

The Effect of the Financial Crisis  
on Default by Spanish Households

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## **Abstract**

We analyse the default behaviour of Spanish households immediately before and after the recent financial crisis. Using several waves of the Survey of Household Finances (a tri-annual survey of financial position of Spanish households), we show that younger, poorer and less well educated households are most likely to default, but that while there were substantial changes in default over time, the response was different across household types. Since households separately report information on credit applications and acceptances, we can decompose the changes in default into a borrower and a lender effect. We find most of the changes in behaviour can be attributed to changes in the default behaviour of borrowers. Nevertheless, there is also some evidence that lenders restricted credit to some groups during the crisis, attenuating the rise in default among poorer households.

**Keywords:** Spanish financial crisis, household-debt, default, rationing.

**JEL classification:** D14, G21.

# 1 Introduction

The aim of this paper is to explore the borrowing and default behaviour of Spanish households since 2002 using household data from the Survey of Household Finances (EFF). Since 2002, Spain experienced a boom followed by a severe crash ensuing from the sub-prime crisis, with a return to the high unemployment and under-employment which had characterized the Spanish economy a generation earlier. Household credit in Spain has mirrored these changes in the macro-economy. Bernardino and Gutiérrez (2012) provide an exhaustive analysis of the evolution of the credit sector in Spain using aggregated data provided by lenders where they identify a large period of expansion from the middle 90's to the end of 2007. Igan et al. (2012) also use aggregated lender records to document the increase of household debt in several advanced economies and attribute the expansive phase (2002-2006) to the Spanish housing boom, which they believe to be the cause of the subsequent loss in consumption in 2010. This paper, in contrast, will use household survey data to explore the changing default behaviour of Spanish households over the last few years. The particular focus of this paper will be to explore the application, acceptance and default behaviour of Spanish households since 2002, and to document their changes during and after the crisis. It will also try to explore how changes in lender and borrower behaviour over this period has contributed to changes in the observed level of default among Spanish households.

The Spanish financial system during this period is particularly interesting, since credit to the household sector expanded more rapidly than in other EU countries in the years before the financial crisis and the recent international financial crisis has affected the Spanish financial system especially severely. Crook (2006) document a number of key features in the household credit market for different European countries, showing how credit to the household sector had grown substantially during the 1980s and 1990s. More recently, Bover et al (2014) compare household debts across

EU countries in 2010. These papers find that by the end of this period, Spanish households were as heavily indebted as many northern European households such as those in Britain and the Netherlands. Similarly, Cecchetti et al. (2011) shows the evolution of household debt as a percentage of GDP for several OECD economies. Their study shows that there was an increase in the proportion of indebted households from 54% to 91% in Spain during the period 2000-2010.

This paper will not only document the expansion and subsequent decline in credit, and the changes in default behaviour of Spanish households over the last 15 years, it will also try to understand the extent to which changes are driven by changes in application behaviour, in acceptance behaviour or by changes in the behaviour of borrowers once they have the loan. Our approach builds on Grant and Padula (2012) who utilize self-reported household data from the 2008 wave of the European Union Survey of Income and Living Conditions to calculate the underlying propensity to default (which accounts for the default behaviour of households who do not have credit). They find differences in repayment among the Spanish households, with the youngest and the poorest significantly more prone to default.

This paper makes use of individual data collected at household level during four different waves in the period 2002-2011. The Survey of Household Finances (EFF) was launched by the Bank of Spain to collect information about the financial position of Spanish households. It provides a rich source to study the debt holding and repayment behaviour of a representative sample of Spanish families. With this dataset, we will analyse the behaviour of borrowers and lenders in the Spanish credit market both before and after the financial crisis. The aim is to understand what happened to borrowing and default during the crisis and to decompose the observed changes over time into the contribution from changes in borrower and changes in lender behaviour. We will find that while changes in characteristics are important, there were also important behavioural changes at the time of the crisis, but that changes in borrower and lender behaviour was not uniform across

different types of household.

We proceed by first describing some background information about the Spanish credit market and review the existing literature on household default in section 2 before proceeding with the main part of the paper. Section 3 describes the Survey of Household Finances, the household data set which will be used for the main analysis in the paper. The results are reported in section 4. An experiment is proposed in section 5 where we will attempt to attribute the changes in default to the changes in borrower and in lender behaviour. Our conclusions are reported in section 6.

## **2 Background Material**

There is an extensive existing literature that documents default behaviour. For example, Berkowitz and Hynes (1999), Domowitz and Sartain (1999), and Fay, Hurst and White (2002) investigate the bankruptcy decision of US households, while Duygan and Grant (2009) look at the default behaviour of households across the EU. More recently, attention has been focused on understanding the Great Recession where there is considerable debate in the academic literature about the increase in credit in many countries prior to the sub-prime crisis. The simplest explanation is that households defaulted when they suffered an income shock. Foote et al. (2009) argue that unexpected falls in income drove the increase in default in the US, while Elul et al. (2010) contend that unemployment explains mortgage arrears. Gerlach-Kristen and Lyons (2015) use a European household data set to explore the role that affordability problems and negative equity have on mortgage arrears for 18 countries (included Spain) for the period 2004-2011. They find that while affordability alone has some effect on arrears, the largest long-run effects are when affordability and negative equity are combined. Blanco and Gimeno (2012) use regional default rates for 50 Spanish provinces between 1984 and 2009 to conclude that changes in unemployment is the main explanation for the surge

in household default between 2007 and 2009, but that the drop of interest rates since the end of 2008 moderated this increase. Ampudia et al. (2014) use Spanish micro data from Household Finance and Consumption Survey (HFCS) collected between 2008 and 2011, and conclude that, in Spain, low wealth, being unemployed or self-employed are among the most important determinants of financial distress. However, they were unable to compare their results with default before the crisis.

Much of the US literature has focused on the expansion of credit to households hitherto excluded from borrowing due to low income and poor credit scores. Keys et al. (2010) argue that securitization had a negative effect on the screening incentives of sub-prime lenders, which lead to an increase in the acceptance rate of credit applications. Using lender records on US mortgages, Mian and Sufi (2009), Demyanyk and Van Hemert (2011) and Mayer, Pence and Sherland (2009) all argued that deteriorating lending standards after the turn of the century is the main explanation for the rise in defaults during the sub-prime crisis. Both Crook (2006) and Duygan and Grant (2009) noted that there had been a large increase in borrowing by Spanish households in the years prior to the crisis.

Maddaloni and Peydró (2011), using the Bank Lending Survey, a quarterly survey of Euro area banks on their lending practises for 2002-2008, and equivalent data from US lenders, provide evidence for the excessive softening of lending standards before the crisis (especially for mortgage loans). Akin et al. (2014) use an administrative micro-data set from a real state company in Spain which is representative of the Spanish mortgage market. Using data from 2005 and 2010, they find lending standards were softer before the onset of the crisis, especially when the loan was made by an institution which was subsequently rescued: they argue there had been too much lending to households without an adequate income as lenders frequently valued the house at a significantly higher value than the sale price to avoid regulatory penalties. Using the same data,

Díaz-Serrano (2015) showed that weaker lending standards before the crisis were associated with greater competition between lenders in the local credit market.

Dell'Arricia, Igan and Laeven (2012), by looking at the pool of US mortgage applicants, argue that there was also an increase in credit demand prior to the onset of the crisis which was just as important as the changes in lending policy. Lusardi, Schneider and Tufano (2011) investigated the capacity of US households to withstand an income shock and conclude that nearly half of Americans were 'financially fragile'. Jappelli, Pagano and Di Maggio (2013) compare Germany, Britain and the US and the role of institutions in explaining default. Guiso, Sapienza and Zingales (2013) argue, using evidence from a survey of US household's, that Americans became more willing to default regardless of their circumstances during the sub-prime crisis households. This study will also look at the role in lenders in granting credit in explaining credit market outcomes, as well as changes in the demand for loans. We will investigate the experience of Spanish households since the onset of the sub-prime crisis to see how it has changed compared to the years before the crisis.

## 2.1 The Spanish Credit Market

This study covers the 2002-2011 years, which is an interesting period for the Spanish financial system since it covers the years prior to and following the outbreak of the recent international financial crisis in 2008. This crisis had severe effects on the Spanish financial sector and the Spanish economy, with important consequences for the household sector. Figure 1 shows that in the years prior to the crisis, credit to the household sector had expanded rapidly. This was partly a result of the expansion in market share of savings banks, the main competitors of the commercial banking sector, which from 1990 had begun a process of liberalisation, mergers and the expansion of their branch network.<sup>1</sup> Although the crisis began in 2008, figure 1 shows that the annual growth rate

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<sup>1</sup>Saving banks are commercially orientated non-profit-organizations which competed with commercial banks. These organisations are governed by stakeholders groups which typically included representatives of local and re-

of credit to households had already started to decline at the end of 2005, before reaching zero in 2008. During the crisis it became apparent that many savings banks were under-capitalized, which resulted in their consolidation into fewer organisations, new regulation, and finally necessitated a bank bailout in 2012. For a detailed description of the entire process, see Calvo and Martín de Vidales (2014).

In 2002, the Bank of Spain began collecting information on changes in the loan-granting policies of the banking sector (using a representative sample of Spanish financial institutions), and on credit applications. This information is reported quarterly in summary form in the Bank Lending Survey, which is summarized in figure 2a and figure 2b. Figure 2a shows lenders' assessment of how their credit practises have changed over the previous three months, with separate responses for housing loans (plotted with a solid line) how lending behaviour has changed over the survey period, plotting lending for housing loans (solid line) and for other loans (dashed line). The figure shows that from the end of 2006, banks strongly tightened the conditions of access to credit to households and this tightening continued until late 2009. Since 2009 banks report that there has been no further change in their lending practises (e.g. no subsequent return to earlier lending standards). Figure 2b plots the lenders assessment of the changes in the demand for loans by households. It shows that the banks believed that there was also a drop in the demand for credit at the end of 2006 and the decline in demand continued until 2009, after which there was again no recovery to earlier levels of demand. Figure 3 provides information on the household default rate. It shows there was a sharp increase in the default rate for both mortgages and consumer loans during 2007 and 2008, which plateaued between 2009 and 2011, before again increasing in the following years. This increase in the rate of default is despite the fact we have observed a tightening of lending standards, and a reduction in the demand for credit. In the rest of the paper we will explore this increase in

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gional public authorities, workers and depositors. Nevertheless, despite their governance structure, they were subject to the same regulatory framework as the commercial banks.



household default, and we will investigate the extent to which supply and demand factors have contributed to this increase (or to how much more the increase in default would have been if there had not been fall in the supply and demand for credit).

### 3 Data

The data used in this paper is taken from the Survey of Household Finances (EFF) developed by the Bank of Spain. This is a survey of Spanish households which is collected every three years starting in 2002 (e.g. we have data for 2002, 2005, 2008 and 2011). While the EFF has both a cross-sectional and a rotating panel component, in this paper we will only exploit the cross-sectional component of the survey. The survey collects detailed information on the financial position and financial decisions adopted by a representative sample of Spanish households as well as questions about the composition, income, housing and labour market participation of household members. In the design of the survey, richer households were over-represented in order to collect information on a variety of assets which are mainly held by wealthy households.<sup>2</sup> We restrict attention to households whose head is between 30 and 75 years old and exclude those households with multiple unrelated adults (where we define the household head as the main earner). After making these selections, there are over 4,000 households included in each year of the analysis.

Household-related variables are constructed from several questions asked to the household respondent. We utilize variables containing information on the level of education, marital status, labour market status, age and the number of children living in the house. We also include variables containing information on household income (adjusted by monthly consumer price index from Instituto Nacional de Estadística). The main focus of the paper will be to exploit questions on debt

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<sup>2</sup>The participation rate is not particularly high, as is typical among these types of surveys. The overall participation rate, although decreasing with wealth, was 47.3% (2002), 47.3% (2005), 61.9% (2008) and 50.8% (2011) (see Bover, 2004, 2008, 2011, and Bover et al., 2014). For missing values, the Bank of Spain devised a system of imputations to facilitate data analysis. Among the five imputations released, we use the first one in our analysis.

holding,<sup>3</sup> whether the household applied for a loan (or was discouraged from doing so because they would have been rejected) or whether they were rejected in the last two years. Households also report whether they were unable to pay as scheduled any of their debt payments in the last year.

Table 1 provides summary statistics for each wave of the variables included in the analysis. We observe that average annual real household income (in thousands) falls over the survey period, which is especially surprising for 2002-2005 period, but nevertheless can be explained by noting the change in households' structure: there was an increase in the number of 1-2-members households from 40.9% in 2002 to 44.4% in 2005 and a reduction in the proportion of couple households over the sample period (Banco de España, 2007). The table also shows unemployment doubled between 2005 and 2011. Similarly, the percentage of rationed and discouraged households also doubles over this period, as does the proportion of households that experienced problems in repaying their debts. However, the percentage of households holding any kind of debt has barely fallen between 2005 and 2011, while the ratio of applicants is even higher in 2011, than in earlier years.<sup>4</sup>

Tables 2 and 3 provides detailed information of the characteristics of the households including in the sample, differentiating for each year by the relevant financial variables of this study. The top of table 2 shows the differences between borrower and non-borrower households and the evolution in the period considered. We observe that borrowers earn around 10,000 euros more than the latter, are around ten years younger, have more children, are better educated, and are more likely to be in employment (rather than retired). Households where the head is unemployed are more likely to hold debts in 2002 and 2005, but are less likely to borrow in 2008 and 2011. At the bottom part

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<sup>3</sup>We consider loans granted by banks, saving banks, co-operative or rural saving banks, other credit institutions and stand-alone internet banks, what represent more than 90% of the debts held (other kind of debts not considered are those coming from business in which individual works, non-financial corporations, friends and family and 'others'). Credit card debt information is included for waves 2005 (2.4%), 2008 (8.0%) and 2011 (6.9%) but questions on credit cards were not included in the 2002 wave.

<sup>4</sup>This pattern does not necessarily contradict figure 2b as our definition of borrowers includes those households holding any kind of debt regardless they have been turned down for additional loans. Further, our definition of applicants includes borrowers and discouraged households.

of Table 2 we observe the differences between applicants and non-applicants. The picture is pretty similar to the one observed for the top part, except for the unemployed, since these households are more likely to have applied for a loan in 2008 and 2011, even if are they not borrowers.

The top half of table 3 shows the differences between rationed and unrationed households. Differences among these two groups are larger than for either borrowers or applicants. Rationed households are, as might be expected, poorer, less educated, and with a higher probability of being unemployed. On average, they are around six years older in 2002 and 2005, but this difference disappears from 2008. Lastly, at the bottom part of table 3 we take the sample of borrowers and compare those households that repay their debts on time with those that can not (restricting attention to the sample of borrowers). The table shows that in this case, income, education and labour status differences are associated with large differences in repayment behaviour among households with debts.

## 4 Regression Results

The aim of the paper is to investigate how the repayment behaviour of Spanish households has changed since the onset of the recent financial crisis. This requires not only studying the default behaviour of borrowers, but also their application behaviour, and the lending behaviour of credit institutions. Consequently, we perform separate logit estimations for each wave of the data to have a picture of the household credit market before and after the financial crisis. Accordingly, we study the determinants of whether the household applied for a loan, whether they borrowed or whether they repaid the debts on schedule. As explanatory variables, we include a set of household characteristics including: dummies for different age strata of the household head, sex of the head, whether the household is headed by a couple, dummies for level of income (separated into seven

categories), whether the household head has a university degree, number of children living in the house and three different dummies to indicate whether the head is self-employed, retired or unemployed.

#### 4.1 The Rate of Default

Table 4 reports results for arrears for each wave of the survey. These regressions include all households (where, clearly, non-borrowers will not report arrears). The results for the 2002 wave (the second column in table 4) show that each age group is significantly different from the left-out group (households between 70 and 74). However, the Wald test for the different age dummies shows that differences between the different age-groups is not statistically significant. University educated households are also more likely to repay, while the number of children increases the incidence of arrears. Households with a male head are less likely to be in arrears than households with a female head while unemployed households are significantly more likely to be in arrears. However, couple is not significant in the 2002 wave. As could be expected, high income households are more likely to repay on schedule than middle income households, who in turn are more likely to repay than low income households; a joint significance test rejects that these dummies are all equal.

The results are similar in the remaining three waves. The effect of a university education, of being unemployed and of children remain significant; however, male is only significant in the 2008 wave. The effect of being self-employed gets larger over time, and is significant in the last two waves of the survey. Similarly, the coefficient on couple has changed sign, and in the last wave, has become significant. The effect of the age dummies remains significant in the later waves. The slope effect of age, however, is now bigger since the coefficients on the dummies are larger. Moreover, unlike in 2002, the Wald test which tests whether the coefficients are different (at the bottom of the table) is now significant in 2005, 2008 and 2011 waves of the survey. The income coefficients

are also significant in these waves (except for the lower income groups in the last two waves); the joint-test again rejects that all the coefficients are the same.

Figure 4 plots how arrears changes as income changes (top panel) and as age changes (bottom panel), holding other variables at their median value.<sup>5</sup> The upper panel plots the rate of arrears among borrowers for six different income groups. It shows that in each survey year, the rate of arrears was higher for low income groups and lower for higher income groups. It also shows that arrears tended to be lower in the 2002 wave of the survey than in later waves, with the increase in arrears mostly being greater for lower income groups. The lower panel looks at age, and shows that among borrowers, there seemed to be no clear pattern to the age-profile of arrears. However, for households below 60, the rate of arrears increased steadily between waves, at by a similar amount for each age-group (the pattern is less clear-cut for older households).

This paper aims to understand the arrears behaviour of households in more detail. In particular, the effect of several of the variables seems to have changed over the sample period, and we would like to know why. Moreover, it seems the results for some groups, such male households, are surprising. The results for unemployment and income seem plausible and intuitive. However, the observed pattern of arrears might be because, for instance, low income or unemployed households do not have credit, and hence can not thus enter arrears: for a household to enter arrears it must first want to borrow; then be given the loan it wants; and finally fail to repay the loan on schedule. A low level of arrears could be due to any of these three factors (e.g. it may have low demand for a loan, it may be refused credit, or it may repay when required). It would be useful to disentangle these three different possible explanations for the results we observe.

Columns 6-9 of table 4 looks at the repayment behaviour of borrowers.<sup>6</sup> The results for this

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<sup>5</sup>The median values are taken by pooling all waves of the survey together. The resulting representative household is aged 45-49, has no children, is headed by a couple and the head is an employed man. Total household income is between 20,000 and 30,000 euros per year (in 2010 real terms).

<sup>6</sup>Grant and Padula (2012) estimate what they describe as “the true propensity to repay” which they argue can

sub-sample are mostly similar to the results for the whole sample. They show that university education consistently reduces arrears, but the number of children raises arrears. When looking at the sample of borrowers, we find that age is not significant in any wave (the Wald test never rejects the null that all age-groups default at the same rate). This contrasts to the regressions using the whole sample, and suggests an important role for banks in accepting loan applications. In contrast the effect of income in the regressions is now stronger, since there is a larger difference between the lowest income and highest income households in their repayment behaviour. Similarly unemployed households are significantly less likely to repay, and the effect is slightly stronger.

## 4.2 Applications and Acceptances

Table 4 showed there were some differences between arrears among borrowers and arrears in the whole population. This suggests that application and acceptance behaviour might have an important role in explaining arrears. The first four columns of table 5 report the determinants of loan applicants. For the most part, the results show there have been few changes in the effect of these variables over time. The results show that coupled households are significantly more likely to apply for a loan than single households; a university education reduces the demand for loans; while having children increases the demand for loans. These results help to explain the rate of arrears among university graduates: table 4 showed graduates are less likely to be in arrears, while here we have shown that these households are less likely to want a loan. Similarly, children raise the demand for loans but increase the rate of arrears. However, couples do not have higher arrears even though they have higher credit demand. Households with a female head are more likely to want credit in 2002 and 2008 but the results are not significant in the other two waves. The observed effect of male on applications is consistent with their arrears in table 4 since the two waves where males had lower 

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be bounded between the estimates on the whole population, and the estimates on the population of borrowers.

arrears are also the two waves in which they are less likely to apply for a loan. The effect of age is strongly significant; younger age-groups are more likely to apply for credit (the Wald test reported at the bottom of the table shows that the differences across age-groups is statistically significant). This is consistent with the results in table 4 which showed that younger households are more likely to be in arrears, hence part of the explanation for their arrears is that these households are more likely to borrow.

The results for unemployment are not significant, which is surprising on two grounds. First, if unemployment is associated temporarily low income, the life-cycle model would predict a desire to borrow in order to smooth consumption, but the results do not show unemployed households attempting to do this. Second, the high level of arrears among unemployed households is not due to their high demand for loans since unemployed households are no less likely to apply for a loan than other types of household even though they are more likely to be in arrears. Demand for loans vary among income groups. In each wave, lower income households are less likely to apply for a loan than higher income households. In each case, a joint test for whether the income dummies differ finds that differences across income groups are significant. Again, this is despite the fact that lower income households are more likely to be in arrears.

The last four columns in table 5 we consider the banks' decision to give credit. It looks at whether the credit application was rejected by the lender (e.g. whether the applicant is credit constrained) in each wave of the survey. The estimated coefficients on the age-dummies suggest a hump shape to credit constraints: middle-aged households are more likely to be accepted than either the youngest or the oldest households (the left-out group is the 70-74 group, and the largest coefficient is always for households in their fifties). This is slightly surprising since the oldest households have the lowest rate of arrears. Couple is positive and significant in all but the first wave, while the number of children is never significant, even though table 4 suggests children increase

arrears. Similarly university educated are just as likely to be refused credit as other households despite their lower arrears.

The table suggests that there are some differences across income groups in the acceptance rate on loans. Middle and high income households seem to be more likely to have their application for credit accepted than low income households (although the Wald test only rejects the null at 10 percent in 2002 wave). This is consistent with the fact our results showed these households are the least likely to default. Similarly, except in 2002, unemployed households are more likely to be refused credit; table 4 shows these households are significantly more likely to be in arrears.

Figure 5 plots the prediction of the level of applications and acceptances for a representative household through the four waves considered in this study (taken, as before at the median). We consider two explanatory variables: age and income. The figure suggests that younger households are more likely to apply for credit than older households. The figure also suggests that applications among younger households (below 60) are noticeably lower in 2002 than in later years, and that applications from households over 50 peaked in 2005, before falling back in the last two waves. We found that differences between age-groups in their rejection rates by lenders was not significant, but the figure suggests there may be a slight increase in rejection at the oldest ages. The figure does suggest, however, there was a decline in acceptance rates in the 2011 wave, particularly concentrated among the oldest households. The final picture for the last wave seems paradoxical: those households (the oldest households) with the best propensity to repay in table 4 are the ones who became more rationed in the loan market.

When we look at the estimate of applicants for different income groups, we observe that in 2002 there were significantly fewer households applying for loans at every income level. with application rates continuing to drift upwards for higher income groups in 2008 before falling slightly in 2011. The figure also shows that acceptance rates were higher for higher income groups. Moreover,



acceptance rates fell dramatically for lower income households in the 2008 and 2011 waves. This result coincides with evidence reported in figures 1 and 2a.

## 5 Explaining the Change in Arrears

The regression results in tables 4 and 5 show which factors affect default in each year. Earlier, in table 1, we found that the rate of arrears increased during the financial crisis, and we also found that there was an increase in the proportion of households that were credit constrained. We would like to understand how changes in borrower and in lender behaviour has contributed to the change in arrears during the years before and after the crisis. For a household to default it must first apply for a loan; it must then have the loan application accepted; and then it must fail to repay the loan when required to do so. A change in the default behaviour of a household with some given characteristics (we will denote the set of characteristics as  $X$ ) could be the consequence of a change in any of these three things. Figures 4 and 5 provided some indication of the effect of age and income on default; in this section we will explore the role of age, income, and other characteristics in more detail.

### 5.1 Design of the Decomposition Exercise

Let  $D_i$  denote a dummy for whether household  $i$  repays its debts on schedule (it takes the value one if the household is in arrears and zero otherwise). Similarly, let  $A_i$  denote a dummy variable that takes the value one if the household has applied for a loan (and zero otherwise), and let  $C_i$  be a dummy that takes the value one if the household's application for credit was accepted (and zero otherwise). In each wave  $t$  (where we have separate estimates in 2002, 2005, 2008 and 2011) we can estimate the probability of default of household  $i$ , given characteristics  $X_i$  as  $Pr^t(D_i = 1|X_i)$ . And we can compare how the default behaviour of households differs in different waves. Note, however,

we can only observe a household in arrears if it borrows, that is if  $A_i = 1$  and  $C_i = 1$ , hence we can make the following decomposition

$$Pr^t(D_i = 1|X_i) = Pr^t(D_i = 1|A_i = 1, C_i = 1, X_i) \cdot Pr^t(C_i = 1|A_i = 1, X_i) \cdot Pr^t(A_i = 1|X_i) \quad (1)$$

where each of the probabilities has already been estimated and is reported in tables 4 and 5. Using the coefficients reported in tables 4 and 5 and using equation 1, we can compute the propensity to default for each observation in the sample. We can then calculate the default rate in the whole population in wave  $t$  by taking the weighted average of each individual household probability of default in that wave. Consequently we can investigate how the default rate has changed over time.

Of fundamental interest, however, is to understand what has caused the change in default rates over time. Using equation 1, we can decompose the overall change in the default rate between two periods for a household with characteristics  $X$ , to changes in the default behaviour of borrowers, to changes in acceptance behaviour and to changes in application behaviour between those waves. The default rate between two periods can also change because the distribution of underlying household characteristics has changed. To calculate how changes in characteristics affect default between two wave we can take the household characteristics for wave  $t + 1$  but use the estimated probability function for wave  $t$  (where, slightly abusing notation, we write this as  $Pr^t(D|X_{t+1})$ ).

Using the decomposition made in equation 1, the probability of default in wave  $t$  can be written as  $Pr^t(D|A = 1, C = 1, X_t) \cdot Pr^t(C|A = 1, X_t) \cdot Pr^t(A|X_t)$ , (where we are taking the weighted average over the observations in wave  $t$ ). In this formulation we are using the estimates for application, acceptance and borrower behaviour for wave  $t$  that has already estimated. A measure of the effect of changes in application behaviour can be obtained by using the period  $t + 1$  estimated application regression but with the  $t$  characteristics. That is,

to investigate how changes in applications affects the overall level of default we can calculate  $Pr^t(D|A = 1, C = 1, X_t) \cdot Pr^t(C|A = 1, X_t) \cdot Pr^{t+1}(A|X_t)$  and see how this affects the estimated default rate changes when  $Pr^t(A|X_t)$  is replaced by  $Pr^{t+1}(A|X_t)$ . Similarly, we can investigate the effect of changes in acceptance behaviour and of the repayment behaviour of borrowers by, in turn, using the next period estimate for acceptance behaviour  $Pr^{t+1}(C|A = 1, X_t)$  and default among borrowers  $Pr^{t+1}(D|A = 1, C = 1, X_t)$ . Results from this thought experiment are reported in the next section.

## 5.2 Results of the Decomposition Exercise

### 5.2.1 All Sample

The top row of table 6 reports the predicted default rate in each wave of the data (compiled as the weighted sum of each household's predicted default rate using the logit estimates in tables 4 and 5). The table shows that predicted default fell from 9.2 percent to 8.3 percent between 2002 and 2005, before increasing to 9.3 percent in 2008 and more sharply to 11.2 percent in 2011. This pattern closely mirrors the raw data in table 1. The second row of table 6 investigates the effect of changing household characteristics in explaining the change in arrears over time. It shows that if we had used the 2005 characteristics but the 2002 logit estimates for applications, acceptances and arrears then the default rate would have been 9.4 percent rather than the 9.2 percent we find using the 2002 logit estimates. The table shows that the predicted rate of arrears in 2005 is 8.3 percent. This shows that most of the change in default between 2002 and 2005 is due to changes in borrower and lender behaviour rather than in household characteristics (in fact the change in characteristics slightly increases arrears compared to the no change scenario). The top row of table 6 shows that the predicted default rate increased from 8.3 percent in 2005 to 9.3 percent in 2008. The second row shows that changes in characteristics alone increases arrears to 8.5 percent, but the remaining three-

quarters of the change in default rates is due to changes in borrower and lender behaviour. Finally, this decomposition for the change between the last two waves shows that changes in characteristics increased default from 9.3 percent to 9.5 percent, while changes in behaviour have a much more important role, since they increase the rate of default to 11.2 percent.

The results show that most of the changes in the rate of default among Spanish households is driven by changes in applications, acceptances and/or arrears; even in the last wave a substantial proportion of the change is caused by changes in behaviour despite the fact that the economic crisis resulted in larger unemployment and lower income per capita in Spain in 2011 compared to 2008 (the 2008 survey was mostly undertaken just prior to the onset of the crisis in Spain). This suggests that additional insights can be gained by exploring this change in behaviour in more detail. The next three rows of table 6 separate the change in the level of default into a change in the rate of applications; a change in the rate of acceptances; and a change in the rate of arrears among borrowers.

The table shows that using the 2005 estimates for application behaviour, but the 2002 characteristics, would have results in an increase in default rates to 10.4%. Using the 2005 estimates of both applications and acceptances would have reduced this rate very slightly to 10.2%. The two rows of the thought experiment suggest that there was an increase in the proportion of households borrowing, and that the decline in the default rate between 2002 and 2005 was despite the expansion in borrowing. The last row additionally investigates the effect of changes in the default rate of borrowers (using the 2002 characteristics), which shows that the default rate would have fallen to 8.1%. This shows the increase in borrowing was countered by a much larger fall in the default rate among borrowers, and a change in borrower behaviour is the major explanation for the fall in default in the whole population between 2002 and 2005.

We found that a quarter of the increase in default between 2005 and 2008 can be explained

by changes in household characteristics. However, table 6 shows that changes in applications and changes in acceptances (e.g. using the 2008 logit estimates but the 2005 characteristics) would both have reduced the default rate as credit conditions slightly tightened. It shows that a great deal of the change in default in the top row of the table can be explained by a rebound in the default rates of borrowers (the bottom row) between 2005 and 2008. However, the full change in default requires a change in both characteristics and borrower behaviour.

The top row of table 6 shows how default increased between 2008 and 2011. The surge in default between these two years can partly be explained by an increase in credit applications, which would have raised default to 9.9%. However, lenders reduced the availability of credit, which slightly reduced the default rate. The most substantial contribution to the increase in default in the top row of the table, however, was due to changes in the behaviour of borrowers. Overall, the table suggests that changes in borrower behaviour are the most important explanation for the changes in default over the period between 2002 and 2011. Nevertheless, changes in characteristics are also a necessary part of the explanation.

### **5.2.2 Age**

In table 7 we investigate the differences in default across age-groups.<sup>7</sup> The table reports results for each of the 5-year age groups that have been used in the analysis (except that we have merged to two oldest age-groups as there are relatively fewer older households). For each group (for example households between 30 and 34 years old) we have calculated their predicted level of default given their other characteristics. The general pattern shows that, on the whole, older households have lower default rates than younger households. For example, in 2002, although the default rate was highest among households aged 40-44, the pattern otherwise shows that default rates fell from

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<sup>7</sup>Of course, the effect age, time and year-of-birth are not separately identifiable. We have reported the changes by age-group and year and have not attributed the changes in default to cohort effects.

11.85% for households aged 30-34 to 4.91% for households aged 65-75 when investigating differences across age groups.

Three of the four age-groups under 50 saw a slight increase in default rates between 2002 and 2005. In contrast, all household age-groups over 50 decreased their rates of arrears, even though their rates were already lower in 2002. For the youngest age-group, the increase in default can be attributed to changes in characteristics since although there was an increase in applications, there was also a reduction in acceptances hence no overall change in their level of borrowing. However, they sharply reduced their level of default conditional on getting a loan. The much larger countervailing effect of changes in characteristics meant that overall these households increased their level of arrears. The other age-groups all saw a slight increase in applications between 2002 and 2005 which was mostly accommodated by lenders. They also all saw an improvement in borrower behaviour. As a result the 35-39 and 45-49 age groups saw only modest increases in overall arrears, while the other age-groups saw a reduction in overall arrears; and changes in characteristics are not an important part of the story for these other age-groups.

A less clear pattern is observed for the period 2005-2008. The very youngest and oldest cohorts experienced a decline in the default rate, while the other age-groups all saw their default rates increase (where the increase was substantial for the 35-39, 55-59 and 60-64 age-groups). All but the 35-39 age-group saw a reduction in applications and all groups except the 45-49 and the 65-75 age-group saw a reduction in acceptances. Borrowers became less likely to repay between 2005 and 2008 for all age-groups except 30-34, 45-49 and 65-75 households, with particularly large effect for some groups. But changes in characteristics are also important for 35-39 age-group, the 45-49 age-group and the 60-64 age-group.

Finally, we analyse the period 2008-2011, in which most groups experienced a surge in their default rate. The youngest households (30-34 years old) shows the largest increment, since de-

fault increased from 11.0% to 22.5%; while all factors contribute to that rise, changes in borrower behaviour is the most important. A similar pattern is apparent for 50-54 years old households: the large increase in arrears of over 5% can partially be attributed to changes in characteristics, applications and acceptances, but default among borrowers makes the largest contribution to this increase. The table shows that 40-44 and 45-49 years old households both experience a similar surge in default rate of around 2.5 percentage points. However, while in former case we can attribute the increase to worsening characteristics and higher applications, in the latter the increase is explained by the worsening repayment behaviour of households that more than compensates for the more restrictive lending behaviour of banks. For 60-64 years old households, characteristics, repayment and application behaviour by households, as opposed to the restrictive granting behaviour by banks, help to explain almost equally the surge in the overall default rate. The results for 65-75 years old households show the opposite result as for this age-group the overall level of default improved between 2008 and 2011; although applications increased default, it is more than cancelled by the better characteristics and repayment behaviour of borrowers as well as the better granting behaviour by banks to result in the decline of their overall default rate. The other group that experienced a decline in default rate is the 35-39 years old age-group; in this case the fall is explained by their better repayment behaviour and by the more restrictive granting behaviour by banks.

### **5.2.3 Income**

Table 8 divides the sample into six different income groups. The table shows that the level of default decreased between 2002 and 2005 for all income groups. For all income groups, there was an increase in the application rate. However, while lenders reduced the acceptance rate for the two lowest income groups, there was a slight increase in the acceptance rate for middle income groups.

All income groups saw a fall in the rate at which borrowers fell into arrears between 2002 and 2005, which explains most of the fall in default reported in the top row for each group. The exception is the 20-30,000 euro group, where the reduction in arrears is mainly due to changes in characteristics (characteristics also reduced arrears for the 40-50,000 euros group).

Between 2005 and 2008, the overall rate of default fell sharply for the lowest income households. This fall in default among the poorest households can be explained by the large fall in applications, in acceptance by lenders, and in the repayment of loans by borrowers (characteristics play a small part). All other income groups saw an increase in the rate of default, with especially large increases among middle income groups. Changes in application behaviour does not explain this increase since the increase in the rate of applications is rather small (and applications actually fell for the highest two income groups). Similarly, there was also a small reduction in the rate at which applicants received credit. For the 20-30,000 income group there was also no change in borrower behaviour: the increase in the rate of arrears for this group is thus attributable to changes in their other characteristics. However, the change in overall arrears for all the other income groups between 2005 and 2008 is attributable to the increase in the rate of default among borrowers.

Between 2008 and 2011, all income groups saw an increase in credit applications, but only the lowest income group saw a substantial reduction in the rate at which credit was granted. The default rate of borrowers increased sharply for the lowest two income groups, but actually improved for the middle two income groups. Borrowers also reduced their rate of repayment for households with incomes between 50-60,000 but repayment improved for the highest income households. Changes in characteristics are never a particularly important factor in explaining the changes between 2008 and 2011, although they play some part in the increase in arrears for the lowest income households and the reduction in arrears for the 50-60,000 group. By far the largest part of the explanation of the changes in overall default is due to changes in the behaviour of borrowers.



#### 5.2.4 Employment and Education

Table 9 investigates four different employment groups: employees, self-employed, unemployed (or households outside employment) and retirees. The pattern of arrears for employees is very similar to the pattern for the whole sample reported in table 6. The overall rate of default fell between 2002 and 2005, before increasing in 2008 and then increasing again in 2011. As in table 6, the fall in arrears between each wave is mainly attributable to the changing default behaviour of borrowers. The unemployed group have much higher rates of arrears in all the waves, but this rate fell sharply between 2002 and 2005 due to a sharp reduction in the rate at which unemployed borrowers defaulted on their loans. Their small increase in arrears between 2005 and 2008 is mainly due to changes in the households' characteristics (there was a reduction in applications which would otherwise have reduced arrears). Their small decrease in overall arrears between 2008 and 2011 is due to a reduction in credit acceptances and in arrears among borrowers.

Retired households have the lowest rate of default among all employment categories, and steadily reduced their rate of arrears throughout the sample period. Changes in characteristics played very little part in this decline. Instead, it can be explained by a decline in the default rate of borrowers between 2002 and 2005 and between 2008 and 2011 (which in both cases outweighed the effect of an increase in applications). Between 2005 and 2008 there was a small reduction in applications which reduced their overall default rate (changing characteristics also playing a small part).

Except in 2008, self-employed households had lower default rates than employees. However, the pattern of changes over time is rather different: their arrears increase steadily from 2002 and 2005 until 2008, and then fall in 2011. The increase between 2002 and 2005 is largely due to an increase in the rate of applications, as self-employed borrowers reduced their arrears. In contrast, the increase in arrears in 2008 is mainly due to the very large increase in arrears among borrowers,

and there was a reduction in applications and acceptances in 2008. This pattern was reversed in 2011, where there was an increase in applications and acceptances and a very sharp reduction in arrears by borrowers (and an improvement in characteristics) leading to an overall reduction in default.

The bottom of table 9 contrasts households with a university education with those who did not go to college. University educated households are, in all waves, much less likely to default. University educated households experienced a decline in default from 2002 to 2008, where the increasing tendency to apply for loans is more than compensated by an improvement in repayment behaviour among borrowers. In 2011 there was a very small reduction in the rate of applications, and a small increase in the rate of non-payment by borrowers. However, changes over time for college educated households are rather small.

Non-university educated households see larger changes over time: they reduced the rate of arrears in 2005, and increased their arrears in 2008 and then, more substantively, in 2011. The rate of applications increased in 2005 and again in 2011, but fell in 2008, while there were also small reductions in the rate of acceptances over time. However, most of the changes in the overall rate of default in 2005 and 2008 was due to changes in the rate of default among borrowers, which fell in 2005, but increased moderately in 2008. In 2011, increases in applications, in default among borrowers, and in characteristics all caused similarly large increases in the overall change in default among non-college educated households which was only partially counter-balanced by a reduction in credit acceptances by lenders.

## 6 Conclusion

This paper contributes to our understanding the default behaviour of Spanish households before and after the recent crisis, an issue that has attracted the attention of a number of researchers in financial economics. The recent international financial crisis has affected a number of developed economies and Spain constitutes a particularly interesting country to study due to the severity of the crisis and its aftermath. Spanish unemployment more than doubled from 2007 to 2009, and households default rates experienced even larger increases in these years. Our paper complements the analysis made in other papers that has hitherto used aggregate and micro-administrative data. We utilise households' self-reported information collected by the Survey of Household Finances provided by the Bank of Spain for the years before and immediately after the recent crisis, and, to the best of our knowledge, this is the first paper to exploit such data. Thus we can not only look at which households are more likely to default, but also how this has changed over the sample period. Moreover, we as have separate information on applications, acceptances and default, we can clearly distinguish between changes in borrower and lender behaviour as the ultimate cause of changes in the level of default observed for Spanish households.

The raw results show that the rate of default fell in 2005, and then rose in 2008 and again in 2011. The regression results also show that lower income and unemployed households are more likely to default, as are younger households and households with lower levels of education. However, these effects are apparent in all four waves included in the analysis, and hence in themselves do not explain the changes in the level of default during and after the crisis: although changes in unemployment and income form part of the explanation, they are too small to be able to explain all of the changes that are observed in the data. Instead, by exploiting information households provide on applications and rejections, we can understand the role of changes in behaviour in

driving these changes in default.

A key contribution of our analysis is to decompose the incidence of arrears into an affect caused by changes in the demand for loans, by changes in the acceptance of credit applications, and by changes in the default behaviour of borrowers. Our results suggest that the fall in default rates between 2002 and 2005 was despite the increase in credit applications which was mostly met by lenders. Similarly, the increase in default between 2005 and 2008 happened even though applications fell. Rather, changes in the default behaviour of borrowers drove these changes. Between 2008 and 2011 there was an increase in the incidence of borrowing and in default among those receiving a loan which together explain a substantial proportion of the change in default between these two years.

These results suggest that changes in the behaviour of actual borrowers is driving the default rate, rather than changes in the type of households that borrow. However, this overall picture masks substantial variation in the experience of default over this period of different household types. For example, the oldest households in the sample did not see an increase in their default rate, while for some (but not all) of the younger households, the increase in default rates was substantial; middle-income households increased default rates although the very richest and poorest households did not; while unemployed households have higher default rates, only employed and self-employed households increased the rate at which they defaulted; university educated households had little change in their default rates, but poorly educated households both had higher default rates, and their rates increased substantially through this period.

For most groups changes in default among borrowers drove these changes in default, although there is some evidence that lenders reduced credit to low income households. However, all but the highest income groups increased their application rate during the crisis, as did middle-aged households. Hence the results highlight a puzzle: why did lenders not react by reducing lending

more substantively? Moreover, given that the income and unemployment characteristics are not driving the change in default among borrowers, we can not explain why borrowers did change their behaviour. Lastly, we make a note of caution. Throughout the analysis, we only capture whether the household is borrowing and has repaid (the extensive margin) rather than the size of the loans (the intensive margin). This paper highlights that changes in the composition of borrowers is not substantively explaining default behaviour, hence future research might usefully analyse changes in loan size and its contribution to the debt crisis for Spanish households during the last few years.

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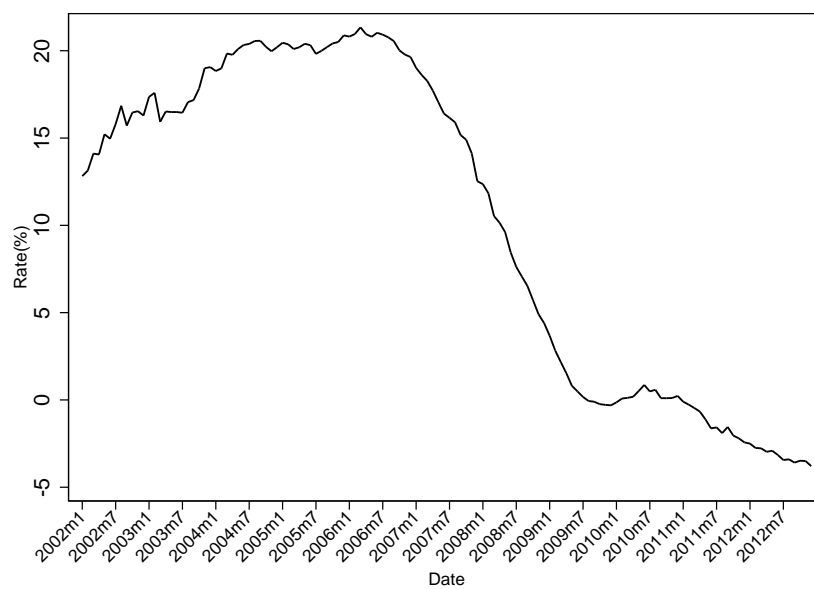
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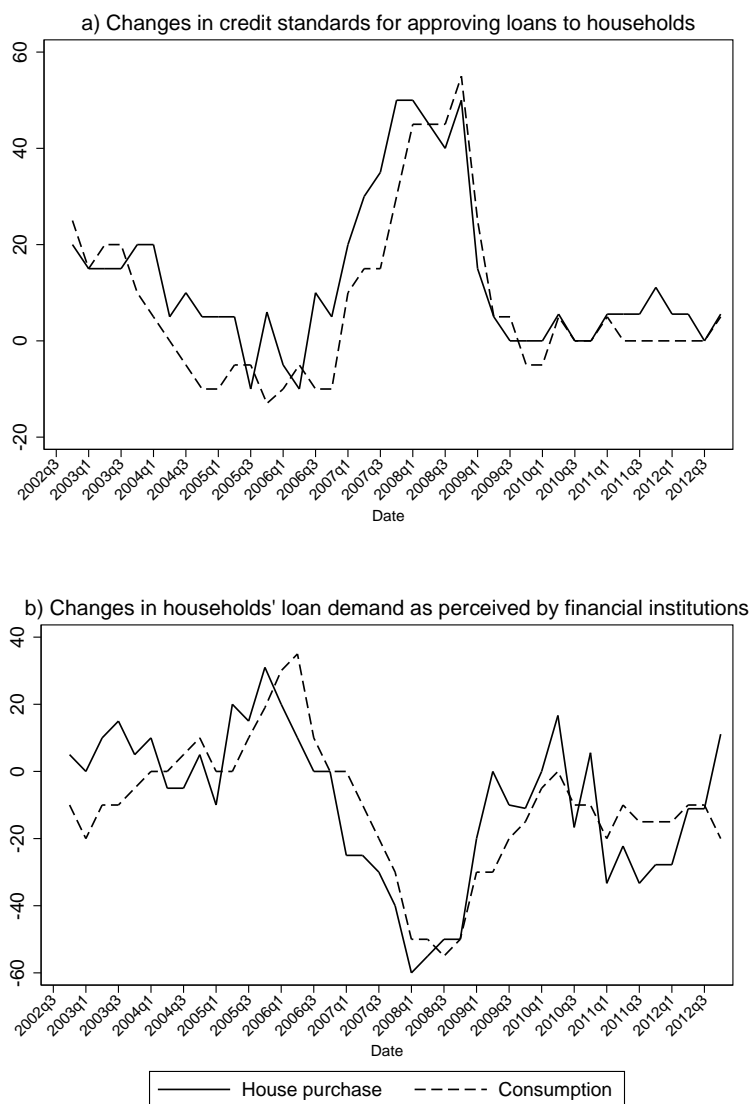
## A Appendix

FIGURE 1. Credit to households (annual growth rate).



Note: Total financing of households and non profit institutions serving households (NPISHs) resident in Spain (nominal terms). Source: Bank of Spain.

FIGURE 2. Evolution of Spanish banks' credit supply and demand

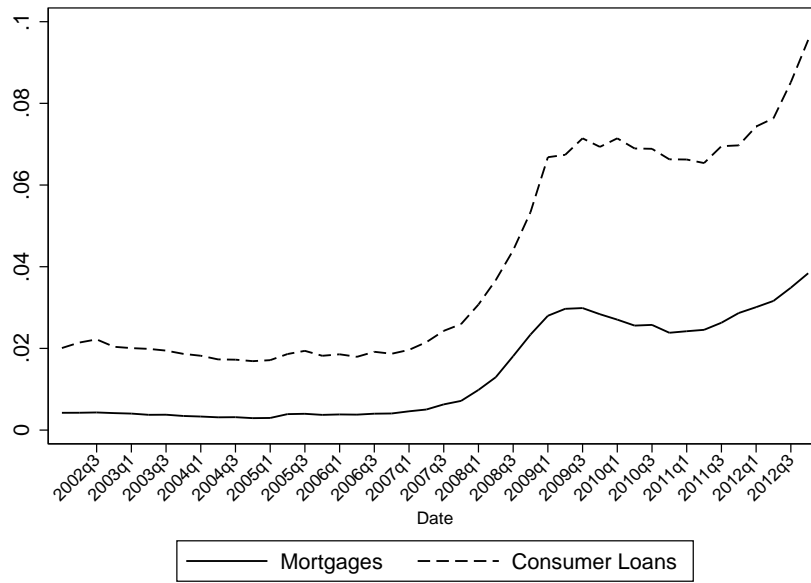


Note: Subfigure a) is constructed from banks' answers to the following question: *Over the past three months, how have your bank's credit standards as applied to the approval of loans to households changed?* Indicator = (Share of banks that have tightened considerably in last three months)  $\times$  1 + (share of banks that have tightened somewhat)  $\times$  1/2 - (share of banks that have eased somewhat)  $\times$  1/2 - (share of banks that have eased considerably)  $\times$  1.

Subfigure b) is constructed from banks' answers to the following question: *Over the past three months, how has the demand for loans to households changed at your bank apart from normal season fluctuations?* Indicator = (Share of banks reporting considerably increased demand)  $\times$  1 + (share of banks reporting somewhat increased demand)  $\times$  1/2 - (share of banks reporting somewhat reduced demand)  $\times$  1/2 - (share of banks reporting considerably increased demand)  $\times$  1.

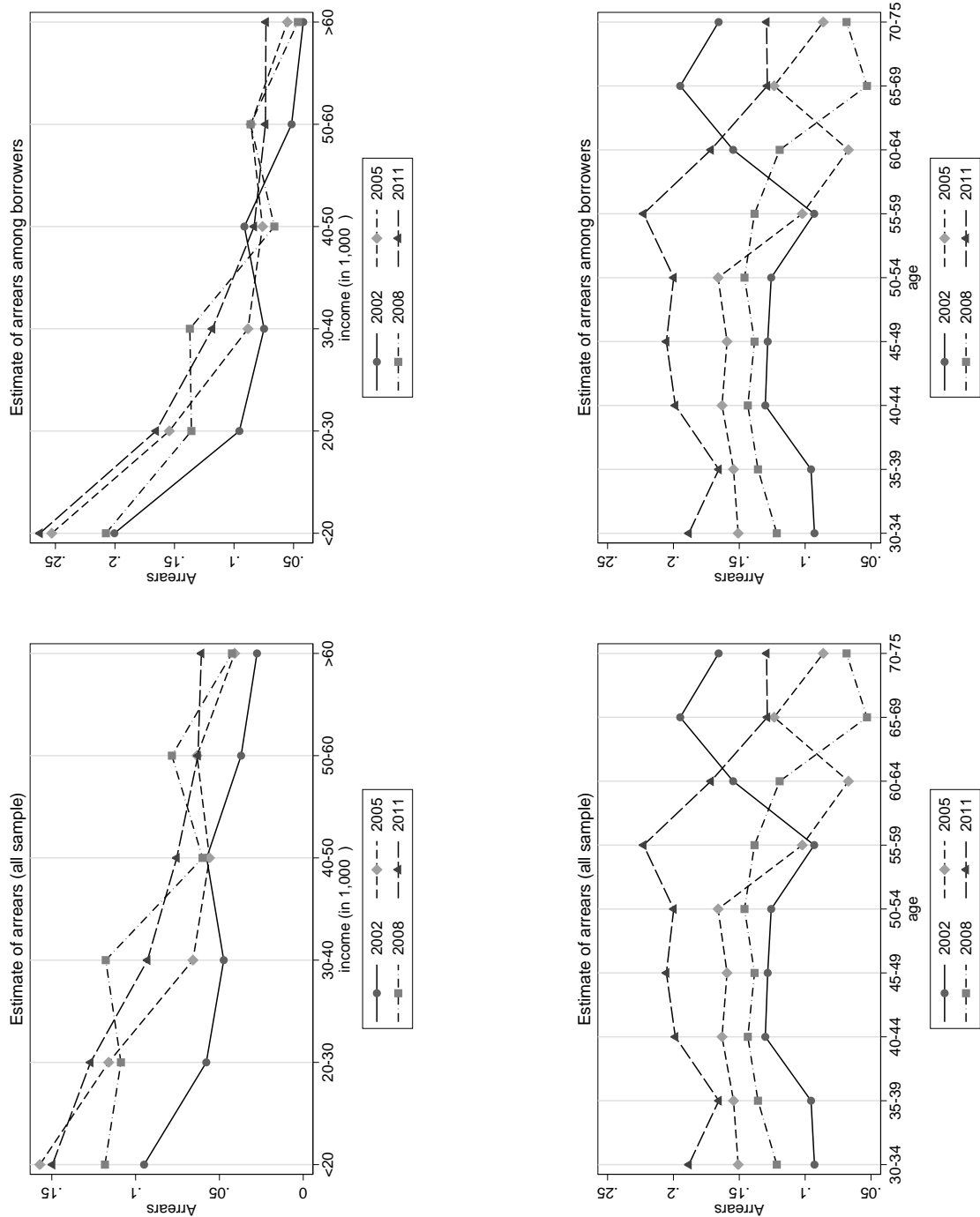
Source: Bank Lending Survey (Bank of Spain).

FIGURE 3. Households' default rate



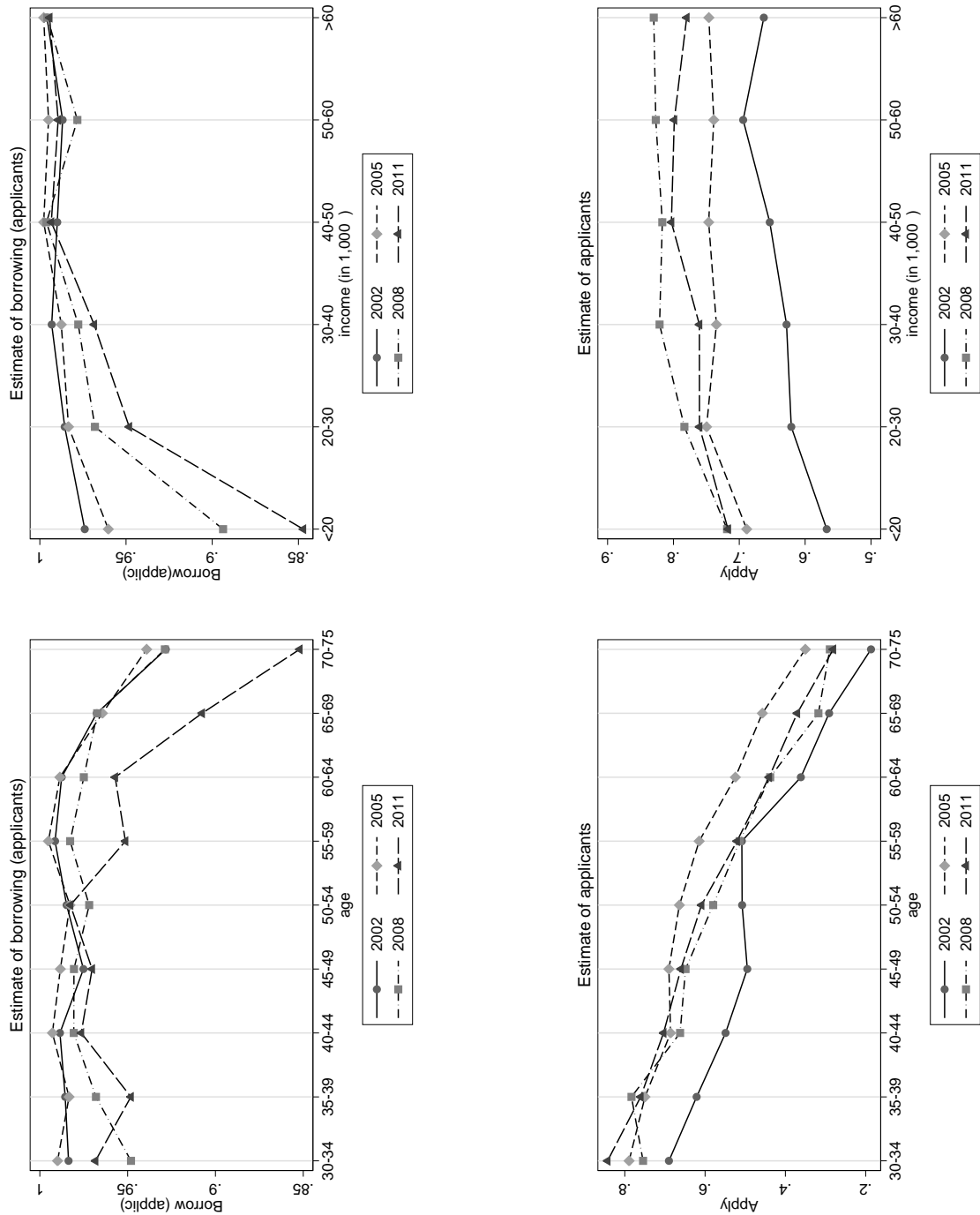
Note: Both rates are defined as the ratio between the total doubtful loans (Loans in which some instalment has not been paid for a period of more than 90 days, and those exposures in which there are reasonable doubts as to total repayment under the terms agreed) and total lending to households at Spanish economy.  
Source: Bank of Spain.

FIGURE 4. The Rate of Arrears by Income and Age



Note: Predicted values obtained from logit estimations (Table 4) applied to a reference household: headed by a man, 45-49 years old that lives in couple, employed, no children and total household income sums up between 20,000 and 30,000 euros (in 2010 real terms) per year.

FIGURE 5. The Rate of Applications and Acceptances by Income and Age



Note: Predicted values obtained from logit estimations (Table 5) applied to a reference household: headed by a man, 45-49 years old that lives in couple, employed, no children and total household income sums up between 20,000 and 30,000 euros (in 2010 real terms) per year.

TABLE 1. Summary Statistics

	2002		2005		2008		2011	
	mean	sd	mean	sd	mean	sd	mean	sd
income	40.6	0.70	38.4	0.84	38.7	0.94	36.4	0.88
age	50.9	0.27	50.9	0.29	50.6	0.31	50.9	0.35
couple (%)	77.0	0.86	73.7	0.97	72.3	1.04	71.8	1.14
n.childs	0.5	0.02	0.5	0.02	0.5	0.02	0.5	0.02
male(%)	78.9	0.83	77.8	0.91	77.1	0.95	74.1	1.08
university (%)	17.4	0.78	19.3	0.89	19.1	0.98	21.6	1.10
employed (%)	57.8	1.01	58.4	1.07	56.4	1.17	54.8	1.28
unemployed (%)	5.0	0.47	4.9	0.50	8.0	0.64	10.9	0.79
retiree (%)	26.4	0.85	26.8	0.92	24.7	0.93	23.5	0.97
selfemployed (%)	10.8	0.66	9.9	0.65	10.8	0.79	10.8	0.86
borrow (%)	52.6	1.03	57.1	1.08	56.3	1.18	55.9	1.27
applicant (%)	54.1	1.02	59.3	1.07	59.5	1.16	60.8	1.22
rationed (%)	1.5	0.24	2.2	0.30	3.2	0.46	4.9	0.57
ration(applic) (%)	2.8	0.44	3.7	0.50	5.4	0.76	8.0	0.93
arrears (%)	9.2	0.63	8.3	0.59	9.3	0.72	11.2	0.94
arrears(debt) (%)	17.4	1.14	14.5	1.01	16.5	1.24	20.0	1.59
discour (%)	1.4	0.23	2.1	0.29	2.8	0.44	4.1	0.55
discour(applic) (%)	2.6	0.43	3.5	0.49	4.7	0.74	6.8	0.89
N. observations	4,047		4,701		4,836		4,685	

Authors own calculations using 2002, 2005, 2008 and 2011 waves of Survey of Households Finances. Household head age: 30-75 years. 'borrow' is the percentage of households holding any kind of debt (including credit card outstanding balances for 2005, 2008 and 2011) in the moment of the interview. 'applicant' comprises debt holders and those that applied for a loan or refused to do so because of sure rejecting (discouragement) in the last two years. 'rationed' are those discourages and totally rejected that do not hold any kind of debt. 'arrears' is a dummy variable recorded as a 1 when the household delayed the payment of any of its debts in the last 12 months. Weights are used.





TABLE 3. Summary Statistics – III

	2002		2005		2008		2011	
	No ration mean	Ration mean	No ration mean	Ration mean	No ration mean	Ration mean	No ration mean	Ration mean
income (1,000)	40.8	24.1	38.9	17.4	39.4	16.2	37.5	14.8
age	50.8	56.8	50.8	56.5	50.6	50.4	50.8	51.8
couple (%)	77.4	54.4	74.3	43.5	72.7	58.6	72.9	50.0
n.children	0.5	0.4	0.5	0.3	0.5	0.4	0.5	0.4
male(%)	79.1	61.3	78.0	66.6	77.3	68.9	74.5	65.4
university(%)	17.4	11.7	19.5	10.5	19.4	10.1	22.2	9.4
employed(%)	58.2	32.9	59.2	23.1	57.2	32.5	56.2	27.5
unemployed(%)	4.9	11.5	4.5	22.3	7.5	23.4	9.7	35.0
retiree(%)	26.0	50.8	26.3	47.7	24.6	28.8	23.3	28.3
selfemployed(%)	10.9	4.8	10.0	7.0	10.7	15.3	10.8	9.2
N. observations	3,998	49	4,614	87	4,733	103	4,517	168
	No repay mean	Repay mean	No repay mean	Repay mean	No repay mean	Repay mean	No repay mean	Repay mean
	sd	sd	sd	sd	sd	sd	sd	sd
income (1,000)	32.6	48.2	25.2	45.1	31.8	46.6	25.9	45.4
age	46.7	45.9	45.4	46.6	45.7	46.3	44.8	46.7
couple (%)	72.6	86.2	73.6	82.6	69.5	81.8	78.3	78.7
n.children	0.8	0.7	0.9	0.6	0.9	0.7	0.8	0.6
male(%)	72.0	82.6	74.7	82.3	74.9	80.5	76.5	76.9
university(%)	7.5	22.6	7.3	24.1	5.7	25.8	6.1	27.2
employed(%)	60.5	72.1	62.9	72.8	56.2	72.1	63.3	68.1
unemployed(%)	15.6	2.59	12.5	3.8	19.9	5.1	20.6	7.0
retiree(%)	14.7	2.32	14.2	11.5	10.8	10.9	6.6	11.8
selfemployed(%)	9.1	13.3	10.3	12.0	13.1	11.9	9.5	13.1
N. observations	265	1,195	279	1,685	282	1,520	322	1,464

Authors own calculations using 2002, 2005, 2008 and 2011 waves of Survey of Households Finances. Household head age: 30-75 years. 'Ration' are those discourages and totally rejected that do not hold any kind of debt at the moment of the interview; 'No ration' comprises the rest of the observations in the sample. 'No repay' comprise those 'borrowers' that delayed the payment of any of their debts in the last 12 months. 'No repay' represents those households that did not declare to have delayed any of those payments. Weights are used

TABLE 4. Logit Estimation Results I

	Pr(Arrears)				Pr(Arrears/Borrow)			
	2002	2005	2008	2011	2002	2005	2008	2011
age 30-34	1.064** (0.489)	1.892*** (0.507)	1.728*** (0.458)	2.107*** (0.455)	-0.662 (0.548)	0.632 (0.550)	0.631 (0.484)	0.446 (0.481)
age 35-39	0.903* (0.475)	1.802*** (0.503)	1.865*** (0.440)	1.666*** (0.444)	-0.632 (0.535)	0.660 (0.547)	0.759 (0.467)	0.290 (0.468)
age 40-44	1.128** (0.470)	1.804*** (0.499)	1.765*** (0.432)	1.890*** (0.431)	-0.282 (0.531)	0.725 (0.543)	0.823* (0.458)	0.512 (0.457)
age 45-49	0.960** (0.472)	1.743*** (0.493)	1.642*** (0.426)	1.777*** (0.420)	-0.298 (0.536)	0.697 (0.533)	0.781* (0.450)	0.554 (0.444)
age 50-54	0.972** (0.469)	1.733*** (0.495)	1.571*** (0.425)	1.700*** (0.418)	-0.323 (0.536)	0.746 (0.535)	0.843* (0.448)	0.520 (0.438)
age 55-59	0.811* (0.461)	1.188** (0.493)	1.433*** (0.419)	1.460*** (0.418)	-0.660 (0.517)	0.187 (0.529)	0.781* (0.448)	0.657 (0.441)
age 60-64	0.752* (0.421)	0.529 (0.497)	1.048*** (0.388)	1.091*** (0.395)	-0.082 (0.483)	-0.271 (0.527)	0.611 (0.422)	0.333 (0.422)
age 65-69	0.746** (0.300)	0.775** (0.389)	-0.089 (0.413)	0.456 (0.400)	0.198 (0.368)	0.401 (0.415)	-0.273 (0.436)	-0.005 (0.425)
couple	-0.222 (0.193)	0.186 (0.193)	0.224 (0.176)	0.325** (0.165)	-0.610*** (0.212)	-0.162 (0.206)	-0.139 (0.193)	0.059 (0.180)
income 20-30	-0.536*** (0.185)	-0.350** (0.164)	-0.095 (0.171)	-0.191 (0.157)	-0.865*** (0.207)	-0.618*** (0.172)	-0.511*** (0.185)	-0.588*** (0.171)
income 30-40	-0.745*** (0.227)	-0.973*** (0.223)	-0.004 (0.180)	-0.541*** (0.195)	-1.132*** (0.245)	-1.252*** (0.229)	-0.500*** (0.192)	-0.980*** (0.206)
income 40-50	-0.540** (0.235)	-1.147*** (0.276)	-0.742*** (0.249)	-0.768*** (0.232)	-0.914*** (0.255)	-1.414*** (0.282)	-1.308*** (0.258)	-1.370*** (0.241)
income 50-60	-1.002*** (0.341)	-1.014*** (0.324)	-0.456 (0.289)	-0.965*** (0.303)	-1.527*** (0.354)	-1.284*** (0.330)	-1.023*** (0.300)	-1.503*** (0.312)
income >60	-1.308*** (0.254)	-1.476*** (0.245)	-1.105*** (0.240)	-1.001*** (0.219)	-1.747*** (0.265)	-1.759*** (0.248)	-1.684*** (0.248)	-1.508*** (0.230)
univ	-0.964*** (0.229)	-0.823*** (0.207)	-0.950*** (0.201)	-1.048*** (0.191)	-1.028*** (0.239)	-0.757*** (0.210)	-0.843*** (0.206)	-0.993*** (0.198)
unemployed	1.152*** (0.224)	0.635*** (0.239)	0.857*** (0.185)	0.654*** (0.167)	1.403*** (0.273)	0.928*** (0.271)	1.141*** (0.209)	1.006*** (0.190)
retiree	-0.278 (0.367)	-0.318 (0.367)	0.156 (0.315)	-0.267 (0.299)	-0.202 (0.400)	0.028 (0.403)	0.326 (0.329)	-0.174 (0.311)
selfemployed	-0.371 (0.236)	-0.215 (0.202)	0.519*** (0.174)	0.323* (0.168)	-0.298 (0.251)	-0.184 (0.211)	0.569*** (0.183)	0.306* (0.179)
male	-0.420** (0.181)	-0.233 (0.182)	-0.403** (0.165)	-0.172 (0.158)	-0.396** (0.200)	-0.093 (0.196)	-0.300 (0.184)	-0.162 (0.173)
nchilds	0.443*** (0.091)	0.319*** (0.081)	0.317*** (0.079)	0.229*** (0.076)	0.308*** (0.097)	0.243*** (0.087)	0.250*** (0.085)	0.200** (0.083)
Constant	-2.515*** (0.443)	-3.434*** (0.485)	-3.695*** (0.416)	-3.556*** (0.422)	0.255 (0.510)	-1.487*** (0.529)	-1.659*** (0.440)	-1.217*** (0.449)
Wald test (age)	0.3407	0.0026	0.0023	0.0005	0.5059	0.2208	0.5316	0.7735
Wald test (income)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	4,047	4,701	4,836	4,685	1,724	2,318	2,296	2,181

Standard errors in parentheses. Reference age: 70-75. Reference income: less than 20,000 real euros. Wald test files report p-value of the joint significance test of the dummies. Income dummies excluded when predict success. perfectly \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 5. Logit Estimation Results II

	Pr(Applic)				Pr(Borrow/Applic)			
	2002	2005	2008	2011	2002	2005	2008	2011
age 30-34	2.272*** (0.232)	1.938*** (0.209)	2.022*** (0.219)	2.620*** (0.258)	1.536 (1.140)	1.848** (0.822)	0.337 (0.742)	1.670*** (0.560)
age 35-39	1.965*** (0.221)	1.714*** (0.201)	2.184*** (0.207)	2.096*** (0.208)	1.663 (1.118)	1.342* (0.790)	0.842 (0.747)	1.156** (0.499)
age 40-44	1.668*** (0.217)	1.399*** (0.193)	1.573*** (0.190)	1.804*** (0.193)	1.898* (1.136)	2.197** (0.872)	1.358* (0.773)	1.972*** (0.523)
age 45-49	1.451*** (0.207)	1.418*** (0.179)	1.512*** (0.178)	1.605*** (0.172)	1.110 (1.069)	1.701** (0.797)	1.352* (0.754)	1.734*** (0.489)
age 50-54	1.502*** (0.201)	1.299*** (0.178)	1.221*** (0.170)	1.384*** (0.160)	1.607 (1.105)	1.312* (0.752)	0.975 (0.708)	2.282*** (0.532)
age 55-59	1.505*** (0.193)	1.085*** (0.165)	0.955*** (0.165)	1.022*** (0.157)	2.179** (1.084)	2.577*** (0.927)	1.474* (0.762)	1.221*** (0.467)
age 60-64	0.902*** (0.178)	0.716*** (0.154)	0.649*** (0.145)	0.702*** (0.138)	1.815* (0.934)	1.726*** (0.663)	1.093* (0.655)	1.355*** (0.422)
age 65-69	0.581*** (0.148)	0.447*** (0.129)	0.135 (0.126)	0.410*** (0.122)	0.836* (0.433)	0.561 (0.348)	0.820* (0.446)	0.535* (0.317)
couple	0.380*** (0.103)	0.464*** (0.095)	0.444*** (0.090)	0.173* (0.088)	-0.032 (0.463)	1.165*** (0.335)	0.733** (0.306)	0.801*** (0.233)
income 20-30	0.223** (0.113)	0.303*** (0.101)	0.348*** (0.102)	0.225** (0.103)	0.602 (0.423)	0.894*** (0.317)	1.281*** (0.298)	1.194*** (0.238)
income 30-40	0.254** (0.123)	0.225** (0.113)	0.586*** (0.111)	0.226* (0.116)	1.351** (0.647)	1.188*** (0.428)	1.652*** (0.379)	1.713*** (0.339)
income 40-50	0.365*** (0.134)	0.286** (0.126)	0.558*** (0.125)	0.475*** (0.126)	0.964* (0.584)	2.909*** (1.024)	3.420*** (1.020)	3.293*** (0.728)
income 50-60	0.549*** (0.162)	0.245* (0.148)	0.626*** (0.144)	0.448*** (0.147)	0.693 (0.663)	2.101** (1.030)	1.676*** (0.625)	2.822*** (0.736)
income >60	0.405*** (0.118)	0.284*** (0.105)	0.648*** (0.109)	0.335*** (0.110)	1.861*** (0.696)	2.909*** (0.751)	3.298*** (0.755)	3.457*** (0.553)
univ	-0.180** (0.088)	-0.288*** (0.081)	-0.343*** (0.080)	-0.278*** (0.080)	0.175 (0.492)	0.166 (0.381)	0.671 (0.432)	0.037 (0.279)
unemployed	0.188 (0.178)	0.069 (0.176)	-0.028 (0.138)	0.028 (0.129)	-0.843 (0.619)	-1.520*** (0.405)	-1.190*** (0.306)	-0.951*** (0.255)
retiree	-0.158 (0.149)	-0.472*** (0.133)	-0.136 (0.134)	-0.160 (0.126)	-0.597 (0.959)	-0.690 (0.681)	-0.049 (0.645)	-0.027 (0.397)
selfemployed	-0.147 (0.105)	-0.078 (0.099)	0.014 (0.098)	0.109 (0.100)	-0.134 (0.668)	-0.106 (0.525)	-0.323 (0.410)	-0.252 (0.324)
male	-0.176* (0.102)	-0.073 (0.095)	-0.152* (0.090)	0.099 (0.088)	0.746* (0.447)	-0.185 (0.338)	-0.147 (0.306)	-0.089 (0.243)
nchilds	0.331*** (0.059)	0.295*** (0.056)	0.254*** (0.057)	0.287*** (0.059)	0.117 (0.262)	0.022 (0.179)	0.272 (0.176)	0.054 (0.135)
Constant	-1.899*** (0.203)	-1.311*** (0.177)	-1.540*** (0.172)	-1.437*** (0.167)	1.244 (1.017)	0.863 (0.736)	0.701 (0.693)	-0.155 (0.461)
Wald test (age)	0.0000	0.0000	0.0000	0.0000	0.3580	0.0994	0.1106	0.0013
Wald test (income)	0.043	0.0346	0.0000	0.0022	0.0668	0.0000	0.0000	0.0000
Observations	4,047	4,701	4,836	4,685	1,773	2,405	2,399	2,349

Standard errors in parentheses. Reference age: 70-75. Reference income: less than 20,000 real euros. Wald test files report p-value of the joint significance test of the dummies.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 6. Decomposing the Change in Default

	2002	2005	2008	2011
$\Pr^t(D X_t)$	9.22	8.28	9.29	11.22
$\Pr^t(D X_{t+1})$	9.38	8.51	9.52	.
$\Pr^t(D X_t)$ using:				
$\Pr^{t+1}(A X_t)$	10.40	7.84	9.94	.
... and $\Pr^{t+1}(C A = 1, X_t)$	10.23	7.58	9.65	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	8.09	8.60	10.50	.

*Notes:* The first row calculates the predicted probability of default  $D$  using the weighted sum of each household's predicted default (using the logit regressions for each wave) over the observations with characteristics  $X$  in wave  $t$ . In the second row, the probability of default is calculated by using the probability of default for wave  $t$  but the observations from wave  $t + 1$ . The remaining rows report the effect on default holding the characteristics fixed for wave  $t$  but using: (i) the probability applying for a loan  $A$  in wave  $t + 1$ ; (ii) and additionally the probability of receiving credit  $C$  in wave  $t + 1$ ; and (iii) and additionally the probability of default given credit in wave  $t + 1$ .

TABLE 7. Decomposing the Change in Default by Age-group

	30-34 years old				35-39 years old			
	2002	2005	2008	2011	2005	2005	2008	2011
$\Pr^t(D X_t)$	11.85	12.58	11.00	22.47	10.34	10.98	14.51	11.51
$\Pr^t(D X_{t+1})$	14.12	11.84	11.77	.	10.22	11.48	13.71	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	12.15	12.38	12.00	.	11.66	11.22	14.62	.
... and $\Pr^{t+1}(C A = 1, X_t)$	11.92	11.03	12.65	.	11.52	10.97	13.12	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	10.34	10.80	19.91	.	10.90	13.29	11.09	.
	40-44 years old				45-49 years old			
	2002	2005	2008	2011	2005	2005	2008	2011
$\Pr^t(D X_t)$	15.36	12.36	12.46	14.92	10.41	11.55	12.10	14.72
$\Pr^t(D X_{t+1})$	15.27	12.17	12.92	.	10.44	12.90	13.25	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	16.61	11.79	13.68	.	12.23	10.98	12.67	.
... and $\Pr^{t+1}(C A = 1, X_t)$	16.27	11.37	13.64	.	12.08	11.18	11.97	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	12.82	11.86	13.58	.	10.92	10.47	13.85	.
	50-54 years old				55-59 years old			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	8.73	7.46	7.91	13.27	6.71	3.79	9.62	9.50
$\Pr^t(D X_{t+1})$	9.67	8.00	8.27	.	5.77	4.02	10.43	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	10.37	6.24	9.46	.	7.65	3.33	9.94	.
... and $\Pr^{t+1}(C A = 1, X_t)$	10.27	5.92	10.30	.	7.69	3.12	9.54	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	7.30	7.87	11.92	.	4.42	8.67	9.24	.
	60-64 years old				65-75 years old			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	7.12	2.19	3.87	5.26	4.91	4.56	3.61	2.49
$\Pr^t(D X_{t+1})$	6.76	2.23	4.23	.	4.56	4.30	3.32	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	8.76	2.05	4.40	.	5.77	4.05	3.83	.
... and $\Pr^{t+1}(C A = 1, X_t)$	8.45	1.89	4.17	.	5.63	4.14	3.40	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	2.27	3.85	4.97	.	4.83	3.58	2.65	.

Notes: For each sub-sample, the first row calculates the predicted probability of default  $D$  using the weighted sum of each household's predicted default (using the logit regressions for each wave) over the observations with characteristics  $X$  in wave  $t$ . In the second row, the probability of default is calculated by using the probability of default for wave  $t$  but the observations from wave  $t + 1$ . The remaining rows report the effect on default holding the characteristics fixed for wave  $t$  but using: (i) the probability applying for a loan  $A$  in wave  $t + 1$ ; (ii) and additionally the probability of receiving credit  $C$  in wave  $t + 1$ ; and (iii) and additionally the probability of default given credit in wave  $t + 1$ .

TABLE 8. Decomposing the Change in Default by Income

	<20,000 euros				20,000-30,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	13.85	13.08	10.49	14.86	9.02	8.97	9.80	14.15
$\Pr^t(D X_{t+1})$	13.85	13.50	11.74	.	8.42	10.13	10.32	.
Pr <sup>t</sup> (D X <sub>t</sub> ) using:								
Pr <sup>t+1</sup> (A X <sub>t</sub> )	16.53	11.47	11.71	.	9.69	9.23	10.36	.
... and Pr <sup>t+1</sup> (C A = 1, X <sub>t</sub> )	15.84	10.70	10.93	.	9.57	9.16	10.26	.
... and Pr <sup>t+1</sup> (D C = 1, A = 1, X <sub>t</sub> )	13.19	9.83	12.96	.	9.55	9.11	14.50	.
	30,000-40,000 euros				40,000-50,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	7.45	6.81	11.38	9.80	8.82	4.03	9.97	6.35
$\Pr^t(D X_{t+1})$	7.95	7.26	10.21	.	8.11	4.43	9.18	.
Pr <sup>t</sup> (D X <sub>t</sub> ) using:								
Pr <sup>t+1</sup> (A X <sub>t</sub> )	8.09	7.05	11.73	.	9.72	4.09	10.41	.
... and Pr <sup>t+1</sup> (C A = 1, X <sub>t</sub> )	8.12	7.03	11.51	.	10.00	4.08	10.38	.
... and Pr <sup>t+1</sup> (D C = 1, A = 1, X <sub>t</sub> )	6.44	10.29	10.34	.	4.56	8.93	6.70	.
	50,000-60,000 euros				>60,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	6.94	5.94	6.59	10.42	5.14	2.84	4.47	2.97
$\Pr^t(D X_{t+1})$	6.29	5.50	6.06	.	5.11	2.74	3.56	.
Pr <sup>t</sup> (D X <sub>t</sub> ) using:								
Pr <sup>t+1</sup> (A X <sub>t</sub> )	7.65	5.74	7.17	.	5.49	2.73	4.69	.
... and Pr <sup>t+1</sup> (C A = 1, X <sub>t</sub> )	7.76	5.67	7.16	.	5.49	2.76	4.69	.
... and Pr <sup>t+1</sup> (D C = 1, A = 1, X <sub>t</sub> )	6.71	6.64	10.85	.	2.91	4.34	3.24	.

Notes: For each sub-sample, the first row calculates the predicted probability of default  $D$  using the weighted sum of each household's predicted default (using the logit regressions for each wave) over the observations with characteristics  $X$  in wave  $t$ . In the second row, the probability of default is calculated by using the probability of default for wave  $t$  but the observations from wave  $t + 1$ . The remaining rows report the effect on default holding the characteristics fixed for wave  $t$  but using: (i) the probability applying for a loan  $A$  in wave  $t + 1$ ; (ii) and additionally the probability of receiving credit  $C$  in wave  $t + 1$ ; and (iii) and additionally the probability of default given credit in wave  $t + 1$ .

TABLE 9. Decomposing the Change in Default by Employment Status and Education

	Employed				Unemployed			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	9.69	8.90	9.34	13.02	29.16	21.46	22.31	21.20
$\Pr^t(D X_{t+1})$	10.01	8.62	9.38	.	30.26	23.13	20.86	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	10.88	8.70	9.67	.	32.66	18.44	24.88	.
... and $\Pr^{t+1}(C A = 1, X_t)$	10.89	8.47	9.57	.	29.92	17.36	22.59	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	8.51	9.28	12.62	.	22.57	19.58	20.34	.
	Retired				Self-employed			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	4.97	4.57	3.94	3.22	7.87	8.14	11.58	9.41
$\Pr^t(D X_{t+1})$	4.74	4.22	3.95	.	7.97	6.87	10.88	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	5.72	4.02	4.50	.	9.01	7.88	12.60	.
... and $\Pr^{t+1}(C A = 1, X_t)$	5.61	4.02	4.15	.	8.91	7.16	13.01	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	4.72	4.12	3.21	.	7.42	11.34	8.81	.
	University education				Non university education			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	3.77	3.14	2.84	3.16	10.36	9.51	10.81	13.43
$\Pr^t(D X_{t+1})$	3.88	2.99	2.92	.	10.70	9.82	11.34	.
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	4.10	3.32	2.74	.	11.72	8.92	11.63	.
... and $\Pr^{t+1}(C A = 1, X_t)$	4.05	3.24	2.70	.	11.53	8.62	11.29	.
... and $\Pr^{t+1}(D C = 1, A = 1, X_t)$	3.02	2.92	3.49	.	9.16	9.96	12.16	.

Notes: For each sub-sample, the first row calculates the predicted probability of default  $D$  using the weighted sum of each household's predicted default (using the logit regressions for each wave) over the observations with characteristics  $X$  in wave  $t$ . In the second row, the probability of default is calculated by using the probability of default for wave  $t$  but the observations from wave  $t + 1$ . The remaining rows report the effect on default holding the characteristics fixed for wave  $t$  but using: (i) the probability applying for a loan  $A$  in wave  $t + 1$ ; (ii) and additionally the probability of receiving credit  $C$  in wave  $t + 1$ ; and (iii) and additionally the probability of default given credit in wave  $t + 1$ .