | 0.005 | 0.726 | 0.037 |
| t-stat | -2.5 | 2.33 | -4.33 | 2.95 | 0.35 | 2.15 |
| Number of instruments | | 32 | | 32 | | 43 |
| AR(2) | | 0.157 | | 0.415 | | 0.241 |
| Hansen | | 0.366 | | 0.126 | | 0.385 |
| Hansen test excluding groups | | 0.165 | | 0.16 | | 0.210 |
| Difference in Hansen | | 0.84 | | 0.225 | | 0.853 |
| R2 | 0.744 | | 0.610 | | 0.819 | |
| Number observations | 288 | 288 | 288 | 288 | 276 | 276 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

This specification calculates the variables GDP per capita and income per capita as the ratio between real GDP and real income over the population aged 20 or more (rather than total population), as it was done in the construction of the top income shares. Estimates in this specification closely follow those from the main results. The point estimates are slightly lower than those in the main specification. The single result which adds a different tone to previous findings is that in contemporary changes, top 5% concentration of income is found to impact GDP per capita growth positively and significantly at the 5% level, with a coefficient of about 0.37. Nevertheless, this result should be interpreted cautiously since the Arellano Bond AR(2) test for autocorrelation in the error terms yields a p-value of 0.157, only slightly above the threshold of 0.1 (recall that the null hypothesis is absence of autocorrelation).

### 2.2.3 Changes in the period under analysis: 2002 to 2008

This analysis tries to identify if the results could be driven by the year 2009, which was an outlier in terms of economic activity given that was the year that absorbed the worst of the current economic crisis. To provide some figures of the change between 2008 and 2009, unemployment rose from 11.3% to 18%, exports fell from an annual growth of 1.7% to -13.2%, real GDP growth fell from 0.8% to -3.9% and public deficit changed from -4.5% to -11.2%. Results excluding the year 2009 are presented in the following two tables:

Figure 2.9: Specification of top 5% over the period 2002 to 2008. Lagged time

| Dependant Variable | GrowthGDPpc | | | GrowthIncomePC | | | GrowthCredito | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top5t10 | 0.281* | 0,13067 | 0.489** | 0.422*** | 0.132 | 0.489** | 0.976*** | 0.769*** | 1.106** | 0.768*** | 0.530** | 0.818* |
| Sd | (0.141) | (0.117) | (0.203) | (0.132) | (0.116) | (0.203) | (0.259) | (0.214) | (0.448) | (0.257) | (0.216) | (0.4214) |
| p-value | 0.053 | 0.27 | 0.02 | 0.003 | 0.263 | 0.02 | 0,000 | 0.001 | 0.017 | 0.005 | 0.018 | 0.058 |
| t-stat | 1.99 | 1.12 | 2.41 | 3.19 | 1.13 | 2.41 | 3.76 | 3.59 | 2.47 | 2.98 | 2.45 | 1.94 |
| Number of instruments | | | 27 | | | 27 | | | 31 | | | 31 |
| AR(2) | | | 0.9 | | | 0.899 | | | 0.772 | | | 0.662 |
| Hansen | | | 0.648 | | | 0.647 | | | 0.182 | | | 0.076 |
| Hansen test excluding groups | | | 0.652 | | | 0.651 | | | 0.137 | | | 0.041 |
| Difference in Hansen | | | 0.468 | | | 0.467 | | | 0.461 | | | 0.525 |
| R2 | 0.758 | 0.756 | | 0.745 | 0.757 | | 0.847 | 0.829 | | 0.828 | 0.824 | |
| Number observations | 276 | 230 | 230 | 276 | 230 | 230 | 276 | 230 | 230 | 276 | 230 | 230 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 2.10: Specification of top 5% over the period 2002 to 2008. Current time

| Dependant Variable | logGDPpc | | logIncomePC | | logCredito | | logCreditoPC | |
|---|---|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B | F.D. | A-B |
| top5 | -0.403*** | 0.421 | -0.403*** | 0.423 | -0.008 | 1.051** | -0.048 | 0.894** |
| Sd | (0.147) | (0.286) | (0.147) | (0.286) | (0.171) | (0.449) | (0.156) | (0.414) |
| p-value | 0.009 | 0,148 | 0.009 | 0.146 | 0.961 | 0.024 | 0.759 | 0.036 |
| t-stat | -2.75 | 1,47 | -2.74 | 1.48 | -0.05 | 2.34 | -0.31 | 2.16 |
| Number of instruments | | 26 | | 26 | | 36 | | 36 |
| AR(2) | | 0.532 | | 0.532 | | 0.547 | | 0.293 |
| Hansen | | 0.478 | | 0.478 | | 0.409 | | 0.307 |
| Hansen test excluding groups | | 0.178 | | 0.187 | | 0.425 | | 0.207 |
| Difference in Hansen | | 0.941 | | 0.941 | | 0.373 | | 0.646 |
| R2 | 0.663 | | 0.674 | | 0.743 | | 0.724 | |
| Number observations | 230 | 230 | 230 | 230 | 230 | 230 | 230 | 230 |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

These tables show very similar results to the ones obtained in the main specification. However, there is one important difference that was already mentioned before. Contrary to the specification for the years 2002 to 2009 where the lagged effect of income concentration did not show a significant effect on income per capita growth (however it was found a positive, significant and robust effect on the GDP per capita growth), when excluding the year 2009 there is a positive and significant impact of top 5% income concentration on income per capita growth.

The results from the validity tests are very strong with p-values above 0.4 (far above the 0.1 threshold). It should be noted that in the main specification, the absence of significant result was accompanied by far lower values in the validity tests (i.e. the difference in Hansen test gave a result of 0.118, only slightly above 0.1). In the appendix the same period is tested using the top 20% income share rather than the top 5%. Similar results show up in these specifications.

## 2.3 Summary of the results

From the main specification and the robustness checks, the following results from the AB estimations (recall that Fixed Effect and First Differencing are inconsistent by definition) could be summarized:

- Lagged timing: there is very strong evidence of a positive impact of income concentration (top5, top10, top20) on subsequent GDP per capita growth and on income per capita growth (in the latter, this is true once the year 2009 is dropped). In addition, the evidence shows a strong positive link between income concentration and both aggregate private credit growth and private per capita credit growth. However, the results for the effect on credit are less robust to the tests intended to validate the AB estimations (although in all the cases the p-values are over the threshold of 0.1).

- Contemporary timing: the evidence about the impact of income concentration on GDP per capita growth is mixed. It only shows significance for the top 5% income share measures, and the validity tests are not very strong. The impact on current income per capita is never significant and if anything, estimates tend to be negative. By the contrary, results of current changes in income concentration on private credit acquisition show a positive and very significant effect, very robust to all type of validity tests.

- In the two timings, both lagged and contemporary, top 5% income share relative to top 10% and top 20% shows slightly higher point estimates and stronger results. The same is true for top 10% relative to top 20%. This indicates that the effect of changes in income concentration in the variables under analysis comes from the top of the distribution (the top 5%) rather than from broader measures of concentration. This finding is consistent with the behavior of top income shares in Spain at the aggregate level during this same period (see figure 1.10), where the "top of the top" income shares (especially the top 1% and 0.1%) appear to be driving the behavior of broader measures like the top 10%.

## 2.4 Interpretation of the results

The results of this study should be understood in the specific context of Spain during the years 2002 to 2009. As explained in Section II, these were special years, characterized by a huge housing bubble, an important process of immigration and very weak conditions in the access to credit. In addition, it should be noted that these results correspond to yearly data for a short period of time. Therefore, all these results should be understood locally, as in principle they might be driven by the specific conditions of the Spanish economy during this period, and also by the short run relationship between income concentration and the growth of GDP, income and credit.

Three facts about this period and this relationship between income concentration, economic growth and credit expansion should be clarified before interpreting the results. First, for the period 2002 to 2009 there is an important increase in top income shares between 2002 and 2006, especially at the very top (1% and 0.1%), followed by an important decrease. Second, this expansion in top income shares coincides in time with a notable growth in average GDP per capita between 2002 and 2007 (average real yearly increase of 1.57%) followed by two years of crisis with a fall in real per capita GDP of -0.75% in 2008 and -4.63% in 2009. Third, during the period 2002 to 2006 aggregate private credit grew in real terms around 84% while household private credit grew during the same period, also in real terms, around 60%. Throughout 2007, 2008 and 2009, household credit decreased by 2.5% while overall private credit grew by about 2% (data from Figure 1.4).

### Impact from top 5% income concentration on GDP/income growth

As summarized above, the findings in this study show a positive, significant and very robust impact of changes in income concentration on subsequent GDP and income per capita growth. In addition, results do not show this impact on contemporary time for income per capita growth, and only show a positive and slightly significant coefficient for GDP per capita growth in few specifications.

I consider that the results found in my study can be understood resorting to the following three arguments and theoretical frameworks in line with the literature in this area:

1. Aggregate demand. This explanation focuses on the lower propensity for consumption at the top of the income distribution, which implies higher propensity for savings (i.e Kaldor 1957). This theory predicts that a higher concentration of income at the top would lead to more savings, which could be translated into more investment and entrepreneurship, generating a positive impact on future GDP and income per capita growth.

   The higher propensity for savings is predicted to decrease aggregate consumption in the immediate time. Given that aggregate consumption is about 67% of Spanish GDP, this would lead to a reduction of present income/GDP per capita. Taken literally, this theory could fit the facts presented in my study. Nevertheless, it could be argued that productive capital could need a longer temporal horizon to show up economic returns, and maybe the one-year lag is not a far enough temporal distance.

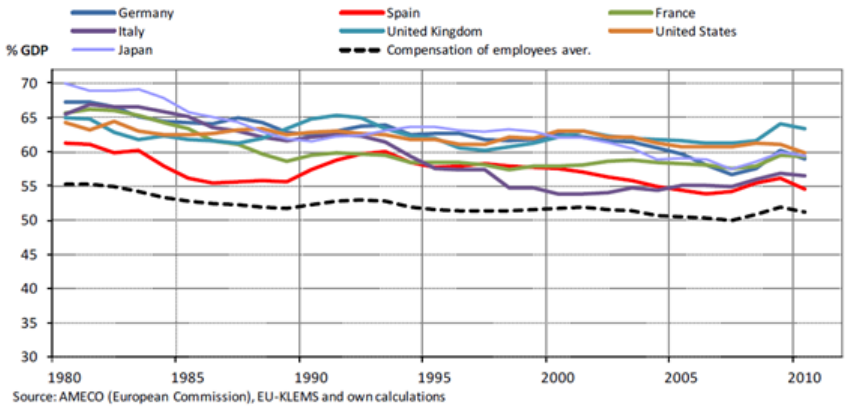
2. Debt led economic growth. This theory, recently presented for the case of the US by Cynamon and Fazzari (2008), argues that growth in aggregate demand, and particularly in consumption, could be financed by debt but not necessarily by real income increases. My study finds a positive and very significant relationship between income concentration and credit per capita growth in both current and lagged timing. Following the debt led economic growth theory, this increase in debt would lead to increases in demand in both periods, lagged and contemporary.

Therefore, while the first theory predicts a present negative effect and a future positive effect, this debt led growth theory would predict an increase in the aggregate demand when credit increases, which in my study happens in both present and future time. Thus, both theories find opposite predictions for the present time and similar predictions for the future. The complement between both theories could help to explain my results: no impact or just slightly positive impact of income concentration on GDP/income per capita growth in current time (when both forces go on opposite directions), but clear positive results with a lagged period (when both theories predict an increase in growth).

3. The third theory, developed by Piketty (2014), argues that capital returns tend to grow faster than the economy. Therefore, if capital ownership is concentrated at the top of the income distribution, it could be expected that top income shares (which reflect both labor and capital returns) would grow faster than the rest of the economy. If there is an increase in top income shares in one period, it could be expected that top incomes would grow faster from that period to the next one, if indeed, the rate of return of capital is higher than that of the economy (r¿g). Hence, average GDP/income per capita might also increase, but not necessarily because the overall economy grows faster but rather because the top does. Indeed, the strong Spanish growth observed between 2002 and 2007 coincides with a sharp increase in the top income share (as it was shown in Section II), where it is specially striking the acute increase in the top 1 %. The top 1% increased its share in the total Spanish economy in about 3.36 percentage points between 2002 and 2006 (from 9.24% to 12.6% share in total income), followed by a rapid fall. This coincides with the movements in the rates of return (taking the Spanish Stock market IBEX 35 as reference).

   In parallel, and consistent with this rise in top shares, labor shares in Spain fell during the same period as shown in the following graph (taken from the work of Angel Estrada and Eva Valdeolivas "The fall of labour income share in advanced economies", Banco de España, 2012):

Figure 2.11: Evolution of Compensation of employment over GDP




This graph clearly shows how labor shares sharply decreased in the period 2002 to

2006, and subsequently recovered from 2007 to 2009.

Complementing the two previous graphs, the next table shows the returns of labor relative to other type of returns, using the Spanish Annual Sample Income Tax Return (IRPF), which is the same source I use to compute top income shares.

Figure 2.12: Evolution of Net Revenues (% share over the total), 1999-2009

| | Evolution of Net Revenues (% share over the total) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Net Labor income | Net income from capital | Net revenue from fixed capital | Net revenue from economic activities | Net Revenues from estimated economic activities (excluding agriculture, livestock and forestry) | Net Revenues from estimated activity on agriculture, livestock and forestry activities | Capital gains, general part | Capital gains, special part |
| **1999** | 74,71 | 4,17 | 2,96 | 7,68 | 4,20 | 1,43 | 1,58 | 4,27 |
| **2000** | 74,22 | 4,37 | 2,82 | 7,26 | 3,34 | 1,42 | 1,00 | 5,57 |
| **2001** | 75,98 | 4,79 | 2,90 | 6,83 | 3,20 | 1,41 | 0,57 | 4,32 |
| **2002** | 77,54 | 4,52 | 2,81 | 6,61 | 2,86 | 1,48 | 0,42 | 3,75 |
| **2003** | 81,56 | 3,68 | 2,02 | 5,21 | 2,32 | 1,11 | 0,41 | 3,70 |
| **2004** | 78,90 | 3,48 | 1,86 | 4,71 | 1,51 | 2,47 | 0,47 | 6,60 |
| **2005** | 77,35 | 3,74 | 1,89 | 4,62 | 1,37 | 1,72 | 0,60 | 8,71 |
| **2006** | 71,69 | 3,99 | 1,75 | 4,55 | 1,10 | 1,55 | 0,66 | 14,70 |
| **2007** | 72,29 | 5,49 | 2,02 | 5,24 | 1,14 | 1,74 | 0,16 | 11,91 |
| **2008** | 77,44 | 6,92 | 2,11 | 4,78 | 1,11 | 1,34 | 0,18 | 6,11 |
| **2009** | 79,16 | 6,97 | 2,11 | 4,38 | 1,01 | 1,07 | 0,25 | 5,05 |

Source: Pérez López et al. 2013

This table (from Pérez López et al. 2013) shows exactly the same trend than the previous graph, with a sharp decline in labor shares during the years 2002 to 2006 (from 77,54% of total income to 71,69%) followed by an increase from 2007 to 2009 (from 72,29% to 79,19%). Capital gains (in the last column) have exactly the opposite trend (from 3,75% to 14,70% in 2002-2006 and from 11,91% to 5,05% in 2007-2009).

Together these three theories could help to understand the type of economic growth and income concentration observed in Spain during the period under study, and I consider them potentially as complements rather than competing models since their predictions and dynamics could be interacting. Taking the reference point estimate of 0.56 from the AB estimations for the effect of income concentration on subsequent economic growth, the average yearly increase in the top1% of the income share (which should be driving top 5%) of about 0.84 percent points (3.36/4 periods) during the years 2002 to 2006 would imply that about 0.47 points (0.84*0.563) of the yearly GDP per capita growth of 1.69% in 2003 to 2007 is explained by the impact of increasing top shares. This represents a 27.8% (0.47/1.69) of the total yearly per capita growth, a very notable number.

### Impact from top 5% income concentration on aggregate and per capita credit growth

The results for the impact from top income concentration on credit growth are positive and significant in both current and lagged time. However, the validity tests for the AB

estimations are much stronger in current time than in lagged time. Still, all the tests in lagged time show p-values over the threshold of 0.1.

The relationship between income concentration and indebtedness has recently gained attention in the economic research. For instance, Kumhof, Ranciere and Winant (2013) have set a model for this mechanism linking increases in income concentration with increases in household indebtedness. The model by Kumhof et al. predicts that a larger concentration of income at the top of the distribution would increase savings at the top, enlarging the financial intermediation sector. At the same time, this increase in top income concentration would lead the middle class to borrow more to sustain their relative living standards, increasing their debt to income ratio, which could ultimately lead to an excess of indebtedness and to the fragility of the financial sector.

As explained above, in Spain between 2002 and 2006 there was a notable increase in top income shares (i.e. of about 3.34 percentage points for the 1% top income share between 2002 and 2006), followed by a decrease from 2007 to 2009, starting with the 2007 US subprime crisis. In this same period there was a huge increase in private indebtedness as it will be explained below.

Despite the robust finding of increases in private credit, it is important to keep in mind that the variable for private credit is an aggregate of all the credit not acquired by the public sector and hence it includes households, firms and financial institutions. The way the private credit variable is defined (as an aggregate) represents a difficulty to explain the result of the increase in private credit through the theories mentioned above. These theories focus their analysis on households' behavior and not on the other components of the private sector.

Additionally, the theory by Kumhof et al. relates changes in income concentration with changes in indebtedness for those households below the top share of the income distribution. However, I cannot distinguish who is acquiring this new credit in the population by income level from these aggregate figures. Consequently, to test the validity of this theory, I need to explore the evolution of credit in Spain as a whole (rather than at the province level). At the country level there is information on both the evolution of credit acquisition by firms, financial institutions and households, and there is also information about the behavior of the different income deciles.

The information about the evolution of the three components of the private sector is taken from the "Financial Accounts". This information is provided in a quarterly basis by the Bank of Spain. In addition, the evolution of the different deciles of the income distribution is taken from the "Households Financial Survey" (Encuesta Financiera a las Familias in Spanish) also prepared by the Bank of Spain every three years since 2001 (the survey is made in the month of December for the each of the years presented). I include information for households' evolution for the years 2001, 2004 and 2007. My objective is to check: if there is evidence of a rise in household's indebtedness, if households' indebtedness could be a remarkable component in the aggregate private credit, and also if there is a differential evolution in the dynamics of debt acquisition as predicted by Kumhof et al.

The first aspect to be noted is the huge expansion in private credit during the period

2002 to 2007 followed by a sudden stop in the rate of growth in 2008 and 2009. Figure 2.13 presents the rate of growth of the three components of the private credit, and also of the aggregate value.

Figure 2.13: Annual private credit real growth, by Households, Firm and Financial Institutions, 2002-2009

| | Households credit real growth rate | firms credit real growth rate | Financial firms credit real growth rate | sector credit real growth rate |
|---|---|---|---|---|
| 2003 | 0,169 | 0,104 | 0,539 | 0,195 |
| 2004 | 0,172 | 0,151 | 0,506 | 0,231 |
| 2005 | 0,160 | 0,220 | 0,412 | 0,249 |
| 2006 | 0,095 | 0,135 | 0,284 | 0,166 |
| 2007 | 0,001 | 0,030 | 0,012 | 0,017 |
| 2008 | -0,004 | -0,005 | 0,071 | 0,019 |
| 2009 | -0,022 | 0,006 | -0,028 | -0,012 |
| 2002-2009 | 0,570 | 0,642 | 1,796 | 0,864 |
| 2002-2006 | 0,596 | 0,611 | 1,740 | 0,841 |
| 2006-2009 | -0,025 | 0,031 | 0,055 | 0,023 |

Source: Financial accounts, Bank of Spain

During the period 2002 to 2006, households increased their acquisition of credit in about 60% (summing up the years 2003 to 20076). This is slightly inferior to the aggregate credit increase in the same period (84%), during which the financial sector had a notably higher increase than the average (174%). For the years 2007-2009 the overall credit increased in 2.5%, while households decreased their credit acquisition by 2.5%. This latter period corresponds with the years in which the economic crisis started.

Figure 2.14 shows the share that households' credit represented in the overall credit acquired by the private sector.

This figure shows that in 2002 households' represented 32.66% of total private credit while in 2007 it represented 26.72%. This drop is mainly driven by the increase in the total share gained by the financial sector. Still, it shows that households credit represented between 1/3 and 1/4 of total private credit, which is a relevant number.

The following two tables (figures 2.15 and 2.16) are taken from the "Households Finance Survey" and analyses households' indebtedness by income deciles and quintiles. The first table shows how many households by deciles and quintiles had some debt in the year of the survey and also the change in the share of households with some debt by level of income.

The striking result is that all the deciles bellow the top 10% experienced an increase in the share of households indebted between 2001 and 2004 while the top 10% did not. In addition, from 2004 to 2007 there is an increase in the number of households with some debt at the median of the distribution, a fall in the bottom and stagnation in the other

Figure 2.14: Share institutional sectors on total private credit, 2002-2009

| | Households | Non financial institutions | Financial Institutions | Total Private |
|---|---|---|---|---|
| 2002 | 32,66 | 54,85 | 12,48 | 100,00 |
| 2003 | 32,72 | 51,24 | 16,04 | 100,00 |
| 2004 | 32,01 | 47,46 | 20,53 | 100,00 |
| 2005 | 30,53 | 44,48 | 24,99 | 100,00 |
| 2006 | 28,40 | 43,45 | 28,15 | 100,00 |
| 2007 | 26,72 | 42,32 | 30,96 | 100,00 |
| 2008 | 26,34 | 42,83 | 30,83 | 100,00 |
| 2009 | 25,74 | 41,83 | 32,43 | 100,00 |

Source: Financial accounts, Bank of Spain

Figure 2.15: Shares of households with some debt, by income level. 2001, 2004, 2007.

| | 2001 | 2004 | 2007 | Change 2001-2007 |
|---|---|---|---|---|
| Below 20 | 15,7 | 18,7 | 16,2 | 0,5 |
| From 20 to 40 | 37,6 | 42,3 | 42,3 | 4,7 |
| From 40 to 60 | 49,4 | 57,5 | 63,6 | 14,2 |
| From 60 to 80 | 54,0 | 63,0 | 61,6 | 7,6 |
| From 80 to 90 | 58,1 | 66,5 | 67,9 | 9,8 |
| From 90 to 100 | 64,2 | 65,4 | 65,1 | 0,9 |

Source: Family Financial Survey, Bank of Spain 2002, 2005, 2008.

levels. Overall, between 2001 and 2007 there is an important expansion in the number of households indebted in the middle incomes (from the 20% to the 90% of the income distribution), with almost no increase in the bottom quintile and in the top 10%. This result, in principle, coincides with the prediction made by Kumhof et al. for the increase in debt at the middle of the distribution. Constraints in the access to credit could explain the low change in the number of households indebted at the very bottom 20%.

Figure 2.16 analyzes the debt to income ratio in the median household of each income level.

Analyzing the change between 2001 and 2007, it is observed a large change in the debt to income ratios in the middle of the distribution, ranging from an increase of 29.6 percentage points to 50.3 percentage points. By the contrary, the median household at the top 10% increased its debt to income ratio by 20.9 percentage points while the bottom 20% did only increased in 4.5 percentage points.

From these figures it is possible to conclude the following. During the period 2002

Figure 2.16: Median household (by income level group) debt / income ratio. 2001, 2004, 2007.

| | 2001 | 2004 | 2007 | Change 2001-2007 |
|---|---|---|---|---|
| Below 20 | 123,0 | 87,0 | 127,5 | 4,5 |
| From 20 to 40 | 90,5 | 117,8 | 131,8 | 41,3 |
| From 40 to 60 | 92,1 | 110,8 | 142,4 | 50,3 |
| From 60 to 80 | 69,0 | 119,3 | 100,7 | 31,7 |
| From 80 to 90 | 51,6 | 91,7 | 81,2 | 29,6 |
| From 90 to 100 | 51,0 | 70,0 | 71,9 | 20,9 |

Source: Family Financial Survey, Bank of Spain 2002, 2005, 2008.

to 2007 households represented between 1/3 and 1/4 of the total private credit in Spain, which is a notable part of total credit, and we could expect firms and financial institutions to react to the behavior households, hence not being the other components of the private credit independent of households' behavior. In addition there is an important increase in the number of households indebted in the middle incomes (from the 20% to the 90% of the income distribution), being the largest increase for the median quintile (40 to 60). In the same line, the debt to income ratio for the median household in each group of income experienced an important increase in its debt to income ratio, being this increase especially important for the middle incomes, and much less for the bottom quintile and the top 10% income share. Again, the largest increase in the debt to income ratio corresponds with the median household of the economy (that of the middle quintile).

Summed up, all these findings are perfectly coherent with the thesis suggested by Kumhof et al. pointing to increases in income concentration as a causal factor for the increase in middle incomes indebtedness. The point estimates found in the main specification suggest that an increase of one percentage point in the concentration of the top 5% share leads to a contemporary increase in private credit growth of about 0.93 percent, while with one lag of difference this estimate is of 1.14 percent. If we take as reference the increase in 3.34 percentage points at the top 1% between 2002 and 2006 (therefore with a yearly average increase of about 0.84 percentage points) we can calculate how much of the real credit growth is accounted by increases in income concentration during this period.

The accumulated effect is of about 6.9552 percentage points in this period (0.84*0.93*4 + 0.84*1.14*4, without taking into account the next change between 2006 and 2007 in income concentration). This represents an average annual increase in credit acquisition of about 1.7388 percentage points. Given that the average annual increase in private credit during this same period was of 21%, this implies that the model accounts for the increase of 8.2% of the total private credit acquired during this period (1.7388/21). Although of not a high magnitude, it seems to be reasonable, and in line with the fact that during this same period there were other powerful drivers leading the rise in private credit acquisition like the low interest rates set by the European Central Bank and the housing bubble, which

generated a wealth effect that, with no doubts, triggered credit acquisition.

## 2.5 Conclusion

This study analyzes the impact of income concentration on GDP/income per capita and on the credit acquired by the private sector, and it uses observations of provinces in Spain (46) during 8 consecutive years (2002-2009). These years coincide with a huge housing bubble in Spain, with a large process of immigration and with an acute crisis in the final years (2008-2009). Based on this setting, this study overcomes the usual problems found in the inequality-growth-debt studies based on international comparison, mainly the difficulty to compare indexes taken from different sources, the low number of observations used to carry out econometrical tests and the lack of understanding about the dynamics driving changes in indexes like GINI.

Three are the main findings of this study. First, it detects that it is the "top of the top" of the income distribution (i.e. top 5% rather than top 10% or top 20%) what is impacting the evolution of provincial GDP/income per capita and provincial credit acquisition by the private sector. This is consistent with the idea that incomes at the top have a different composition and behavior than the rest of the economy. Second, it detects a positive and significant relationship between changes in income concentration and subsequent GDP/income per capita growth. However, this relationship does not show up, or it is just weakly positive, in current time (i.e. how changes in income concentration affect GPD/income/credit acquisition at the same time). These findings are consistent with aggregate demand theories (e.g. Keynes in his General Theory), debt led growth theories (e.g. Cynamon and Fazzari 2008) and capital/income theories (Piketty 2014). Third, it finds a positive relationship between income concentration and credit acquisition, both in present and with one period of lagged time. These results are in line with the theoretical model of Kumhof et al (2013), which predicts a rise in middle classes' indebtedness when income concentration at the top of the distribution increases. Although the data on private credit at the province level used in this study does not allow dissecting which sector of the economy is reacting to changes in income concentration, a look at the data for the whole Spanish economy seems to confirm with great accuracy the predictions of the model. This national perspective clearly shows a rapid increase in middle income households' indebtedness with very low variation at the top of the distribution.

In addition to the econometrical setting, the present study contributes to the understanding of regional income distribution in Spain as it provides measures of income concentration at the province level, an analysis never made before. Two are the main findings in this data. On the one hand, it reflects a negative relationship between the level of income concentration and the level of income per capita, probably reflecting long run factors in each of the regions (i.e. the historical distribution of land or the decisions to locate industries). On the other hand, this data shows that most of the regions experienced an increase in income concentration from 2002 to 2006, which was reversed in the subsequent years (2007-2009). This shows a procyclical behavior of income concentration during this time.

Overall these findings fit the literature on the short run relationship between income concentration and both debt and income growth improving key deficiencies found in previous studies, and it calls for new explorations of this relationship in other contexts and time. For the case of Spain, this study improves our understanding of the mechanisms leading the impressive process of indebtedness followed by the private sector in the years previous to the crisis, and also the type of economic growth happened in this time. The release of new years of data (from 2010 on) would allow testing the dynamics found in here with those of the crisis, in what seems to be a promising analysis.

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# APPENDIX

This appendix contains different tables supporting the information contained in the study. Appendix I explains the instrumental variable used as a complement in the AB estimations. Appendix II provides an additional robustness check to the one presented in the text. Appendix III includes tables with the information of each variable by province and year.

## Appendix I

### 2.5.1 The instrument

As pointed in the section IV (DATA), in addition to the lags of the explanatory variables, the Arellano Bond estimator, uses an instrumental variable, which predicts the share of Foreign Born residents in each province and year between 2002 and 2009. The initial idea was to create an instrument for changes in inequality, something already not exploited in the income-growth literature, at least in a time dynamic way, allowing for the use of panel data (Easterly 2007 uses an instrument in his study but is static, therefore using a limited number of observations, which affected the asymptotic properties needed to find consistent estimates). The basic idea beside this instrument is that Spain, during the 2000s received a very important number of immigrants, of which, about 80% came from low income countries (low income countries are those with income below the Spanish one in 2002). To make clear the magnitude of this phenomenon, it should be noted that foreign born residents represented 2.28% of the total population in Spain in 2000, and 12% in 2009.

Following the initial work by Card (2000) for the case of the US, my intention was to generate exogenous predictions of immigrant arrivals to Spain, a method already applied in the international literature and in the case of Spain (i.e. Sanchis-Guarner 2014). The inspiration was that this increase in immigration could have led to increases in inequality in those regions where immigrants settled more intensely. And so it probably happened. Indeed, though not causal, correlation for the relationship between share of foreign born residents and top 20% share shows a positive relationship, as could be expected. Nevertheless, the instrument resulted weak to use it alone. However, given that the Arellano Bond sums different instruments I included it in these regressions, and as it, I will describe it here.

The instrument, to be exogenous, requires the prediction of foreign born residents in each year and province to have no correlation with the variant error term determining credit growth or GDP/income growth (the invariant part of the error term is controlled by the three estimators used in the regressions, see Section III). Therefore, this prediction needs to be uncorrelated with all the variant determinants that are not included in the regressions. I made the predictions with the instrument in 2 steps.

In the first step, I calculated a prediction of foreign born arrivals to Spain from each country of origin. To do this, I used data from the International Migrations Database (OECD) and ran an OLS regression based exclusively in factors affecting foreign born residents in their countries of origin (i.e. unemployment, population growth, GDP per capita, inequality) or in fixed geographical or historical factors relating these countries to Spain (i.e. latitude, longitude, main language spoken, coincident colonial past, etc.). In addition, I included a set of regional dummies. This method closely followed the work by Sanchís-Guarner (2014). Once the OLS regressions are estimated I recuperate each specific country prediction for the number of arrivals to Spain from this nationality every year. Up to here, the argument of exogeneity should hold as non of the regressors could be argued to be related to those variant factors affecting GDP/income or credit in a concrete province of Spain (recall that fixed factors affecting all the provinces are also eliminated by the three estimators used in the study).

In the second step, I need to assign which immigrants go to each province in Spain. However, this method needs to be unrelated to those factors affecting provincial performance in the years analyzed. To overcome this problem, I use the Census from the year 1991. The idea is to assign immigrants arriving to Spain in the same proportion that each nationality had in each province of Spain in that base year. The intention is to capture the selection of immigrants to go to a concrete province based on the previous links they had with residents from their own nationality, rather than for factors affecting the performance in terms of GDP/income or credit in each province during the years 2002 to 2009. For example, if in 1991 12% of Moroccan residents were living in Barcelona, 8% in Madrid, 11% in Malaga,... for each of the predictions of new arrivals of Moroccans to Spain I will use this same share to assign them to the different provinces. The use of the 1991 Census year allows arguing in favour of the exogeneity of the instrument. For instance, in 1991 only a 0.91% of the population was foreigner, whereas in 2002 this figure was already 4.73% and in 2009 it was 12.0%, which implies that in any case, these links are not contaminated by changes in immigration in between. In addition, and more importantly, between 1991 and 2002 Spain had experienced numerous changes making very unlikely that those variant factors specific to a province were the same in 1991 than in 2002. In particular, between 1991 and 2002 there was an economic crisis, the adhesion to Schengen and the entrance on the Euro area. It is clear that the Spanish economy suffered a strong transformation within these years.

These predictions for migrations have resulted useful to predict migrations in other works (i.e. the already cited by Sanchís-Guarner), but for this concrete study failed to be strength enough to generate consistent estimates. Nonetheless, as it was already mentioned, it was included in the set of instruments of Arellano-Bond estimations as it could help to generate a group of instruments with higher explanatory power.

# APPENDIX II

## 2.5.2 Robustness checks for top 20% income share and population aged 20 or more

Figure 2.17: Robustness checks. Top 20%. Population aged 20+. Lagged time.

| Dependant Variable | GrowthGDP20pc | | | GrowthIncome20PC | | | GrowthCreditoPC | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.E. | F.D. | A-B | F.E. | F.D. | A-B | F.E. | F.D. | A-B |
| top20t10 | 0.240*** | 0.209** | 0.520*** | 0.215*** | 0.0876 | 0.114 | 0.713*** | 0.590*** | 0.792*** |
| Sd | (0.0756) | (0.0795) | (0.156) | (0.0595) | (0.123) | (0.339) | (0.203) | (0.176) | (0.290) |
| p-value | | | 0.002 | | | 0.738 | 0.001 | 0.002 | 0.009 |
| t-stat | | | 3.33 | | | 0.34 | 3.51 | 3.36 | 2.73 |
| Number of instruments | | | 33 | | | 33 | | | 38 |
| AR(2) | | | 0.482 | | | 0.413 | | | 0.748 |
| Hansen | | | 0.424 | | | 0.061 | | | 0.082 |
| Hansen test excluding groups | | | 0.410 | | | 0.158 | | | 0.041 |
| Difference in Hansen | | | 0.427 | | | 0.078 | | | 0.591 |
| R2 | 0.272 | 0.733 | | 0.215 | 0.619 | | 0.869 | 0.822 | |
| Number observations | 322 | 288 | 288 | 322 | 288 | 288 | 322 | 276 | 276 |

Figure 2.18: Robustness checks. Top 20%. Population aged 20+. Current time.

| Dependant Variable | GrowthGDP20pc | | GrowthIncome20PC | | GrowthCreditoPC | |
|---|---|---|---|---|---|---|
| | F.D. | A-B (3lags) | F.D. | A-B (3lags) | F.D. | A-B |
| top20 | -0.443*** | 0.194 | -0.958*** | -0.494** | 0.020 | 0.333* |
| Sd | (0.0984) | (0.118) | (0.121) | (0.232) | (0.111) | (0.175) |
| p-value | | 0.105 | | 0.038 | 0.857 | 0.062 |
| t-stat | | 1.65 | | -2.13 | 0.18 | 1.91 |
| Number of instruments | | 32 | | 32 | | 43 |
| AR(2) | | 0.117 | | 0.081 | | 0.160 |
| Hansen | | 0.360 | | 0.099 | | 0.392 |
| Hansen test excluding groups | | 0.202 | | 0.070 | | 0.200 |
| Difference in Hansen | | 0.721 | | 0.415 | | 0.895 |
| R2 | 0.771 | | 0.724 | | 0.819 | |
| Number observations | 288 | 288 | 288 | 288 | 276 | 276 |

# APPENDIX III

### 2.5.3 Tables for GDP per capita, income per capita, top income shares, unemployment rate and proportion of foreign born residents in the economy for the years 2002 to 2009, by provinces (excluding Basque country provinces, Navarra, Ceuta and Melilla.

Figure 2.19: GDP per Capita by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 13317 | 13322 | 13685 | 13971 | 14265 | 14278 | 14065 | 14082 |
| ALICANTE | 15162 | 15338 | 16137 | 16359 | 16632 | 16762 | 15997 | 14938 |
| ALMERIA | 16772 | 17006 | 17227 | 17387 | 17692 | 18516 | 17605 | 16093 |
| AVILA | 13353 | 13808 | 14748 | 14910 | 15775 | 17134 | 16648 | 16457 |
| BADAJOZ | 11217 | 11793 | 12091 | 13086 | 13442 | 14095 | 14082 | 13669 |
| BALEARES | 20264 | 20115 | 20832 | 21201 | 21764 | 22018 | 21194 | 19907 |
| BARCELONA | 20807 | 20932 | 21368 | 21844 | 22381 | 23160 | 22516 | 21185 |
| BURGOS | 19000 | 19901 | 20750 | 21423 | 21734 | 22753 | 22505 | 21233 |
| CACERES | 11349 | 11890 | 12873 | 13020 | 13640 | 14261 | 13922 | 13602 |
| CADIZ | 13183 | 13552 | 14418 | 14953 | 15533 | 15845 | 15389 | 14463 |
| CASTELLON | 19309 | 19214 | 19281 | 20459 | 21184 | 20689 | 19492 | 17998 |
| CIUDAD REAL | 13890 | 14644 | 14914 | 14600 | 14851 | 15430 | 14770 | 13970 |
| CORDOBA | 11298 | 11916 | 12502 | 12750 | 13357 | 13894 | 13437 | 12906 |
| A CORUÑA | 14277 | 14725 | 15385 | 16124 | 16789 | 17729 | 17690 | 17383 |
| CUENCA | 13089 | 13621 | 14406 | 14580 | 15158 | 15924 | 14850 | 14320 |
| GIRONA | 21410 | 21476 | 21956 | 21968 | 23063 | 23068 | 21658 | 20618 |
| GRANADA | 12202 | 12682 | 13073 | 13315 | 14259 | 14724 | 14350 | 13705 |
| GUADALAJAF | 15731 | 15879 | 15800 | 16384 | 16224 | 16638 | 15925 | 14979 |
| HUELVA | 13780 | 14410 | 15359 | 16101 | 16187 | 16332 | 16094 | 14802 |
| HUESCA | 18320 | 18757 | 18937 | 18734 | 19138 | 20380 | 20174 | 18968 |
| JAEN | 11151 | 12293 | 12279 | 12083 | 12428 | 12946 | 12603 | 12346 |
| LEON | 14371 | 14872 | 15469 | 16530 | 17248 | 17911 | 17514 | 17502 |
| LLEIDA | 21856 | 22563 | 22660 | 21638 | 22850 | 23605 | 22822 | 22032 |
| LA RIOJA | 19234 | 19788 | 20007 | 20256 | 20750 | 21461 | 20765 | 19690 |
| LUGO | 12779 | 13258 | 13752 | 14986 | 15612 | 15973 | 15516 | 14986 |
| MADRID | 23407 | 23541 | 24220 | 24712 | 25802 | 26506 | 25608 | 24757 |
| MALAGA | 13178 | 13655 | 14584 | 15307 | 15539 | 15654 | 15176 | 14584 |
| MURCIA | 14714 | 14998 | 15328 | 15787 | 16109 | 16560 | 16159 | 15226 |
| OURENSE | 12685 | 13044 | 13208 | 13634 | 14061 | 14453 | 14434 | 13809 |
| ASTURIAS | 14788 | 15232 | 15851 | 16695 | 17670 | 18542 | 18313 | 17288 |
| PALENCIA | 16574 | 17318 | 18024 | 18633 | 18814 | 20225 | 19745 | 19098 |
| LAS PALMAS | 17006 | 17396 | 17879 | 18069 | 18729 | 19231 | 18496 | 17683 |
| PONTEVEDRA | 13476 | 14001 | 14836 | 15258 | 16175 | 17045 | 16902 | 16119 |
| SALAMANCA | 14465 | 15269 | 15640 | 15694 | 16116 | 16582 | 16238 | 16364 |
| TENERIFE | 15252 | 15731 | 16254 | 16744 | 17072 | 17423 | 16696 | 15696 |
| CANTABRIA | 16870 | 17267 | 17957 | 18729 | 19404 | 20254 | 19874 | 18902 |
| SEGOVIA | 17563 | 18318 | 18685 | 19418 | 20114 | 20640 | 19231 | 18173 |
| SEVILLA | 13463 | 14017 | 14456 | 15109 | 15411 | 16019 | 15531 | 14874 |
| SORIA | 17178 | 18074 | 18751 | 18088 | 18379 | 19068 | 18380 | 17343 |
| TARRAGONA | 22675 | 22766 | 23831 | 22670 | 22888 | 23223 | 22157 | 21217 |
| TERUEL | 18198 | 18349 | 18868 | 19843 | 20577 | 21273 | 20958 | 19708 |
| TOLEDO | 13651 | 14216 | 14202 | 15039 | 15584 | 16058 | 15226 | 14292 |
| VALENCIA | 16750 | 16891 | 17182 | 17218 | 17759 | 18543 | 18110 | 16924 |
| VALLADOLID | 18013 | 18356 | 19125 | 20111 | 20834 | 21695 | 20874 | 20080 |
| ZAMORA | 12712 | 13573 | 14440 | 14343 | 15458 | 16182 | 15907 | 15704 |
| ZARAGOZA | 18778 | 19452 | 19987 | 20604 | 21509 | 22312 | 21454 | 20361 |

Figure 2.20: Income per Capita by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 7983 | 7919 | 8082 | 8323 | 8719 | 8595 | 8554 | 9344 |
| ALICANTE | 9090 | 9118 | 9530 | 9746 | 10164 | 10089 | 9727 | 9412 |
| ALMERIA | 10055 | 10109 | 10173 | 10358 | 10811 | 11144 | 10704 | 9612 |
| AVILA | 8005 | 8208 | 8710 | 8883 | 9641 | 10313 | 10124 | 9659 |
| BADAJOZ | 6725 | 7010 | 7141 | 7796 | 8214 | 8483 | 8562 | 8348 |
| BALEARES | 12149 | 11958 | 12303 | 12629 | 13300 | 13252 | 12886 | 12361 |
| BARCELONA | 12474 | 12442 | 12618 | 13012 | 13678 | 13940 | 13690 | 12953 |
| BURGOS | 11390 | 11830 | 12255 | 12762 | 13283 | 13696 | 13684 | 12988 |
| CACERES | 6804 | 7069 | 7603 | 7757 | 8336 | 8584 | 8465 | 8047 |
| CADIZ | 7903 | 8056 | 8515 | 8907 | 9493 | 9537 | 9357 | 8643 |
| CASTELLON | 11576 | 11422 | 11387 | 12187 | 12945 | 12451 | 11850 | 11036 |
| CIUDAD REAL | 8327 | 8705 | 8808 | 8698 | 9077 | 9289 | 8983 | 8965 |
| CORDOBA | 6773 | 7084 | 7383 | 7596 | 8164 | 8363 | 8171 | 8373 |
| A CORUÑA | 8559 | 8753 | 9086 | 9605 | 10260 | 10670 | 10756 | 11067 |
| CUENCA | 7847 | 8097 | 8508 | 8685 | 9264 | 9586 | 9031 | 9280 |
| GIRONA | 12835 | 12766 | 12965 | 13086 | 14093 | 13882 | 13167 | 13077 |
| GRANADA | 7315 | 7539 | 7721 | 7932 | 8714 | 8862 | 8724 | 8528 |
| GUADALAJAF | 9431 | 9440 | 9331 | 9760 | 9915 | 10016 | 9685 | 10123 |
| HUELVA | 8261 | 8566 | 9071 | 9592 | 9893 | 9830 | 9786 | 8686 |
| HUESCA | 10983 | 11150 | 11184 | 11161 | 11698 | 12269 | 12269 | 12652 |
| JAEN | 6685 | 7308 | 7252 | 7198 | 7595 | 7792 | 7663 | 8056 |
| LEON | 8616 | 8841 | 9136 | 9847 | 10540 | 10780 | 10649 | 10432 |
| LLEIDA | 13102 | 13413 | 13382 | 12890 | 13965 | 14208 | 13877 | 13560 |
| LA RIOJA | 11531 | 11763 | 11815 | 12067 | 12683 | 12919 | 12627 | 12614 |
| LUGO | 7661 | 7881 | 8122 | 8927 | 9541 | 9615 | 9435 | 9407 |
| MADRID | 14033 | 13994 | 14303 | 14721 | 15768 | 15953 | 15570 | 15423 |
| MALAGA | 7900 | 8117 | 8613 | 9119 | 9496 | 9422 | 9227 | 9189 |
| MURCIA | 8821 | 8915 | 9052 | 9404 | 9844 | 9967 | 9824 | 9788 |
| OURENSE | 7605 | 7754 | 7800 | 8122 | 8593 | 8700 | 8777 | 9190 |
| ASTURIAS | 8866 | 9055 | 9361 | 9945 | 10798 | 11160 | 11134 | 10727 |
| PALENCIA | 9936 | 10295 | 10645 | 11100 | 11499 | 12176 | 12009 | 11437 |
| LAS PALMAS | 10195 | 10342 | 10560 | 10764 | 11445 | 11575 | 11247 | 10420 |
| PONTEVEDRA | 8079 | 8323 | 8762 | 9090 | 9886 | 10260 | 10278 | 10328 |
| SALAMANCA | 8672 | 9077 | 9237 | 9350 | 9850 | 9981 | 9874 | 10263 |
| TENERIFE | 9144 | 9352 | 9600 | 9975 | 10432 | 10485 | 10151 | 10018 |
| CANTABRIA | 10113 | 10265 | 10605 | 11157 | 11859 | 12191 | 12085 | 11233 |
| SEGOVIA | 10529 | 10889 | 11035 | 11568 | 12293 | 12423 | 11694 | 10812 |
| SEVILLA | 8071 | 8333 | 8538 | 9001 | 9419 | 9642 | 9443 | 9407 |
| SORIA | 10298 | 10745 | 11075 | 10776 | 11233 | 11478 | 11177 | 10921 |
| TARRAGONA | 13594 | 13534 | 14075 | 13505 | 13988 | 13978 | 13472 | 13517 |
| TERUEL | 10910 | 10907 | 11143 | 11820 | 12575 | 12803 | 12743 | 12505 |
| TOLEDO | 8184 | 8451 | 8387 | 8959 | 9523 | 9665 | 9257 | 9500 |
| VALENCIA | 10041 | 10041 | 10148 | 10257 | 10853 | 11161 | 11011 | 10787 |
| VALLADOLID | 10799 | 10912 | 11295 | 11980 | 12732 | 13058 | 12692 | 12145 |
| ZAMORA | 7621 | 8069 | 8528 | 8545 | 9448 | 9741 | 9673 | 9255 |
| ZARAGOZA | 11258 | 11563 | 11804 | 12274 | 13146 | 13430 | 13046 | 12734 |

Figure 2.21: Top 5% incomes share by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 0,21 | 0,22 | 0,22 | 0,23 | 0,24 | 0,25 | 0,23 | 0,22 |
| ALICANTE | 0,22 | 0,22 | 0,23 | 0,24 | 0,24 | 0,22 | 0,21 | 0,20 |
| ALMERIA | 0,17 | 0,18 | 0,19 | 0,22 | 0,21 | 0,19 | 0,17 | 0,18 |
| AVILA | 0,21 | 0,21 | 0,21 | 0,21 | 0,25 | 0,20 | 0,19 | 0,19 |
| BADAJOZ | 0,22 | 0,22 | 0,23 | 0,22 | 0,22 | 0,21 | 0,21 | 0,21 |
| BALEARES | 0,20 | 0,20 | 0,22 | 0,22 | 0,24 | 0,22 | 0,20 | 0,20 |
| BARCELONA | 0,24 | 0,25 | 0,25 | 0,26 | 0,28 | 0,27 | 0,23 | 0,23 |
| BURGOS | 0,19 | 0,20 | 0,19 | 0,18 | 0,20 | 0,19 | 0,17 | 0,18 |
| CACERES | 0,24 | 0,23 | 0,23 | 0,24 | 0,23 | 0,22 | 0,22 | 0,23 |
| CADIZ | 0,21 | 0,21 | 0,22 | 0,22 | 0,22 | 0,21 | 0,20 | 0,21 |
| CASTELLON | 0,21 | 0,24 | 0,26 | 0,27 | 0,30 | 0,24 | 0,21 | 0,20 |
| CIUDAD REAL | 0,19 | 0,19 | 0,19 | 0,20 | 0,25 | 0,21 | 0,20 | 0,20 |
| CORDOBA | 0,25 | 0,24 | 0,24 | 0,24 | 0,25 | 0,24 | 0,23 | 0,22 |
| A CORUÑA | 0,25 | 0,26 | 0,25 | 0,26 | 0,25 | 0,24 | 0,22 | 0,21 |
| CUENCA | 0,20 | 0,19 | 0,19 | 0,20 | 0,21 | 0,19 | 0,20 | 0,19 |
| GIRONA | 0,18 | 0,19 | 0,20 | 0,21 | 0,22 | 0,20 | 0,19 | 0,18 |
| GRANADA | 0,25 | 0,25 | 0,26 | 0,26 | 0,27 | 0,24 | 0,23 | 0,23 |
| GUADALAJAF | 0,23 | 0,26 | 0,27 | 0,30 | 0,32 | 0,28 | 0,27 | 0,23 |
| HUELVA | 0,19 | 0,19 | 0,19 | 0,19 | 0,20 | 0,19 | 0,18 | 0,20 |
| HUESCA | 0,18 | 0,19 | 0,20 | 0,21 | 0,25 | 0,21 | 0,18 | 0,17 |
| JAEN | 0,23 | 0,21 | 0,23 | 0,24 | 0,25 | 0,23 | 0,22 | 0,21 |
| LEON | 0,22 | 0,22 | 0,21 | 0,21 | 0,22 | 0,20 | 0,19 | 0,20 |
| LLEIDA | 0,16 | 0,17 | 0,17 | 0,19 | 0,22 | 0,19 | 0,17 | 0,16 |
| LA RIOJA | 0,20 | 0,21 | 0,22 | 0,23 | 0,28 | 0,22 | 0,23 | 0,19 |
| LUGO | 0,21 | 0,21 | 0,22 | 0,20 | 0,21 | 0,20 | 0,20 | 0,20 |
| MADRID | 0,26 | 0,26 | 0,26 | 0,27 | 0,29 | 0,27 | 0,26 | 0,25 |
| MALAGA | 0,24 | 0,26 | 0,26 | 0,25 | 0,26 | 0,23 | 0,22 | 0,21 |
| MURCIA | 0,21 | 0,22 | 0,23 | 0,24 | 0,27 | 0,22 | 0,21 | 0,20 |
| OURENSE | 0,22 | 0,22 | 0,23 | 0,23 | 0,24 | 0,21 | 0,21 | 0,21 |
| ASTURIAS | 0,25 | 0,24 | 0,25 | 0,24 | 0,25 | 0,23 | 0,22 | 0,22 |
| PALENCIA | 0,18 | 0,18 | 0,18 | 0,18 | 0,19 | 0,18 | 0,17 | 0,18 |
| LAS PALMAS | 0,20 | 0,20 | 0,20 | 0,20 | 0,21 | 0,20 | 0,19 | 0,20 |
| PONTEVEDRA | 0,23 | 0,23 | 0,23 | 0,25 | 0,23 | 0,21 | 0,20 | 0,20 |
| SALAMANCA | 0,23 | 0,23 | 0,22 | 0,23 | 0,26 | 0,24 | 0,23 | 0,22 |
| TENERIFE | 0,21 | 0,21 | 0,22 | 0,21 | 0,21 | 0,21 | 0,20 | 0,20 |
| CANTABRIA | 0,23 | 0,23 | 0,24 | 0,23 | 0,25 | 0,22 | 0,21 | 0,22 |
| SEGOVIA | 0,18 | 0,18 | 0,18 | 0,19 | 0,19 | 0,18 | 0,18 | 0,18 |
| SEVILLA | 0,24 | 0,25 | 0,25 | 0,25 | 0,25 | 0,26 | 0,23 | 0,23 |
| SORIA | 0,18 | 0,18 | 0,18 | 0,18 | 0,20 | 0,19 | 0,19 | 0,20 |
| TARRAGONA | 0,17 | 0,18 | 0,18 | 0,21 | 0,22 | 0,20 | 0,18 | 0,17 |
| TERUEL | 0,17 | 0,17 | 0,17 | 0,17 | 0,18 | 0,17 | 0,16 | 0,16 |
| TOLEDO | 0,21 | 0,22 | 0,23 | 0,23 | 0,25 | 0,22 | 0,21 | 0,20 |
| VALENCIA | 0,22 | 0,24 | 0,25 | 0,27 | 0,29 | 0,30 | 0,23 | 0,23 |
| VALLADOLID | 0,21 | 0,21 | 0,21 | 0,21 | 0,23 | 0,21 | 0,20 | 0,20 |
| ZAMORA | 0,21 | 0,21 | 0,20 | 0,21 | 0,22 | 0,19 | 0,19 | 0,20 |
| ZARAGOZA | 0,22 | 0,23 | 0,24 | 0,24 | 0,26 | 0,23 | 0,21 | 0,21 |

Figure 2.22: Top 10% incomes share by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 0,32 | 0,33 | 0,34 | 0,34 | 0,35 | 0,36 | 0,35 | 0,32 |
| ALICANTE | 0,33 | 0,33 | 0,33 | 0,34 | 0,34 | 0,32 | 0,31 | 0,30 |
| ALMERIA | 0,26 | 0,27 | 0,29 | 0,31 | 0,30 | 0,27 | 0,26 | 0,28 |
| AVILA | 0,33 | 0,33 | 0,32 | 0,32 | 0,36 | 0,30 | 0,29 | 0,30 |
| BADAJOZ | 0,34 | 0,35 | 0,35 | 0,33 | 0,34 | 0,32 | 0,31 | 0,32 |
| BALEARES | 0,30 | 0,30 | 0,31 | 0,32 | 0,33 | 0,31 | 0,29 | 0,29 |
| BARCELONA | 0,36 | 0,36 | 0,36 | 0,37 | 0,38 | 0,36 | 0,33 | 0,34 |
| BURGOS | 0,29 | 0,31 | 0,29 | 0,28 | 0,30 | 0,28 | 0,26 | 0,27 |
| CACERES | 0,37 | 0,36 | 0,35 | 0,37 | 0,36 | 0,33 | 0,33 | 0,35 |
| CADIZ | 0,32 | 0,33 | 0,33 | 0,34 | 0,32 | 0,32 | 0,30 | 0,33 |
| CASTELLON | 0,31 | 0,34 | 0,36 | 0,37 | 0,40 | 0,34 | 0,31 | 0,30 |
| CIUDAD REAL | 0,29 | 0,29 | 0,30 | 0,31 | 0,36 | 0,31 | 0,31 | 0,31 |
| CORDOBA | 0,38 | 0,37 | 0,37 | 0,37 | 0,38 | 0,35 | 0,35 | 0,33 |
| A CORUÑA | 0,38 | 0,38 | 0,38 | 0,37 | 0,37 | 0,34 | 0,33 | 0,32 |
| CUENCA | 0,31 | 0,31 | 0,30 | 0,30 | 0,32 | 0,29 | 0,30 | 0,30 |
| GIRONA | 0,27 | 0,28 | 0,29 | 0,30 | 0,31 | 0,29 | 0,28 | 0,26 |
| GRANADA | 0,38 | 0,38 | 0,39 | 0,39 | 0,39 | 0,36 | 0,34 | 0,35 |
| GUADALAJAF | 0,36 | 0,39 | 0,40 | 0,42 | 0,45 | 0,41 | 0,39 | 0,34 |
| HUELVA | 0,30 | 0,30 | 0,30 | 0,29 | 0,30 | 0,29 | 0,28 | 0,31 |
| HUESCA | 0,29 | 0,29 | 0,30 | 0,32 | 0,35 | 0,31 | 0,27 | 0,26 |
| JAEN | 0,35 | 0,33 | 0,35 | 0,36 | 0,37 | 0,34 | 0,34 | 0,32 |
| LEON | 0,34 | 0,34 | 0,33 | 0,33 | 0,33 | 0,30 | 0,30 | 0,31 |
| LLEIDA | 0,25 | 0,25 | 0,26 | 0,28 | 0,31 | 0,28 | 0,25 | 0,25 |
| LA RIOJA | 0,30 | 0,31 | 0,33 | 0,33 | 0,38 | 0,32 | 0,33 | 0,28 |
| LUGO | 0,33 | 0,33 | 0,34 | 0,32 | 0,32 | 0,30 | 0,30 | 0,31 |
| MADRID | 0,37 | 0,36 | 0,37 | 0,37 | 0,40 | 0,37 | 0,36 | 0,34 |
| MALAGA | 0,37 | 0,38 | 0,38 | 0,37 | 0,38 | 0,34 | 0,33 | 0,31 |
| MURCIA | 0,32 | 0,33 | 0,34 | 0,35 | 0,38 | 0,32 | 0,31 | 0,31 |
| OURENSE | 0,34 | 0,34 | 0,35 | 0,35 | 0,35 | 0,32 | 0,32 | 0,32 |
| ASTURIAS | 0,38 | 0,38 | 0,38 | 0,37 | 0,37 | 0,34 | 0,33 | 0,34 |
| PALENCIA | 0,29 | 0,28 | 0,28 | 0,28 | 0,30 | 0,27 | 0,26 | 0,28 |
| LAS PALMAS | 0,30 | 0,30 | 0,30 | 0,31 | 0,31 | 0,29 | 0,28 | 0,30 |
| PONTEVEDRA | 0,36 | 0,35 | 0,35 | 0,36 | 0,34 | 0,31 | 0,30 | 0,30 |
| SALAMANCA | 0,35 | 0,35 | 0,35 | 0,35 | 0,38 | 0,35 | 0,34 | 0,33 |
| TENERIFE | 0,32 | 0,32 | 0,33 | 0,31 | 0,32 | 0,30 | 0,30 | 0,30 |
| CANTABRIA | 0,34 | 0,35 | 0,35 | 0,34 | 0,36 | 0,33 | 0,31 | 0,33 |
| SEGOVIA | 0,28 | 0,28 | 0,28 | 0,29 | 0,29 | 0,27 | 0,27 | 0,28 |
| SEVILLA | 0,36 | 0,37 | 0,37 | 0,37 | 0,37 | 0,37 | 0,35 | 0,34 |
| SORIA | 0,29 | 0,29 | 0,28 | 0,29 | 0,30 | 0,29 | 0,29 | 0,30 |
| TARRAGONA | 0,25 | 0,27 | 0,27 | 0,30 | 0,32 | 0,29 | 0,27 | 0,26 |
| TERUEL | 0,27 | 0,27 | 0,27 | 0,27 | 0,28 | 0,26 | 0,24 | 0,24 |
| TOLEDO | 0,33 | 0,33 | 0,35 | 0,34 | 0,36 | 0,33 | 0,32 | 0,31 |
| VALENCIA | 0,34 | 0,35 | 0,37 | 0,39 | 0,41 | 0,40 | 0,34 | 0,34 |
| VALLADOLID | 0,33 | 0,33 | 0,33 | 0,32 | 0,34 | 0,31 | 0,30 | 0,31 |
| ZAMORA | 0,33 | 0,33 | 0,31 | 0,32 | 0,33 | 0,29 | 0,29 | 0,31 |
| ZARAGOZA | 0,33 | 0,34 | 0,35 | 0,35 | 0,37 | 0,33 | 0,31 | 0,31 |

Figure 2.23: Top 20% incomes share by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 0,48 | 0,50 | 0,51 | 0,51 | 0,52 | 0,52 | 0,51 | 0,47 |
| ALICANTE | 0,47 | 0,47 | 0,48 | 0,48 | 0,48 | 0,45 | 0,44 | 0,43 |
| ALMERIA | 0,38 | 0,39 | 0,42 | 0,44 | 0,42 | 0,39 | 0,37 | 0,40 |
| AVILA | 0,49 | 0,49 | 0,48 | 0,48 | 0,52 | 0,43 | 0,43 | 0,45 |
| BADAJOZ | 0,51 | 0,51 | 0,52 | 0,49 | 0,50 | 0,46 | 0,46 | 0,47 |
| BALEARES | 0,43 | 0,43 | 0,45 | 0,45 | 0,46 | 0,43 | 0,42 | 0,42 |
| BARCELONA | 0,52 | 0,52 | 0,52 | 0,52 | 0,53 | 0,50 | 0,47 | 0,48 |
| BURGOS | 0,45 | 0,46 | 0,44 | 0,43 | 0,45 | 0,42 | 0,40 | 0,41 |
| CACERES | 0,55 | 0,54 | 0,52 | 0,54 | 0,52 | 0,48 | 0,49 | 0,52 |
| CADIZ | 0,49 | 0,50 | 0,50 | 0,50 | 0,48 | 0,46 | 0,45 | 0,49 |
| CASTELLON | 0,46 | 0,49 | 0,52 | 0,52 | 0,54 | 0,47 | 0,44 | 0,44 |
| CIUDAD REAL | 0,44 | 0,44 | 0,44 | 0,46 | 0,51 | 0,46 | 0,46 | 0,46 |
| CORDOBA | 0,57 | 0,55 | 0,55 | 0,55 | 0,55 | 0,51 | 0,51 | 0,49 |
| A CORUÑA | 0,55 | 0,55 | 0,55 | 0,54 | 0,53 | 0,49 | 0,48 | 0,46 |
| CUENCA | 0,47 | 0,46 | 0,45 | 0,45 | 0,47 | 0,42 | 0,44 | 0,44 |
| GIRONA | 0,40 | 0,42 | 0,43 | 0,44 | 0,44 | 0,41 | 0,40 | 0,39 |
| GRANADA | 0,56 | 0,56 | 0,57 | 0,57 | 0,56 | 0,52 | 0,50 | 0,51 |
| GUADALAJAF | 0,54 | 0,58 | 0,59 | 0,61 | 0,64 | 0,59 | 0,57 | 0,52 |
| HUELVA | 0,45 | 0,45 | 0,44 | 0,44 | 0,44 | 0,42 | 0,41 | 0,46 |
| HUESCA | 0,44 | 0,45 | 0,46 | 0,47 | 0,51 | 0,45 | 0,41 | 0,39 |
| JAEN | 0,53 | 0,50 | 0,53 | 0,53 | 0,54 | 0,50 | 0,50 | 0,47 |
| LEON | 0,52 | 0,52 | 0,51 | 0,49 | 0,49 | 0,45 | 0,45 | 0,46 |
| LLEIDA | 0,37 | 0,38 | 0,38 | 0,41 | 0,43 | 0,40 | 0,38 | 0,37 |
| LA RIOJA | 0,45 | 0,46 | 0,48 | 0,48 | 0,53 | 0,45 | 0,46 | 0,41 |
| LUGO | 0,49 | 0,49 | 0,50 | 0,46 | 0,47 | 0,44 | 0,44 | 0,46 |
| MADRID | 0,52 | 0,52 | 0,52 | 0,52 | 0,54 | 0,51 | 0,50 | 0,48 |
| MALAGA | 0,54 | 0,55 | 0,54 | 0,52 | 0,53 | 0,48 | 0,47 | 0,46 |
| MURCIA | 0,47 | 0,48 | 0,49 | 0,50 | 0,53 | 0,46 | 0,45 | 0,44 |
| OURENSE | 0,49 | 0,49 | 0,50 | 0,50 | 0,51 | 0,46 | 0,47 | 0,46 |
| ASTURIAS | 0,58 | 0,58 | 0,58 | 0,56 | 0,55 | 0,51 | 0,50 | 0,52 |
| PALENCIA | 0,45 | 0,44 | 0,43 | 0,43 | 0,45 | 0,40 | 0,40 | 0,42 |
| LAS PALMAS | 0,44 | 0,43 | 0,44 | 0,44 | 0,44 | 0,41 | 0,41 | 0,44 |
| PONTEVEDRA | 0,53 | 0,52 | 0,51 | 0,52 | 0,49 | 0,45 | 0,44 | 0,44 |
| SALAMANCA | 0,53 | 0,52 | 0,52 | 0,52 | 0,55 | 0,51 | 0,51 | 0,49 |
| TENERIFE | 0,47 | 0,47 | 0,47 | 0,46 | 0,46 | 0,43 | 0,43 | 0,43 |
| CANTABRIA | 0,51 | 0,52 | 0,52 | 0,51 | 0,52 | 0,47 | 0,46 | 0,49 |
| SEGOVIA | 0,43 | 0,42 | 0,42 | 0,43 | 0,43 | 0,40 | 0,41 | 0,43 |
| SEVILLA | 0,54 | 0,54 | 0,55 | 0,54 | 0,54 | 0,52 | 0,50 | 0,50 |
| SORIA | 0,44 | 0,44 | 0,43 | 0,44 | 0,46 | 0,43 | 0,44 | 0,45 |
| TARRAGONA | 0,38 | 0,40 | 0,40 | 0,44 | 0,45 | 0,41 | 0,39 | 0,38 |
| TERUEL | 0,42 | 0,42 | 0,42 | 0,40 | 0,41 | 0,38 | 0,37 | 0,37 |
| TOLEDO | 0,49 | 0,49 | 0,52 | 0,50 | 0,53 | 0,47 | 0,47 | 0,46 |
| VALENCIA | 0,50 | 0,52 | 0,53 | 0,55 | 0,57 | 0,55 | 0,49 | 0,49 |
| VALLADOLID | 0,50 | 0,50 | 0,50 | 0,49 | 0,50 | 0,45 | 0,45 | 0,46 |
| ZAMORA | 0,50 | 0,49 | 0,47 | 0,48 | 0,48 | 0,43 | 0,43 | 0,45 |
| ZARAGOZA | 0,50 | 0,51 | 0,51 | 0,51 | 0,53 | 0,48 | 0,46 | 0,45 |

Figure 2.24: Unemployment rate by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 6,9 | 7,7 | 9,0 | 9,8 | 10,0 | 9,2 | 12,2 | 19,8 |
| ALICANTE | 10,7 | 12,3 | 10,6 | 9,6 | 9,6 | 10,5 | 13,5 | 22,0 |
| ALMERIA | 10,8 | 11,3 | 9,8 | 9,2 | 9,3 | 11,4 | 19,4 | 26,6 |
| AVILA | 9,0 | 8,9 | 9,5 | 8,6 | 6,8 | 6,9 | 11,3 | 19,0 |
| BADAJOZ | 19,6 | 16,4 | 18,1 | 17,4 | 14,6 | 14,0 | 15,8 | 21,3 |
| BALEARES | 7,6 | 9,8 | 9,2 | 7,3 | 6,5 | 7,2 | 10,2 | 18,0 |
| BARCELONA | 10,8 | 10,9 | 10,4 | 6,9 | 6,5 | 6,5 | 8,6 | 16,2 |
| BURGOS | 7,7 | 8,7 | 8,5 | 6,8 | 7,1 | 6,5 | 9,2 | 12,7 |
| CACERES | 18,2 | 18,8 | 15,8 | 13,0 | 11,2 | 11,2 | 14,5 | 19,4 |
| CADIZ | 27,1 | 23,3 | 22,8 | 17,6 | 15,3 | 15,0 | 19,2 | 26,8 |
| CASTELLON | 5,3 | 6,8 | 8,5 | 7,5 | 6,3 | 6,8 | 10,7 | 19,6 |
| CIUDAD REAL | 9,4 | 11,1 | 9,7 | 10,7 | 10,9 | 9,3 | 13,5 | 19,8 |
| CORDOBA | 21,2 | 21,1 | 20,8 | 14,8 | 14,5 | 13,8 | 16,3 | 26,0 |
| A CORUÑA | 12,9 | 13,8 | 14,5 | 9,6 | 8,1 | 8,2 | 8,9 | 11,5 |
| CUENCA | 9,4 | 9,2 | 8,7 | 6,4 | 6,9 | 5,8 | 8,0 | 16,0 |
| GIRONA | 8,7 | 10,4 | 8,7 | 7,3 | 6,4 | 8,0 | 11,0 | 18,0 |
| GRANADA | 19,7 | 17,8 | 13,4 | 13,1 | 11,0 | 11,9 | 19,3 | 26,2 |
| GUADALAJAF | 8,9 | 8,7 | 8,1 | 7,0 | 6,7 | 5,0 | 8,8 | 13,9 |
| HUELVA | 21,4 | 19,9 | 16,1 | 15,7 | 14,1 | 14,0 | 17,7 | 22,5 |
| HUESCA | 4,3 | 3,8 | 5,4 | 6,8 | 5,5 | 4,0 | 5,4 | 10,8 |
| JAEN | 18,4 | 18,9 | 18,2 | 16,0 | 13,6 | 13,1 | 16,5 | 23,6 |
| LEON | 10,4 | 9,5 | 8,3 | 10,8 | 8,9 | 7,7 | 9,5 | 14,6 |
| LLEIDA | 6,5 | 5,7 | 4,7 | 6,2 | 6,4 | 3,0 | 6,6 | 11,6 |
| LA RIOJA | 7,1 | 6,0 | 5,9 | 6,4 | 6,1 | 5,8 | 7,9 | 12,6 |
| LUGO | 9,2 | 8,1 | 8,8 | 6,7 | 6,6 | 5,8 | 6,3 | 9,4 |
| MADRID | 7,3 | 7,4 | 6,7 | 6,8 | 6,3 | 6,2 | 8,6 | 13,9 |
| MALAGA | 14,9 | 16,2 | 15,0 | 11,6 | 11,0 | 10,8 | 18,2 | 26,1 |
| MURCIA | 11,3 | 10,8 | 10,7 | 8,0 | 7,9 | 7,5 | 12,4 | 20,3 |
| OURENSE | 8,4 | 8,5 | 13,3 | 10,7 | 9,0 | 5,8 | 6,3 | 10,4 |
| ASTURIAS | 9,8 | 11,3 | 10,3 | 10,0 | 9,2 | 8,4 | 8,5 | 13,4 |
| PALENCIA | 8,5 | 9,2 | 7,4 | 7,4 | 7,2 | 6,2 | 9,7 | 14,6 |
| LAS PALMAS | 10,7 | 10,4 | 11,0 | 12,7 | 12,0 | 11,2 | 18,2 | 27,8 |
| PONTEVEDRA | 13,7 | 14,3 | 14,2 | 11,0 | 9,0 | 8,0 | 9,9 | 15,3 |
| SALAMANCA | 13,2 | 15,4 | 15,6 | 9,4 | 10,1 | 8,6 | 11,5 | 15,6 |
| TENERIFE | 11,5 | 12,3 | 12,9 | 10,6 | 11,2 | 9,6 | 16,1 | 24,0 |
| CANTABRIA | 10,0 | 10,4 | 10,6 | 8,5 | 6,5 | 6,0 | 7,2 | 12,0 |
| SEGOVIA | 9,6 | 9,8 | 8,7 | 6,9 | 7,5 | 5,6 | 10,4 | 12,7 |
| SEVILLA | 20,1 | 18,3 | 17,3 | 13,8 | 12,8 | 12,9 | 16,0 | 23,5 |
| SORIA | 4,8 | 4,9 | 4,3 | 5,2 | 5,2 | 4,7 | 5,6 | 10,5 |
| TARRAGONA | 8,7 | 7,8 | 8,6 | 7,1 | 6,3 | 6,5 | 10,1 | 17,1 |
| TERUEL | 6,0 | 4,7 | 4,3 | 4,7 | 3,8 | 4,5 | 6,3 | 10,3 |
| TOLEDO | 11,5 | 11,7 | 10,5 | 9,4 | 7,9 | 7,1 | 12,1 | 20,4 |
| VALENCIA | 12,1 | 11,5 | 10,8 | 8,7 | 7,9 | 8,0 | 11,2 | 20,2 |
| VALLADOLID | 13,1 | 13,1 | 13,4 | 9,1 | 8,0 | 7,1 | 8,9 | 12,6 |
| ZAMORA | 9,6 | 13,4 | 12,1 | 10,2 | 9,1 | 8,4 | 9,5 | 14,2 |
| ZARAGOZA | 6,2 | 7,5 | 5,9 | 5,8 | 5,8 | 5,7 | 7,9 | 14,0 |

Figure 2.25: provincial Share Foreign Born residents by province

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Prov** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| ALBACETE | 0,04 | 0,04 | 0,05 | 0,06 | 0,07 | 0,08 | 0,08 | 0,08 |
| ALICANTE | 0,15 | 0,16 | 0,19 | 0,20 | 0,22 | 0,24 | 0,24 | 0,24 |
| ALMERIA | 0,10 | 0,11 | 0,15 | 0,17 | 0,18 | 0,20 | 0,21 | 0,22 |
| AVILA | 0,02 | 0,03 | 0,04 | 0,04 | 0,05 | 0,07 | 0,07 | 0,07 |
| BADAJOZ | 0,01 | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 |
| BALEARES | 0,13 | 0,14 | 0,16 | 0,17 | 0,18 | 0,21 | 0,22 | 0,22 |
| BARCELONA | 0,08 | 0,09 | 0,11 | 0,12 | 0,13 | 0,14 | 0,15 | 0,15 |
| BURGOS | 0,03 | 0,04 | 0,05 | 0,06 | 0,06 | 0,09 | 0,09 | 0,09 |
| CACERES | 0,03 | 0,03 | 0,03 | 0,03 | 0,03 | 0,03 | 0,03 | 0,04 |
| CADIZ | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,04 | 0,04 | 0,04 |
| CASTELLON | 0,08 | 0,10 | 0,12 | 0,14 | 0,15 | 0,18 | 0,18 | 0,19 |
| CIUDAD REAL | 0,03 | 0,03 | 0,05 | 0,06 | 0,06 | 0,08 | 0,09 | 0,09 |
| CORDOBA | 0,01 | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 |
| A CORUÑA | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 |
| CUENCA | 0,04 | 0,05 | 0,07 | 0,07 | 0,09 | 0,11 | 0,12 | 0,13 |
| GIRONA | 0,11 | 0,12 | 0,15 | 0,17 | 0,18 | 0,20 | 0,21 | 0,22 |
| GRANADA | 0,03 | 0,03 | 0,04 | 0,05 | 0,06 | 0,07 | 0,07 | 0,07 |
| GUADALAJAF | 0,06 | 0,07 | 0,08 | 0,10 | 0,11 | 0,14 | 0,15 | 0,16 |
| HUELVA | 0,03 | 0,03 | 0,04 | 0,05 | 0,06 | 0,07 | 0,08 | 0,08 |
| HUESCA | 0,05 | 0,06 | 0,07 | 0,08 | 0,09 | 0,11 | 0,12 | 0,12 |
| JAEN | 0,01 | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 |
| LEON | 0,02 | 0,02 | 0,03 | 0,03 | 0,04 | 0,05 | 0,05 | 0,05 |
| LLEIDA | 0,06 | 0,08 | 0,11 | 0,13 | 0,14 | 0,16 | 0,18 | 0,18 |
| LA RIOJA | 0,07 | 0,09 | 0,10 | 0,11 | 0,12 | 0,14 | 0,15 | 0,14 |
| LUGO | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,04 | 0,04 |
| MADRID | 0,10 | 0,11 | 0,13 | 0,13 | 0,14 | 0,16 | 0,17 | 0,17 |
| MALAGA | 0,09 | 0,10 | 0,12 | 0,14 | 0,14 | 0,16 | 0,17 | 0,17 |
| MURCIA | 0,09 | 0,10 | 0,12 | 0,14 | 0,14 | 0,16 | 0,16 | 0,17 |
| OURENSE | 0,03 | 0,03 | 0,03 | 0,04 | 0,04 | 0,04 | 0,05 | 0,05 |
| ASTURIAS | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,04 | 0,04 | 0,05 |
| PALENCIA | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 | 0,03 | 0,04 | 0,04 |
| LAS PALMAS | 0,09 | 0,09 | 0,11 | 0,11 | 0,12 | 0,13 | 0,14 | 0,14 |
| PONTEVEDRA | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 | 0,04 | 0,04 | 0,04 |
| SALAMANCA | 0,02 | 0,03 | 0,03 | 0,04 | 0,04 | 0,04 | 0,05 | 0,05 |
| TENERIFE | 0,10 | 0,10 | 0,12 | 0,12 | 0,13 | 0,14 | 0,15 | 0,15 |
| CANTABRIA | 0,02 | 0,03 | 0,04 | 0,04 | 0,05 | 0,06 | 0,06 | 0,07 |
| SEGOVIA | 0,05 | 0,06 | 0,08 | 0,08 | 0,10 | 0,12 | 0,13 | 0,13 |
| SEVILLA | 0,01 | 0,02 | 0,02 | 0,03 | 0,03 | 0,03 | 0,04 | 0,04 |
| SORIA | 0,04 | 0,05 | 0,06 | 0,07 | 0,07 | 0,09 | 0,10 | 0,10 |
| TARRAGONA | 0,08 | 0,09 | 0,12 | 0,14 | 0,15 | 0,18 | 0,19 | 0,19 |
| TERUEL | 0,04 | 0,05 | 0,07 | 0,08 | 0,10 | 0,12 | 0,13 | 0,12 |
| TOLEDO | 0,05 | 0,06 | 0,07 | 0,08 | 0,09 | 0,11 | 0,12 | 0,12 |
| VALENCIA | 0,05 | 0,06 | 0,08 | 0,09 | 0,10 | 0,12 | 0,12 | 0,12 |
| VALLADOLID | 0,02 | 0,03 | 0,04 | 0,04 | 0,04 | 0,06 | 0,06 | 0,06 |
| ZAMORA | 0,01 | 0,01 | 0,02 | 0,02 | 0,03 | 0,04 | 0,04 | 0,04 |
| ZARAGOZA | 0,05 | 0,06 | 0,08 | 0,08 | 0,10 | 0,12 | 0,13 | 0,13 |

# APPENDIX IV

### 2.5.4 Graphs: Top 20% and top 5% incomes share evolution by province, 2002 to 2009.

Figure 2.26: Top 20% income share evolution, by province, 2002-2009

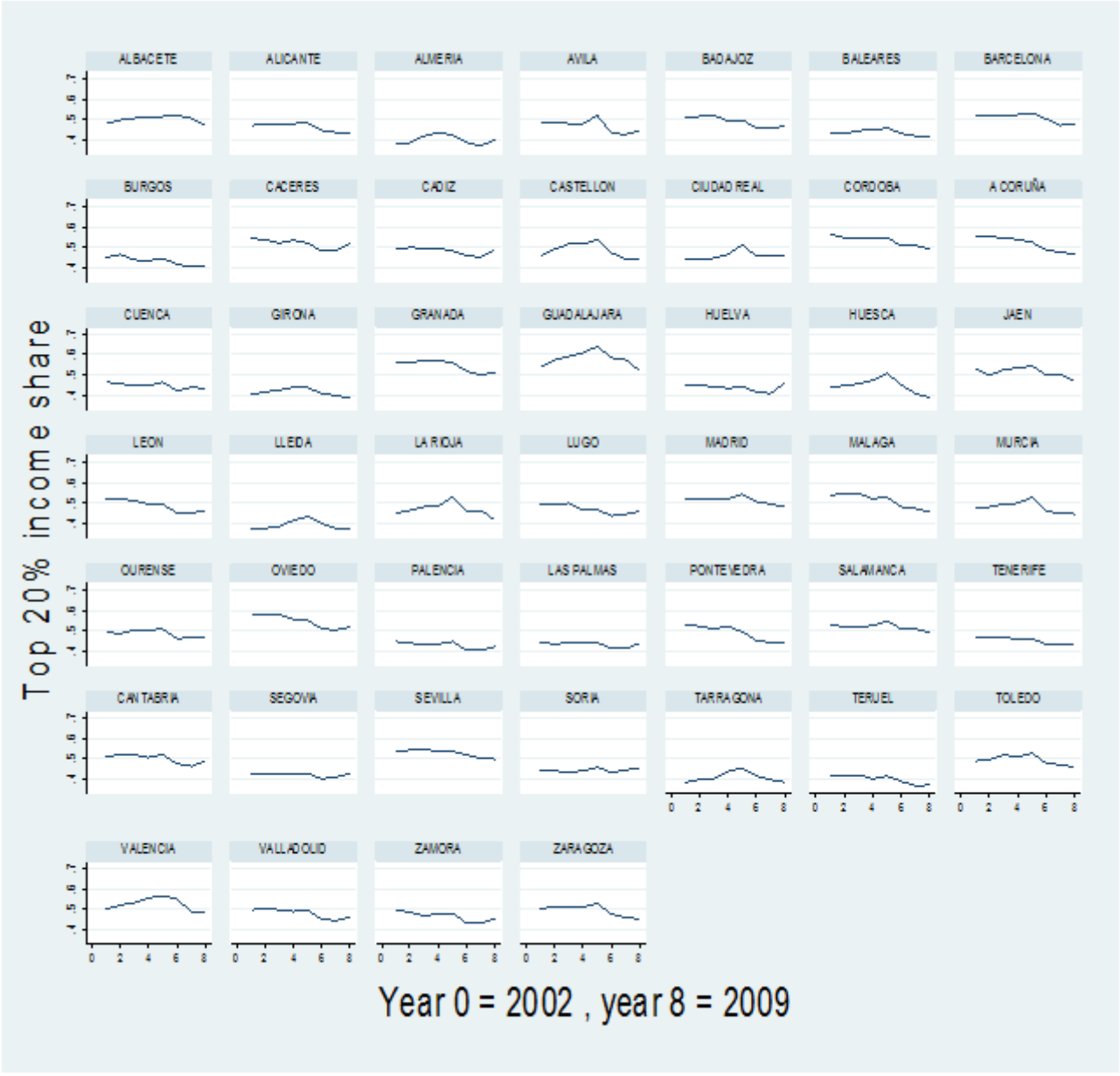

Figure 2.27: Top 5% income share evolution, by province, 2002-2009