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Does higher household debt increase the sensitivity of consumption to shocks?

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ABSTRACT

This paper analyses the impact of the accumulation of household debt in the growth rate of private consumption and the growth rate of unemployment.

The study was carried out with a sample of 17 regions of Spain, using the data provided by the databases BD mores, and the *Instituto Nacional de Estadística* (INE), in the period prior to the crisis of 2008, the period 2003-2007, and a period after to it, which is the period 2007-2010.

In our work we have done an econometric study of the data obtained, and analyzed the vulnerability of the autonomous communities.

The main result was that higher levels of household indebtedness led to lower rates of growth of private consumption and to larger increases in unemployment.

Keywords: household, debt, consumption, unemployment.

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Does higher household debt increase the sensitivity of consumption to shocks?

1. INTRODUCTION

The household sector represents a considerable part of all the agents involved in an economy of a country, since its decisions on consumption, saving and level of indebtedness affect the economy as a whole.

The crisis of 2008 has particularly affected this sector due to the bursting of a housing bubble, which began in the United States and eventually spread in a great part of the world.

In the period before the 2008 crisis, there was a significant increase in the level of household indebtedness, given that a large number of mortgage loans were granted to households for the purchase of housing.

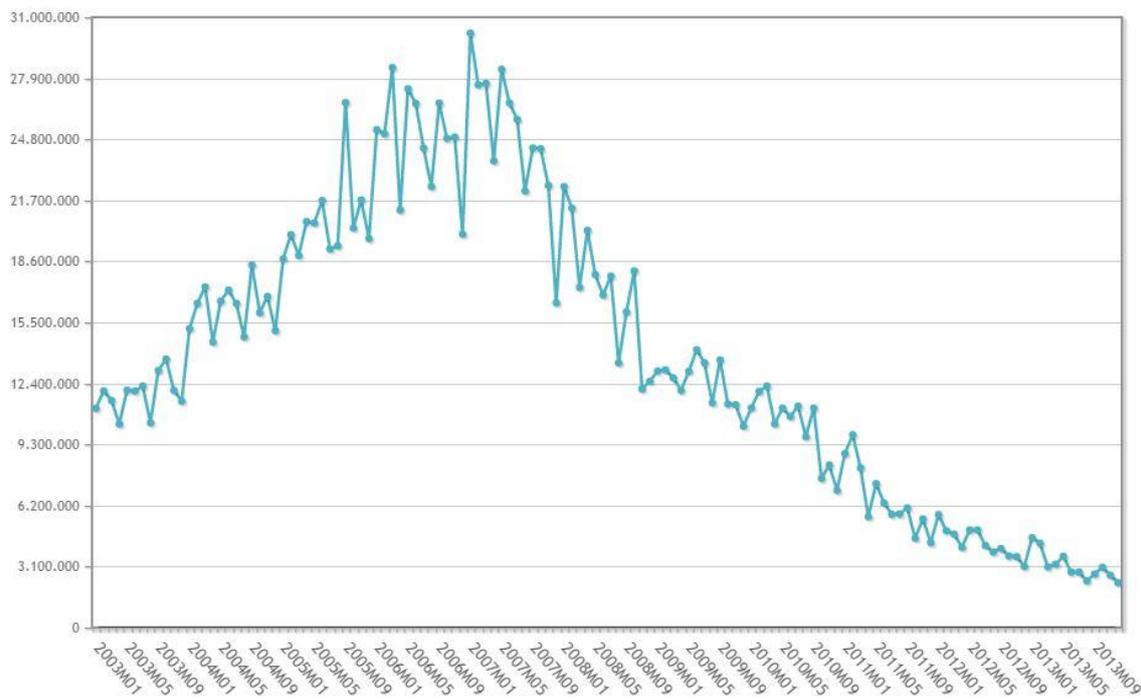
As observed by Krugman, P., & Eggertsson, G. (2013), household debt in Spain as a percentage of disposable income changed from 69% in 2000 to 130% in 2008, increased by 61% in 8 years.

Mortgages accounted for most of the debt of the household sector and accumulated in the years before the crisis with the expansion of the real estate market.

Figure 1 shows the total amount of mortgages given per month, measured in thousands of euros. We can see that this amount increased up to 2007. In this year the value of the mortgages granted per month reached, maximum, of almost 31 trillion euros.

After reaching this maximum value, the trend has been declining during the years following the beginning of the crisis in 2008.

Figure 1: Total amount of property mortgages in Spain



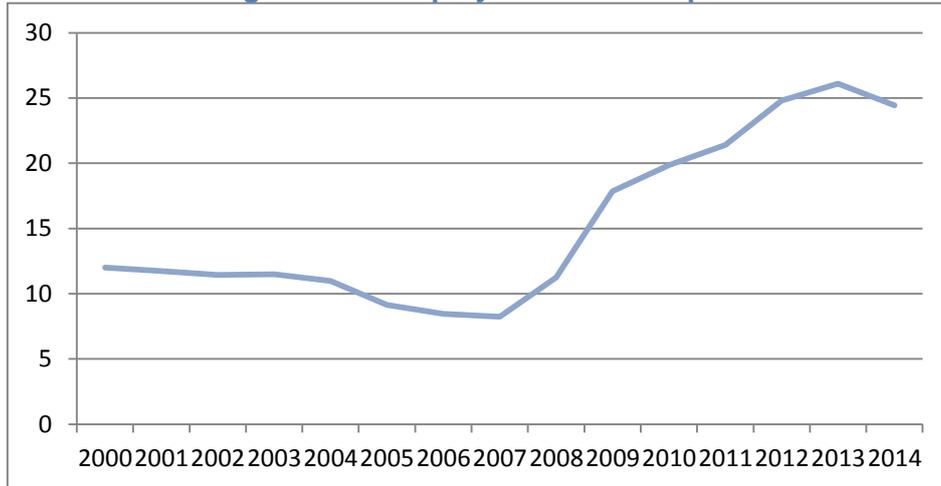
Source: INE

The financial crisis started in 2007 led to high unemployment rates and considerable declines in the growth of average household consumption.

In Figure 2, we can see that until 2007 there was a considerable drop in the unemployment rate, reaching a minimum below 10%. But since 2008, when the crisis began, there is a continuous increase in the unemployment rate, to around 26% in 2013, and from 2014 there has been a slight decline.

The role of household indebtedness during the crisis of 2008 has become the subject of study by some authors. The main objective of this paper is to study how the high level of indebtedness of the families affected private consumption and the growth rate of unemployment in the 17 Autonomous Communities of Spain.

Figure 2: Unemployment rate in Spain



Source: Own elaboration data from BD mores

On the other hand, the vulnerability caused by high levels of indebtedness is under study. This means that a country with a high vulnerability rate finds it more difficult to get out of recession.

To perform this study, data have been used at the aggregate level, since the difficulty of finding data at the microeconomic level precludes a more detailed study.

First, this paper reviews the literature on what other authors have studied regarding the relationship between the level of household debt and consumption.

Secondly, an empirical model will examine how the accumulation of debt and the average growth rates of consumption in the years before to the recession has affected the average growth rate of unemployment and consumption in the years after the crisis.

We also estimate the level of vulnerability in the Autonomous Communities, and shows how this variable has evolved for the case of the Valencian Community.

Finally, we will discuss about the results obtained in the study and conclude.

The importance of this study lies in the current issue of the topic, because households are one of the sectors that has been most affected by the effects of the economic crisis of 2008, and today a large part of the families are at risk because they are in a situation of indebtedness which they cannot cope with.

The paper by Francisco, J., & Redondo, B. (2012) shows that the ratio of non-performing loans to households has been growing steadily since the beginning of the crisis in 2008, reaching over a 3%.

It is also important to know to what extent, the level of indebtedness of household conditions with private consumption, and what is the behavior of households regarding debt and consumption in the face of a shock in the economy.

2. LITERATURE REVIEW

2.1 THEORETICAL LITERATURE

In this section we explain the reason why some authors consider that households with higher levels of debt are more affected from the effects of the crisis.

On the one hand, Guerrieri, V., & Lorenzoni, G. (2016), studies the effects of a credit crisis on the level of consumer spending and household balance.

The fact that a credit crisis occurred means more heavily indebted consumers have to adjust to lower levels of debt, which has implications for the moneylender, who are forced to reduce their holdings of financial claims.

This paper try to provide a theoretical answer to how this effect, affects spending decisions of debtors and creditors, focusing on the response of the family sector, through a model that analyses the response of households to a reduction of their capacity of indebtedness.

This model aims to show how a credit shock can lead to a recession with low interest rates, due to the combination of debt payments and increased precautionary savings by households.

First, interest rates show a considerable initial decline, and then converge to a lower steady state, where credit pressure will decline and the interest rate will progress gradually.

Secondly, there is a slight drop in the level of production that leads to a long-term fall in debt.

This model shows that, with heterogeneous agents, shocks to consumers 'borrowing capacity may be the main cause of falls in natural rates, leading to a drop in borrowers' demand for loans and an increase in borrowing. Offer of these by the creditors.

On the other hand, the study by Philippon, T., et al. (2011) focuses on a relevant feature of the Great Recession of 2008: regions experiencing further declines in debt levels also experienced further declines in the employment rate.

This decline in household debt is due to greater restrictions to access to the credit market or lower housing prices, which causes households to reduce their consumption and increase their savings for precautionary reasons. This reduces employment, since the lower level of expenditure by household decreases economic activity in all sectors of the economy, and this causes activity to be paralyzed by agents.

These authors propose a model that studies the case of the United States and how household liquidity constraints amplify the employment response to debt changes, using panel data on consumption, employment, wages and debt.

The model tries to verify if a quantitative model is able to respond to the regional evidence mentioned above and to describe the implications of the same.

Philippon, T., et al. (2011) believes that changes in mortgage lending depends on a large extent on the degree of household uncertainty.

This uncertainty is important in order to respond to the natural interest rate in the face of aggregate credit shocks. The higher the uncertainty, the lower the sensitivity of household savings to changes in interest rates.

The main conclusion is that changes in the level of household debt of the magnitude observed did not generate large movements in the natural interest rate (equilibrium interest rate with flexible prices) during the Great Recession, and it is necessary to include additional shocks, and that shocks in the credit market have a greater impact on real activity.

Krugman, P., & Eggertson., G (2013) considers that the accumulated debt of households in the years prior to 2008 has been the main cause of the subsequent recession, and also impedes recovery.

These authors propose a Keynesian model that tries to explain the depressions provoked by excess of debt of some agents, which contracts the aggregate demand.

To study debt recessions, two models are established: one with flexible prices and restrictions on the debt limit, and the other with rigid prices in which deleveraging also affects production.

They go against the argument of some critics who maintain that the problem of the debt is not solved with an expansive fiscal policy that is to say, borrowing more. Contrary to these, they consider that the level of debt will be important if its distribution is important.

In analysing the role of monetary and fiscal policies, they postulate that more debt can be the solution to a recession caused by debt, because if households stop spending, someone has to make up for this lower expense.

Finally, Sufi, A. (2009), considers that the main factors that have aggravated the recession of the crisis of 2008 are the high indebtedness of the homes and the drastic fall in prices of houses. Its main objective is to describe the macroeconomic environment more consistent with the situation of household debt and falling housing prices, and to describe three lessons for policymakers on these facts.

These lessons focus on providing solutions to the issues discussed by Guerrieri, V., & Lorenzoni, G. (2016), Philippon, T., et al. (2011) and Krugman, P., & Eggertson., G (2013).

The first lesson focuses on short-term policies aimed at reducing the level of household debt, which will have a positive effect on the economy as a whole.

Sufi, A. (2009) proposes a government involvement in condone of the principal amounts of mortgages, which is a controversial political option, but would have an immediate positive effect on the economy. However, this measure is difficult to implement because many issues need to be discussed before implementing such a measure.

The second lesson proposed by this author is the need to consider the differences in household behavior in relation to the aggressiveness of borrowing when establishing macroeconomic models and policy regulation.

Finally, the third lesson implies that macroeconomic policymakers should pay more attention to the possibility of making mortgage contracts more flexible.

The objective of this measure is to automatically adjust the quotas downwards when there are falls in house prices.

2.2 EMPIRICAL LITERATURE

The recent crisis in 2008 has led to a significant drop in household consumption in most countries, which could be due to the high levels of debt accumulated in the previous years to this recession.

This fact has been studied by several authors, and in this section we explain some of their empirical work related to debt and household consumption.

First, Jordà, Ò., Schularick, M., and Taylor, A. M. (2013) in their article *When Credit Bites Back*, try to study the importance of credits, and the accumulation of these over the economic cycles.

To this end, they have conducted a study with 14 developed countries in order to study how the accumulation of credit has affected the most important macroeconomic variables during the period between 1870 and 2008.

To conduct the study, they have divided the 140 years studied in four periods of financial development, in order to compare different historical periods.

First, they study whether there are differences in recessions after financial crises and normal recessions, and the results obtained are a decrease of approximately 5% lower in the trajectory of GDP per capita during the financial recession.

Therefore, one of the main results of the study has been that recessions after financial crises are more severe than normal recessions.

On the other hand, they have shown that there is a positive relationship between the accumulation of credit during periods of expansion, and the severity of the subsequent recession. To this end, they have constructed a measure of accumulation of "excess credit".

It has also been studied that the effect of excess credit on some macroeconomic variables for 5 years after the beginning of the recession. Significant changes in results have been observed, such as investment, loans, inflation and the current accounts.

Finally, Jordà, Ò., Schularick, M., and Taylor, A. M (2013) applied the results obtained, to the case of credit growth in the US economy during the years prior to the recession of 2008, and obtained a similar result to the other studies.

On the other hand, the OECD (2012) article, "Debt and Macroeconomic Stability", talks about the effect that debt causes on the macroeconomic stability of the countries studied, given that we observe since the mid-1990s a growth of debt as a percentage of GDP in all OECD countries.

They considered that Indebtedness, in general, affects the whole set of macroeconomic actions. It transmits, expands and even disturbs the ability to deal with shocks, and changes investment and consumption decisions by companies and households.

But above all it is remarkable, as the high indebtedness of the homes and the growth of this causes the consumption to be more volatile.

These high debt rates create vulnerabilities to households, businesses and governments, and also make the economy more vulnerable to macroeconomic shocks.

Therefore, the article considers it important to pay attention to the situation of the balance sheets of households, companies and governments, as the state in which they are affected affects the currents of the banking system, and have a high level of debt which seriously affects consumption, investment and employment in the face of a macroeconomic shock.

Considering the vulnerabilities mentioned above, it is stated that the evolution of debt affects the characteristics of economic cycles.

To demonstrate this, a study has been conducted with the OECD countries since 1980 and has been divided into economic cycles of low and high debt, and the behaviour of real activity, real GDP and government consumption in each cycle.

When debt levels are above trend, they are more likely to enter a recession, and these probabilities increase more significantly when it comes to household and the non-financial sector debt.

Although it is difficult to have debt levels above the trend, Estonia, Spain, the United Kingdom and the United States reached these levels before the 2008 crisis.

On the other hand, the private sector borrowing levels gives warning signs before a recession. However, the measures of debt leverage does not give any information, it only deteriorates when the recession is beginning.

Finally, the article discusses the existence of a debate and about how monetary and financial policy should react to debt accumulation.

The most robust options are given by a micro-prudential regulation, which helps to cushion shocks and curb the problems of debt accumulation, and macro prudential regulation, capable of identifying threats to financial and economic stability.

Finally, another line of defense is monetary policy, which may influence desired levels of debt by altering the price of leverage, but, care must be taken not to misinterpret its effects and interventions, so as not to incur large costs.

When public debt rises to high levels, it is more difficult to stabilize the economy, whereby households believe that public debt will result in higher taxes and their behavior towards this belief will reduce the effectiveness of a fiscal policy, which could result in pro-cyclical.

It is therefore necessary to reduce the levels of public debt during the good times, with the help of institutional frameworks, fiscal rules and fiscal councils.

Finally, it is a considerable challenge to deal with high debt levels, which is why legal frameworks and debt repayment procedures are important.

Other works related to household indebtedness is that of Emanuelsson, R. (2015), Melander, O. (2015) and Molin, J. (2015), entitled Financial risks in the household sector, which explains the high level of debt of households in the case of Sweden due to the increase in the price of housing and the expansion of mortgage loans.

These authors have carried out two studies for the Swedish case, with micro and macro data with the objective of evaluating the risk of the economy associated to the level of indebtedness of the household sector.

The main conclusion of both studies is that the debt situation of Swedish households is currently at a level that makes the Swedish economy more vulnerable and may pose a high risks for the entire Swedish economy. This fact makes it necessary to take into account this variable in order to estimate the possible effects it may have on some macroeconomic variables.

On the other hand, Jauch, S., & Watzka, S. (2012), in the paper The Effect of Household Debt on Aggregate Demand-The Case of Spain, study the relation between the level of debt of the households and the change of this, and the aggregate demand,

because the consumption of the households supposes an important part of the same one.

In the first study, these authors make a comparison between 18 European countries and obtain a high and significant correlation between debt accumulation before 2007 and changes in employment in the post-crisis years, that is, in the period 2008-2010.

The second study consists of making an analysis for the Spanish regions and the main result obtained is also that there is a significant relationship between the role of aggregate demand and the increase in unemployment rates.

The main conclusion obtained from these studies is that a large part of the increase in unemployment in Spain is due to the high levels of indebtedness of the families.

Finally, Flodén, M. (2014), in his article entitled *Did Household Debt Matter in the Great Recession?*, studies whether household debt generates or exacerbates economic recessions, using a sample of 26 OECD countries and using a period comprising years before the crisis 2012.

A study of the impact of some debt-related explanatory variables on the cumulative percentage growth of private household consumption, unemployment, house prices and per capita output is carried out.

The explanatory variables used in the article are: household debt as a percentage of disposable income for 2007, average annual growth of household debt in the period 2003-2007, the average current account balance of 2003-2007 expressed as a percentage of GDP, and the growth of the average annual private consumption rate per capita of the period 2003-2007.

In the study by Flodén, M. (2014), an important variable, both in the cumulative percentage growth of private consumption and in other dependent variables, is the one that measures the household debt ratio, so that the higher the rate of indebtedness, the lower the growth in the private consumption of families.

On the other hand, the degree of vulnerability to shocks in the economy of all the countries studied, for 2007, has been calculated as a function that depends on the household debt ratio from 2003 to 2007, the growth of this ratio during the same period and the current account balance in this same period before the crisis.

The result for 2007 shows that Estonia is the most vulnerable country of all, and Spain is in sixth position, so it is also highly vulnerable.

In the case of Sweden, a country whose vulnerability has declined during the post-crisis period, of the three variables that explains it has contributed most to this decline, is the fall in the rate of growth of the economy debt.

Additional explanatory variables have also been added, such as financial wealth, wealth growth and investment, which have been significant in explaining the growth of unemployment, but has not explained the impact on growth in consumption, object of interest of this paper.

Finally, Flodén, M. (2014) describes another possible argument for the high debt of families, such as the drop in house prices, which has worsened since the bursting of the housing bubble of 2008.

Therefore, the article restricts the sample of the 17 countries that suffered a fall in the price of housing during the period 2007-2012, obtaining results similar to those obtained with the complete sample of 26 countries and its conclusion is that household debt and housing growth appears to be less important when the sample focuses on countries with declines in the price of their homes.

3. EMPIRICAL APPROACH

3.1 DATA DESCRIPTION

In this article, we study how the level of household debt has affected the average growth rate of private consumption and the average growth rate of unemployment in the years before the recession of 2008, following the model proposed by Flodén, M. (2014) described in the previous section of empirical literature.

The study was carried out using a sample of 17 Autonomous Communities of the Spanish region, provided by the database BD Mores and by the Instituto Nacional de Estadística (INE). Ceuta and Melilla have not been included in the sample, due to the lack of data necessary to carry out the study.

On the one hand, the BD Mores database collects data of regional magnitudes. These magnitudes are classified by region and branch of activity, and measures appear at current or constant prices in 2008.

On the other hand, the Instituto Nacional de Estadística (INE) provides information on the official statistics of Spain, and provides free access data.

Next, the base variables used to construct the variables with which the regressions were later performed are described. These variables are:

- Unemployment rate: is the percentage of the labour force that is unemployed.
- Private consumption: is expressed in thousands of euros at constant 2008 prices and represents the level of expenditure that households devote to private consumption.
- Debt: this is the cumulative amount of new mortgages given, from 2003 to 2016, expressed in thousands of euros. This is an approximate variable to the debt, since, although it does not represent the total debt, mortgages account for a large part of it. This variable does not represent the total stock of debt, but the accumulated mortgages since 2003.
- Total population: total population, expressed in thousands of people.
- Private consumption per capita: it is a variable that represents the average private consumption per person, and is expressed in thousands of euros per capita. It is constructed to the ratio between private consumption, expressed in thousands of euros, and the total population, expressed in thousands of people.

- Gross disposable income: measures economic activity, and is measured in thousands of euros at current prices.

Second, the dependent and independent variables of the regression are constructed, as detailed below:

- Consumption growth 2007-2010 (ΔC_{0710}): is the direct accumulated growth rate of consumption for the period from 2007 to 2010.
- Unemployment 2007-2010 (ΔU_{0710}): is the percentage points increase in unemployment from 2007 to 2010.
- Unemployment 2007-2013 (ΔU_{0713}): is the percentage points increase in unemployment from 2007 to 2013
- Debt ratio 2007 ($DebtRatio_{07,i}$): is the household debt in percent of disposable income in 2007. It is important to include this variable in the model because higher household debt can cause falls in consumption and increases in the unemployment rate.
- Growth in debt 2003-2007 ($GrowthDebt_{0307,i}$): This is the average growth in the value of new mortgages given between 2003-2007. This variable tells us how much household debt has grown, which may explain changes in consumption and the rate of unemployment growth in the post-crisis years.
- Consumption growth 2003-2007 ($ConsGrowth_{0307,i}$): This variable measures the magnitude in which household consumption has grown over the years before to the crisis, which may affect consumption and the unemployment rate in subsequent years.

Table 1 shows the results of the calculations of the variables studied:

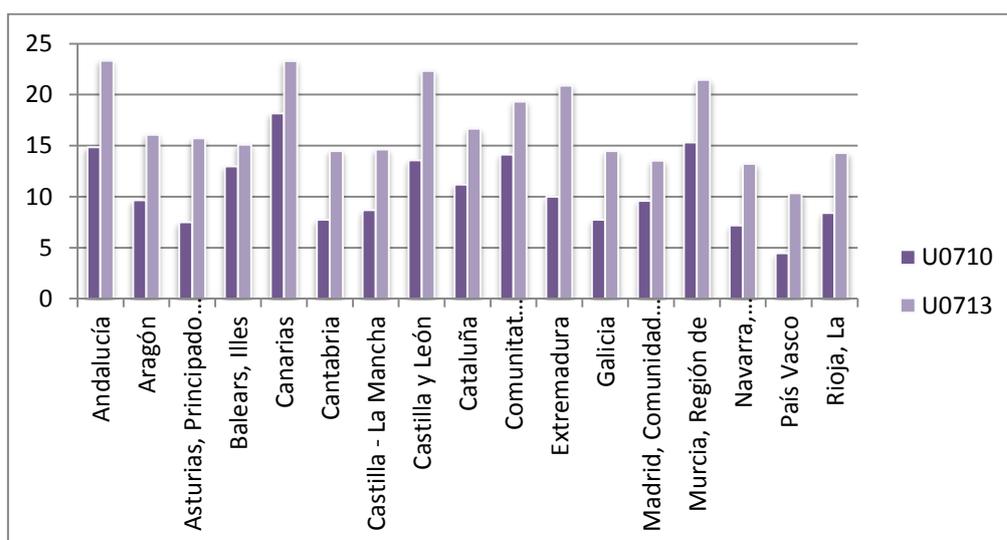
Table 1: Model Variables

| i | Difference in Unemp. 2007-2010 (percentage points) | Difference in Unemp. 2007-2013 (percentage points) | Cons Growth 2007-2010 (%) | Growth in debt 2003-2007 (%) | Debt ratio 2007 | Cons Growth 2003-2007 (%) |
|-----------------------------|--|--|---------------------------|------------------------------|-----------------|---------------------------|
| Andalucía | 14,84 | 23,32 | -7,27% | 24,79% | 2,25 | 2,40% |
| Aragón | 9,65 | 16,08 | -9,77% | 23,85% | 1,55 | 2,20% |
| Asturias, Principado de | 7,5 | 15,71 | -4,18% | 16,28% | 1,07 | 2,76% |
| Balears, Illes | 12,96 | 15,11 | -11,77% | 25,31% | 2,35 | 1,83% |
| Canarias | 18,15 | 23,28 | -11,85% | 18,57% | 2,10 | 4,17% |
| Cantabria | 7,74 | 14,48 | -4,92% | 20,49% | 1,77 | 2,09% |
| Castilla - La Mancha | 8,67 | 14,62 | -5,56% | 38,72% | 1,25 | 3,37% |
| Castilla y León | 13,56 | 22,31 | -6,99% | 19,14% | 2,12 | 2,09% |
| Cataluña | 11,19 | 16,65 | -9,25% | 17,81% | 1,90 | 1,78% |
| Comunitat Valenciana | 14,13 | 19,32 | -8,91% | 27,61% | 2,12 | 2,13% |
| Extremadura | 10 | 20,9 | -2,77% | 25,02% | 1,02 | 3,61% |
| Galicia | 7,75 | 14,46 | -3,34% | 21,78% | 1,01 | 2,92% |
| Madrid, Comunidad de | 9,6 | 13,52 | -9,89% | 15,39% | 1,67 | 2,88% |
| Murcia, Región de | 15,32 | 21,44 | -9,59% | 33,60% | 2,47 | 1,74% |
| Navarra, Comunidad Foral de | 7,19 | 13,21 | -6,88% | 21,19% | 1,17 | 3,46% |
| País Vasco | 4,46 | 10,34 | -5,54% | 11,95% | 1,16 | 2,72% |
| Rioja, La | 8,39 | 14,27 | -6,04% | 21,02% | 1,85 | 2,38% |

Source: Own elaboration data from BD mores and INE

To compare the magnitudes of the variables explained among the 17 Autonomous Communities, bar graphs have been performed. Figure 3 shows unemployment growth rates for the 2007-2010 and 2007-2013 periods, respectively.

Figure 3: Unemployment from 2007 to 2010 and 2007 to 2013



Source: Own elaboration, data from BD mores

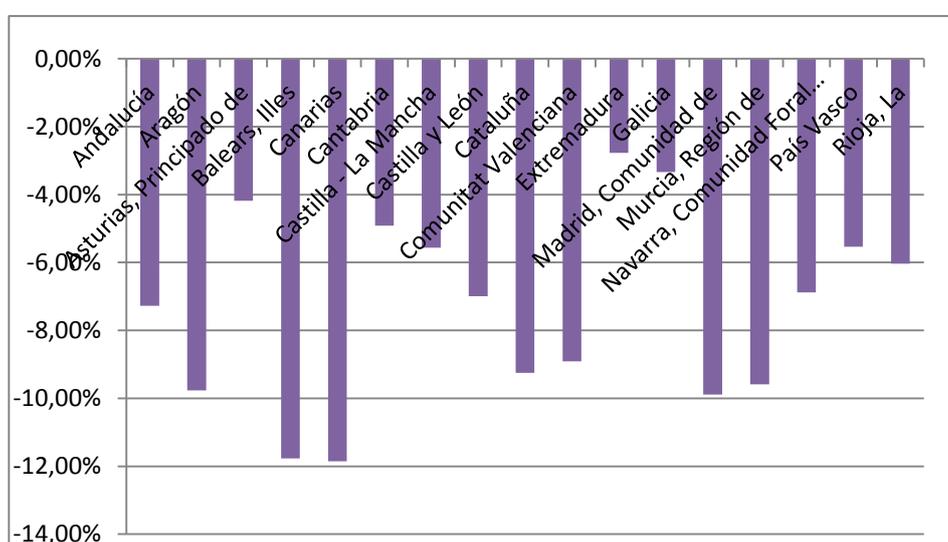
As can be seen in Figure 3, the growth rate of unemployment has grown more during the period from 2007 to 2013 in all regions.

The regions with the highest growth rates are *Andalucía, las Islas Canarias, Castilla y León and Murcia*. Its unemployment growth rates are above 20 percentage points.

Andalusia is the one with the highest growth rate of unemployment, standing close to 25 percentage points.

On the other hand, Figure 4 shows the direct growth rates of consumption in the Spanish regions from 2007 to 2010.

Figure 4: Consumption growth from 2007 to 2010



Source: Own elaboration, data of BD mores

This graph shows negative consumption growth rates for the period studied. This means that consumption has declined considerably since the beginning of the crisis until 2010 in all of the Autonomous Communities of Spain.

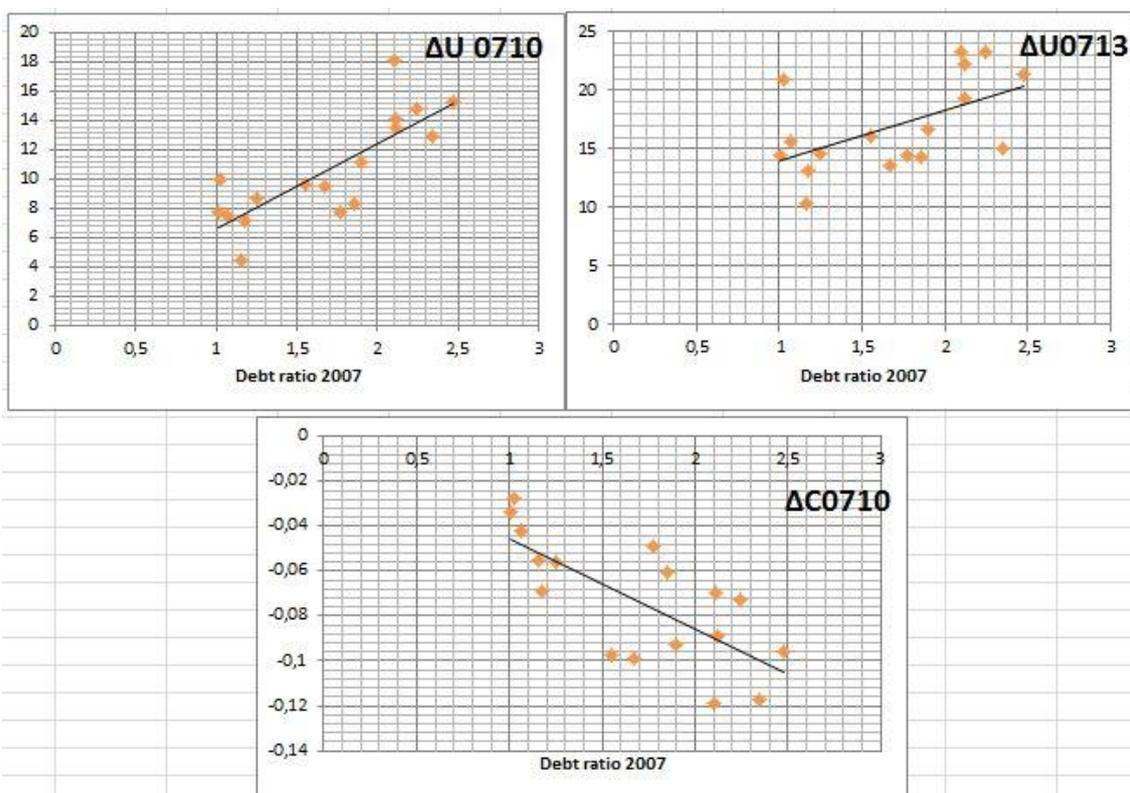
It is observed that consumption has fallen drastically in the Balearic and Canary Islands, with growth rates close to -12%.

The growth of consumption has also fallen considerably in Murcia and in the Community of Madrid to a lesser extent, close to -10%.

Finally, the variable explained in the debt ratio could be significant to explain changes in unemployment growth rates and consumption.

In order to better visualize the relationship between the explanatory variable debt ratio and the dependent variables, Figure 5 shows a scatter plot of the dependent variables against the debt ratio in 2007.

Figure 5: Developments of dependent variables against debt ratio 2007



Source: Own elaboration

In Figure 5, the points around the line represent the 17 Autonomous Communities under study. On the one hand, there is a positive correlation between the debt ratio and the growth rate of unemployment in both periods studied, but the relationship is more dispersed in the case of the growth rate of unemployment in the period from 2007 to 2013.

On the other hand, the ratio between the debt ratio in 2007 and the average rate of consumption growth in the period from 2003 to 2007 is negative. This means that the higher the debt ratio, the lower the growth of consumption by households.

Finally, the regressions take the form:

$$\Delta U_{0710} = \beta_0 + \beta_1 GrowthDebt_{0307,i} + \beta_2 DebtRatio_{07,i} + \beta_3 ConsGrowth_{0307,i} + \epsilon_i \quad (1)$$

$$\Delta U_{0713} = \beta_0 + \beta_1 GrowthDebt_{0307,i} + \beta_2 DebtRatio_{07,i} + \beta_3 ConsGrowth_{0307,i} + \epsilon_i \quad (2)$$

$$\Delta C_{0710} = \beta_0 + \beta_1 GrowthDebt_{0307,i} + \beta_2 DebtRatio_{07,i} + \beta_3 ConsGrowth_{0307,i} + \epsilon_i \quad (3)$$

Where ϵ_i is the term of error or disturbance. This variable includes the factors that can not be specified in our model.

3.2 MAIN RESULTS

The Table 2 presents the main regression results:

Table 2: Development of consumption growth and unemployment growth rate 2007-2010

| | ΔU_{0710} (1) | ΔU_{0713} (2) | ΔC_{0710} (3) |
|--|-----------------------|-----------------------|-----------------------|
| <i>GrowthDebt</i> ₀₃₀₇ | 6,36 (0,35) | 9,01 (0,49) | 0,06 (0,50) |
| <i>DebtRatio</i> ₀₇ | 7,54*** (0,00) | 6,06*** (0,00) | -0,05*** (0,00) |
| <i>ConsGrowth</i> ₀₃₀₇ | 249,73*** (0,00) | 252,50* (0,00) | -0,95 (0,29) |
| <i>Constant</i> | -10,10*** (0,00) | -1,90 (0,77) | 0,02 (0,58) |
| <i>R2</i> | 0,83 | 0,48 | 0,58 |
| <i>Observations</i> | 17 | 17 | 17 |

Source: Own elaboration. OLS regression as in (1) with dependent variable specified in column head; p-values in parenthesis; * and *** indicate significance at 10% and 1% respectively.

From the table 2 it is observed that the Debt Ratio variable is significant in all three regressions at 1%. There is a positive relationship between this variable and the growth rate of unemployment, and a negative relation to the average growth rate of consumption.

As for the interpretation of the variable debt ratio, *ceteris paribus*, an increase in the debt ratio by one percentage point, will lead to an increase in unemployment of 7.54 percentage points for the period 2007-2010.

On the other hand, the effect of this increase in the debt-to-unemployment ratio for the period 2007-2013 is lower, being 6.06 percentage points higher for each increase of the debt ratio by one percentage point, *ceteris paribus*.

This difference may be due to the greater impact of the debt during the first years of crisis, which is the period from 2007 to 2010. Subsequently, the effects have been reduced.

As for the growth rate of consumption in the period 2007-2010, an increase in the debt ratio by one percentage point, causes on average a decrease in the growth rate of consumption of 5%, *ceteris paribus*.

It is also noteworthy that the variable rate of growth of consumption during the period from 2003 to 2010 can explain the changes in the rate of unemployment growth in the post-crisis period.

It is observed that, *ceteris paribus*, an increase of one percentage point in the rate of growth of consumption during the period before the crisis, causes an increase in the growth rate of unemployment of 2.5 percentage points in the period after the recession, this is, the period from 2007 to 2010.

There is also a similar effect on the unemployment growth rate that covers the period 2007-2013. It is observed that a 1% increase in the growth rate of consumption causes an increase in the unemployment rate of 2.52 percentage points, *ceteris paribus*. Moreover, this variable is significant at 10%.

We can observe that for the first regression we obtain an R-squared of 82%, which means that the explanatory variables of the model explain an 82% of the variability of the increase in unemployment for the period 2007-2010.

However, to explain the rate of growth of unemployment in the 2007-2013 period, we obtain a R-squared of 48%, lower than in the previous case.

Finally, the R-squared regression that explains the direct growth rate of consumption in the period 2007-2010 is 58%, so that the explanatory variables explain 58% of the changes in the explained variable.

On the other hand, the Growth in Debt variable was not significant in any regression. Therefore, we can say that this variable does not seem to be important to explain to our regressions.

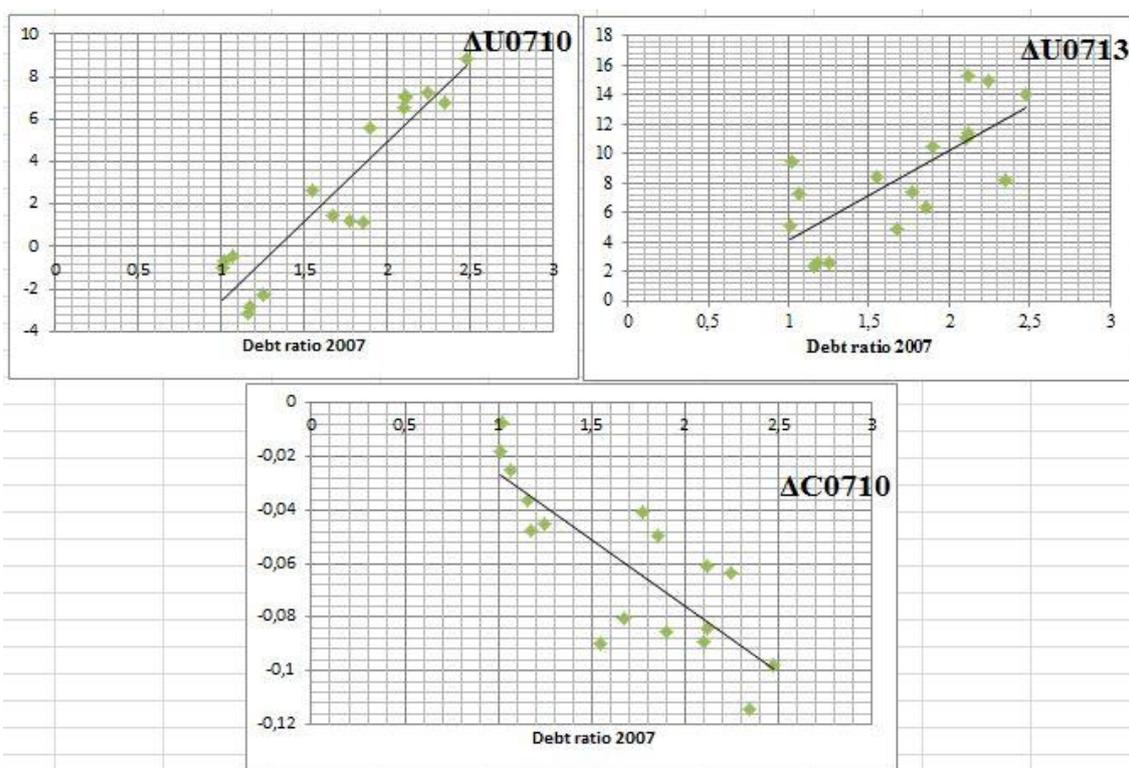
Table 2 shows that the Debt ratio is significant in all regressions, so in figure 6 the relationship between the debt ratio and the dependent variables, net of the part explained by the other explanatory variables, is shown. In particular, the adjusted values have been calculated according to the following equations:

$$C_{0710,i}^{Adj} = C_{0710,i} - (\widehat{\beta}_1 GrowthDebt_{0307,i} + \widehat{\beta}_3 ConsGrowth_{0307,i})$$

$$U_{0710,i}^{Adj} = U_{0710,i} - (\widehat{\beta}_1 GrowthDebt_{0307,i} + \widehat{\beta}_3 ConsGrowth_{0307,i})$$

$$U_{0713,i}^{Adj} = U_{0710,i} - (\widehat{\beta}_1 GrowthDebt_{0307,i} + \widehat{\beta}_3 ConsGrowth_{0307,i})$$

Figure 6: Adjusted developments against debt ratio 2007



Source: Own elaboration

When we calculate the adjusted value of the dependent variables, the points around the lines should be adjusted more, which would have a closer approximation to the relation between the independent variables and the debt ratio in 2007. In this case, if we compare the graphs of Figure 6 with the graphs of Figure 5 discussed above, no significant difference in dot dispersion is observed.

This may be due to the fact that some of the variables taken into account for the calculation of the adjusted variables were not significant in the regressions in Table 2.

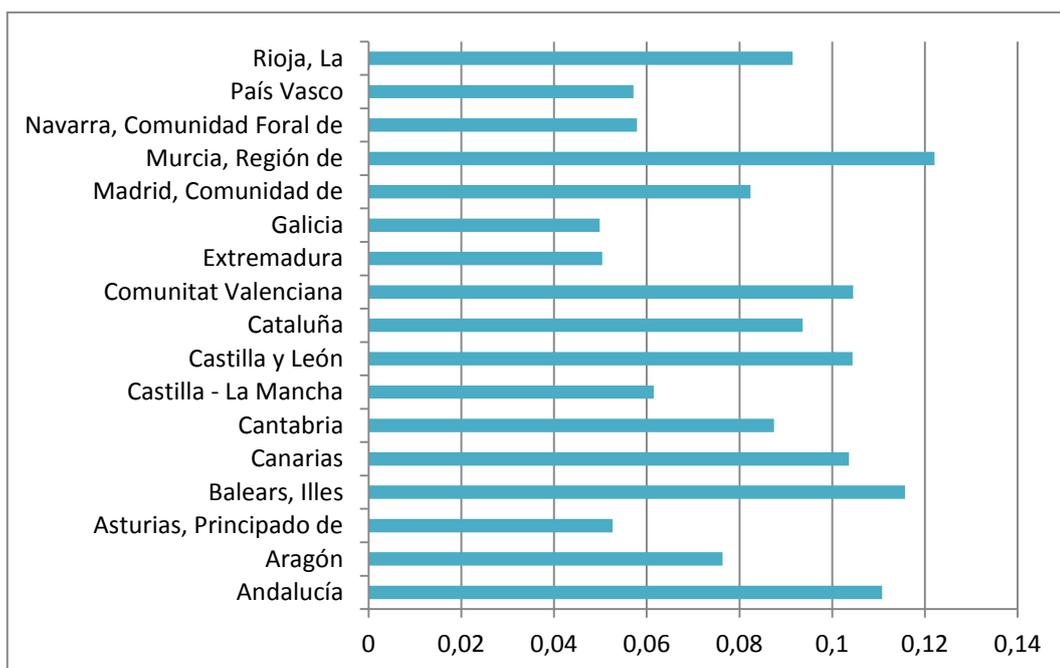
Following Flodén, M. (2014), we can calculate a vulnerability index from the estimated regressions. The degree of vulnerability is an index that measures the part of the decrease in the rate of growth of consumption that is explained by the Debt ratio.

The greater indebtedness of the households implies a greater degree of vulnerability to shocks in the economy. This means that a more vulnerable region has more difficulties in dealing with possible future recessions.

Following Flodén, M. (2014), this article has calculated the vulnerability for 2007 as the predicted fall in consumption for the period 2007-2010 based on the debt ratio of each Autonomous Community, following the following equation, and the results obtained are shown in Figure 7:

$$V_{2007,i} = -(\widehat{\beta}_2 DebtRatio_{2007,i})$$

Figure 7: Vulnerability in 2007



Source: Own elaboration

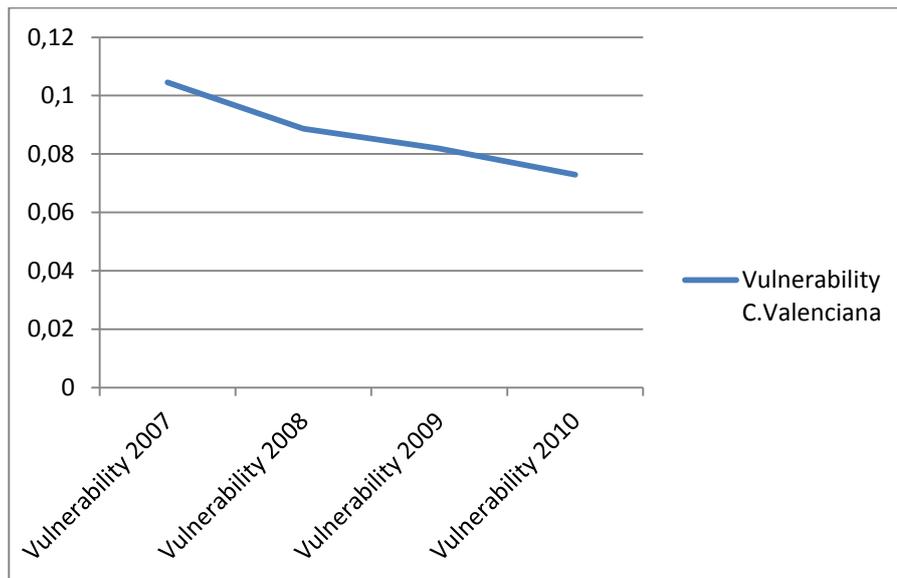
As can be seen in the graph, the *Región de Murcia* is the region that is most vulnerable, followed by the *Islas Baleares* y *Andalucía*. Their vulnerability indexes are close to 0.12 in the case of Andalusia and Balearic Islands, and above 0.12 in the *Región de Murcia*.

On the other hand, the less vulnerable regions include *Galicia*, *Extremadura* and the *Principado de Asturias*.

In this work, a study has been carried out on how vulnerability has evolved in the case of the *Comunidad Valenciana*. To study this evolution, the debt ratios have been calculated from 2007 to 2010 using the following equation and are shown in figure 8:

$$V_{n,CV} = -(\widehat{\beta}_2 DebtRatio_{n,CV})$$

Figure 8: Vulnerability CV



Source: Own elaboration

As can be seen in the graph, vulnerability in *Comunidad Valenciana* has been declining since 2008 until 2010, although by a small proportion.

The vulnerability index has gone from being close to 0.12 in 2007 to close to 0.7 in 2010. Therefore, we can say that *Comunidad Valenciana* has been increasingly less vulnerable to economic shocks.

3.3 DISCUSSION

In this section we will make a comparison of the results obtained in the previous section with the results obtained by Flodén, M. (2014), and the results obtained by Jauch, S., & Watzka, S. (2012). We will describe the similarities and differences between his model and the model presented in this paper, and finally we will make a comparison of results.

On the one hand, when we compare our model with Floden, M. (2014), the most important similarity between the two studies is that both seek to study how the level of debt of households in the years before crisis has affected the growth rate of unemployment and the growth rate of private consumption of households for the years after the 2008 crisis.

Also, following Floden, M. (2014) we have calculated the vulnerability index of all the individuals in our sample, and we have calculated the evolution of this index for the Valencian Community, just as he has done with Sweden.

However, there are differences in terms of the years and the sample considered, and differences in calculations and the variables taken into account to make the regressions, and the results obtained in the two studies have both similarities and differences between them.

The Debt ratio variable shows a negative relation to explain the average growth rate of private consumption of households in both models, and the coefficient of this variable is similar in both regressions. It is also significant in both models, although in our model it is more significant, being its significance of 1% versus 5% of the model of Floden, M. (2014).

On the other hand, in both models there is a positive relationship between the Debt ratio and the growth rate of unemployment. They are also significant at 10% in the case of the model of Floden, M. (2014), and 1% in the case of our model.

However, there is a considerable difference between the coefficients of the regressions. In the study by Floden, M. (2014) the coefficient is 0.02, while the model in this paper shows coefficients of 7.54 and 6.06 for unemployment growth rates in the period 2007-2010 and 2007-2013, respectively. This difference in the coefficients may be due to the fact that Spain is one of the countries that has reached the highest unemployment rates at the beginning of the 2008 crisis.

Debt ratio contributes the most similar results to both models, since in both models, the increase in the debt ratio implies falls in the average growth rate of consumption and increases in the growth rate of unemployment.

The explanatory variable Growth in debt provides considerably different results between the two models.

On the one hand, in the model of Flodén, M. (2014) this variable presents a negative and significant coefficient to explain the relationship between the growth rate of private consumption of households and the average growth of their debt, while in the regression of this work, the coefficient obtained is positive, but it is not significant. This positive relation indicates that the greater the indebtedness in the years prior to the crisis, the growth rate of unemployment in later years has been higher.

On the other hand, the relationship between growth in debt and the average growth rate of unemployment is positive in both models, although the coefficients are considerably higher in our model. This positive relationship indicates that the greater the indebtedness in the previous years to the crisis, the unemployment growth rate in subsequent years has been higher.

Finally, the explanatory variable that measures the average growth of private consumption of households in the period prior to the crisis also shows differences between both models.

On the one hand, the average growth rate of household consumption in the period 2003-2007 shows a negative and no significant coefficient to explain consumption growth in the years after crisis, this means, the higher average consumption growth in the period prior to the crisis, lower consumption growth in the post-recession years, while Flodén, M. (2014) obtained a positive and significant coefficient at 5%.

On the other hand, the relationship between the average rate of growth of consumption in the period 2003-2007 and the average growth of the unemployment rate in the regressions used in this study is positive and significant at 1% and 10% Periods 2007-2010 and 2007-2013, respectively. This indicates that the greater the increase in consumption in the period 2003-2007, the higher the growth rate of unemployment in subsequent years.

However, Flodén, M. (2014) finds that higher growth rates of private household consumption lead to lower rates of unemployment growth in the years after the crisis, and is not significant in its regression.

As we can see, there are a considerable number of differences between the two models, but both provide results consistent with the study.

The general conclusion is that in both models, a higher level of indebtedness of the families in the years prior to the crisis leads to lower levels of private consumption on the part of these already higher rates of unemployment growth in the years after the beginning of this crisis.

On the other hand, when we compare our model with Jauch, S., & Watzka, S. (2012), we observe that there is a considerable number of similarities between both models.

Jauch, S., & Watzka, S. (2012), focus on studying how the high levels of household debt have affected the Spanish regions. They, as in our model, approximate the debt variable by means of the volume of recently issued mortgages, and study the effect of this high levels of debt on the private consumption of households. According to them, mortgages account for 84% of total household debt.

They also observed that there is a high and significant correlation between employment and unemployment rates and household debt levels, and they use a period of time similar to our model, this is, the period 2003-2007.

However, the model of Jauch, S., & Watzka, S. (2012), include real estate prices to observe the differences between the regions to prove if an increase in household debt could be correlated with an increase in the prices of goods. They also try to observe in which sectors unemployment is higher due to the increase in debt.

Finally, by the econometric model they obtain the same results as in our model. They obtain that a higher level of household indebtedness leads to a higher rate of unemployment, being therefore a positive and significant effect, although in our model the variable that measures the average growth in the value of new mortgages given between 2003-2007, this is the growth in debt, is not significant.

On the other hand, in the model of Jauch, S., & Watzka, S. (2012), the greater indebtedness of the households leads to a lower private consumption by this. In our case, the explanatory variable “debt ratio” is negative and significant at 1%, but the variable “growth in debt” provides a positive and non-significant relationship.

4. CONCLUSIONS

In this paper the main objective was to study how the level of debt of households in the Spanish regions in the years prior to the economic crisis of 2008 has affected the growth rate of private consumption and the growth rate of unemployment in the years following the crisis.

The question we want to answer is as follows: To what extent do household levels of indebtedness affect their consumption? And, does the level of household debt have repercussions on the increase in the rates of unemployment?

The study was carried out using a sample of 17 regions of Spain and has studied how some variables relative to the periods prior to the crisis of 2008 affect the growth rates of private consumption of families and the increase in the unemployment rates for the period after the crisis, this is, the period from 2007 to 2010. In addition, we have also contrasted the effect of these variables on the unemployment rate when we choose a longer period, which runs from 2007 to 2013.

The explanatory variables used in the regressions are the Debt ratio for the year 2007, the average growth rate of private household consumption for the period 2003-2007 and the rate of growth of household debt for the period 2003-2007.

The data used in the study are aggregate, since there are still a considerable number of difficulties in obtaining data at the microeconomic level. But the results obtained from the study show clear and consistent results.

On the other hand, in our study, the regions of Ceuta and Melilla have been excluded from the sample, because data on these regions were not available.

It is also important to mention that the variable that collects the debt has been constructed using data on the amount of the mortgages granted, because there are no data available on the total amount of the debt at the regional level. Therefore, it is only an approximation of the debt of the families, even if the mortgages suppose a great part of the debt of the households.

The main result obtained from the regressions was that we expected higher levels of indebtedness by families in the period prior to the crisis of 2008 lead to falls in the average rate of growth of household consumption and to increases in rates of unemployment growth.

The debt ratio of 2007 has a positive effect on the increase in the rate of unemployment and negative on the rate of growth of private consumption. This means that a higher debt ratio leads to lower household consumption and a higher rate of unemployment.

The variable that measures the average growth of consumption in the years prior to the crisis of 2008 has only proved to be significant to explain the effect on the growth rate of unemployment. We obtain that a greater growth of this rate leads to an increase in the growth rate of the unemployment in the years after the recession.

Finally, the variable that measures debt growth in the period prior to the crisis that goes from 2003 to 2007 has not been significant in any of the regressions, so this variable has not been relevant to provide results to the study.

These results have been compared with those of the study by Floden, M. (2014) and significant differences have been observed in the signs obtained in the regressions of the explanatory variables, but both studies are consistent and provide relevant information on the subject matter study.

Finally, our results have also been compared with those of the study by Jauch, S., & Watzka, S. (2012), who study the relationship between the level of household debt and the change in household debt, and make a similar study to ours for the Spanish regions. It is observed that the conclusions of both studies lead to the fact that a large part of the increase in the unemployment rate in the Spanish regions is due to higher levels of indebtedness by households.

In conclusion, we could say that the study carried out in this paper responds to the questions raised about debt and consumption, and about debt and unemployment rate. The main result is that higher levels of household indebtedness cause falls in the level of private consumption and increases in unemployment rates.

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