



# The effect of the financial crisis on default by Spanish households<sup>☆</sup>

Carlos Aller<sup>a,\*</sup>, Charles Grant<sup>b</sup>

<sup>a</sup> Universidad CEU Cardenal Herrera, C/Carmelitas, 3, 03203 Elche, Spain

<sup>b</sup> Brunel University London, Kingston Lane, Uxbridge, Middlesex, UB8 3PH London, United Kingdom

## ARTICLE INFO

### Article history:

Received 12 December 2016

Received in revised form 2 July 2017

Accepted 15 February 2018

Available online 16 February 2018

### JEL classification:

D14

G21

### Keywords:

Spanish financial crisis

Household-debt

Arrears

## 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. A key contribution is to explain the change in arrears since the onset of the crisis. Using information on credit applications and acceptances we decompose the change in arrears among all households into a contribution from four parts: (i) changes in characteristics; (ii) changes in applications; (iii) changes in acceptances; (iv) changes in arrears among borrowers. We show the last is the most important contribution.

© 2018 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

The aim of this paper is to explore the borrowing and repayment behaviour of Spanish households since 2002 using household data. 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. During the span of this study, Spain experienced a boom followed by a severe crash ensuing from the sub-prime crisis. Unemployment more than doubled from 2007 to 2009, and households default rates experienced even larger increases in these years. Bernardino and Gutiérrez (2012) and Igan et al. (2014) show household credit in Spain has mirrored these changes in the macro-economy. Crook (2006) shows that credit to the household sector has expanded more rapidly than in other EU countries in the years prior to the crisis, as Spanish households have become as heavily indebted as households in Northern Europe (see Cecchetti et al.,

2011; or Bover et al., 2016). Default rates on mortgages and consumer loans increased dramatically over this period, and a key aim of this study is to explore the causes of this increase. It will investigate whether the increase was due to changes at the household level in income and unemployment, and whether it was the result of credit being extended to previously excluded households.

This paper will use the Survey of Household Finances (EFF), a household level dataset available for four different waves in the period 2002–2011. This survey was commissioned by the Bank of Spain to collect detailed information about the financial position of Spanish households and hence it provides a rich source to study the debt holding and repayment behaviour of a representative sample of Spanish families. Using household data enables us to understand the differences across households in their responses to the crisis. This paper will also discuss the changes in the borrowing and arrears behaviour of Spanish households before and after the financial crisis.

By building on the approach of Grant and Padula (2016), we will use a decomposition exercise to understand the changes in arrears among Spanish households since 2002 (which rose sharply over the survey period). Christelis et al. (2013) similarly employ a decomposition exercise when looking at differences in asset holding in Europe and the US. Their exercise investigates whether characteristics or coefficients explain these differences. In our decomposition exercise, we will note that between any two years the overall change in arrears in the population can be split into four parts: (i) changes in characteristics; (ii) changes in applications; (iii) changes in acceptances; (iv) changes in arrears among borrowers. We will

<sup>☆</sup> Authors are grateful for helpful comments to participants at XVIII (Alicante) and XIX (Seville) Applied Economics Meeting, Econometric Research in Finance (ERFIN) Workshop (Warsaw), First Catalan Economic Society Conference (Barcelona) and seminar participants at University of Balearic Islands and Middlesex University London. We also thank Iftekhar Hasan (editor) and three anonymous referees for comments which have greatly improved the paper. All remaining errors are our own. Financial support from Generalitat Valenciana grant Prometeo/2017/158 and from 'Obra Social La Caixa' are gratefully acknowledged.

\* Corresponding author.

E-mail addresses: [carlos.allerarranz@uchceu.es](mailto:carlos.allerarranz@uchceu.es) (C. Aller), [charles.grant@brunel.ac.uk](mailto:charles.grant@brunel.ac.uk) (C. Grant).

investigate the relative importance of each in explaining the rise in arrears since 2002. Thus our exercise investigates whether changes in characteristics (such as unemployment and income changes) can explain the increase in arrears during the Great Recession. And since there will be separate regressions for credit applications, for bank acceptances, and for arrears among borrowers, the effect of changes in the coefficients in each of these three regressions can be separately explored. Thus we will be able to investigate whether the rise in arrears was caused by an increase in applications for loans which was accommodated by lenders, or whether it caused by a weakening in lending standards.

We proceed by first describing existing literature and some background information about the Spanish credit market 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. In Section 5 we propose a decomposition exercise which we will use to understand the cause of the change in arrears. Our conclusions are reported in Section 6.

## 2. Literature review

There is already an extensive literature on household arrears as well as the role of arrears in explaining the Great Recession. For example, Gerlach-Kristen and Lyons (2015) explore the role of ‘affordability’ and negative equity in explaining mortgage arrears among European households. For Spain, Ampudia et al. (2016) argue that unemployment and low wealth are among the most important determinants of default, while Sánchez-Martínez et al. (2016) find that Spanish households whose family head is female, married or self-employed are at higher risk of missing mortgage payments. More interesting is to explore how changes in characteristics explains the crisis. For example, Foote et al. (2009) and Elul et al. (2010) argue that unemployment and unexpected falls in income have driven the increase in default among US households. Similarly Blanco and Gimeno (2012) have argued that changes in unemployment explain the surge in Spanish household default between 2007 and 2009.

Not all papers have attributed the increase in arrears to changes in households characteristics. Much of the US literature has focused on the expansion of credit prior to the crisis. Mian and Sufi (2009), Demyanyk and Van Hemert (2011) and Mayer et al. (2009) argue that the records of US lenders show that there was a deterioration of lending standards which precipitated the sub-prime crisis, which Keys et al. (2010) attributed to the reduced incentive to screen applicants which arose with the securitization of mortgage lending in the US market. Similarly, both Crook (2006) and Duygan and Grant (2009), in cross-European studies, showed there had been a large increase in borrowing by Spanish households in the years prior to the crisis. Using lending records supplied by a Spanish real estate company, Akin et al. (2014) and Díaz-Serrano (2015) showed there was softening of lending standards in the Spanish market, while Maddaloni and Peydró (2011) reach a similar conclusion (especially for mortgage loans) analysing the Bank Lending Survey, a quarterly survey of Euro area banks on their lending practices for 2002–2008.

This review of the literature suggests two different explanations of the rise in arrears during the crisis. In the first, the rise in arrears is the concomitant consequence of the deterioration in labour market conditions; while in the second, the increase in arrears is the consequence of the increase in lending to households hitherto excluded from borrowing due to low income and poor credit scores. While these are the two most popular explanations of the rise in arrears during the Great Recession, two other rarer arguments have also been suggested in the literature on US households. Dell’Arricia et al.

(2012), by looking at the pool of mortgage applicants, argue there was an increase in credit demand which was at least as important as changes in lending policy in the US. While Guiso et al. (2013) argue that survey evidence suggests that American households became more willing to default regardless of their circumstances during the sub-prime crisis.

### 2.1. The Spanish credit market

This study covers the period 2002–2011, the years immediately prior to and following the outbreak of the 2008 financial crisis. This crisis had severe effects on the Spanish financial sector and the Spanish economy, with important consequences for the household sector. Spanish households typically hold 25-year or 30-year variable rate repayment mortgages (which move with the Euro-zone interest rate), and this has not changed over the crisis years. Bernardino and Martín de Vidales (2014) discuss how in the years preceding the crisis there was a rapid expansion in credit to the household sector, which they associated with the liberalisation of the regulation of savings banks which started in 1990. However, these organisations were newly regulated following the crisis when it became apparent that many savings banks were undercapitalized.

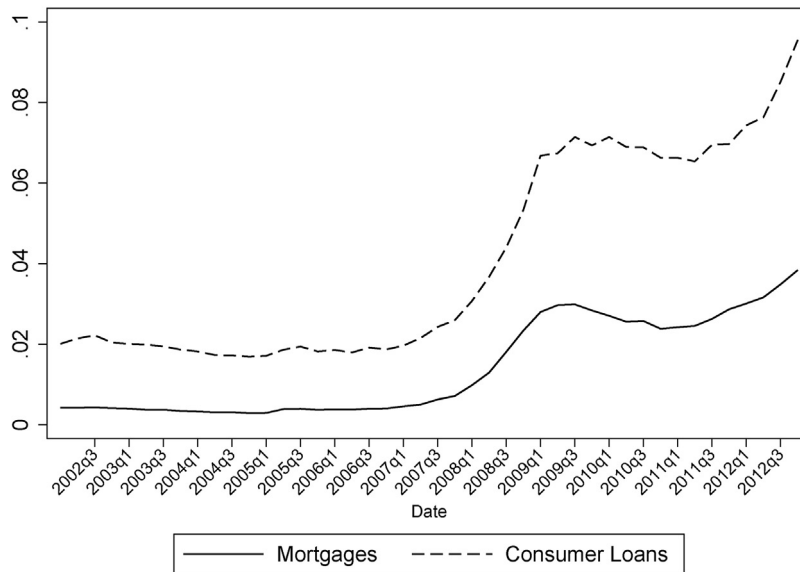
Fig. 1a provides information on the household default rate for the mortgage (housing) loans and for consumer (non-housing) loans. Campbell and Cocco (2015), in a US context, show that households are likely to default on their mortgage when they have little or no equity in the property (which will be during the first few years of the mortgage agreement). Schwartz and Torous (1993) provide evidence that mortgage defaults among US households peak within 16 quarters of the initiation of the loan (the household would have entered arrears considerably earlier). The most important constituents of consumer loans among Spanish households are “unsecured personal loans”, “credit lines” and “credit cards”. The first is an agreed loan with an agreed repayment plan, typically over a period of up to three years; the second is an agreed borrowing limit, which is repayable on demand; while credit cards debt is typically repayable over several months when making minimum repayments. Saurina (2009), classifying loans to the Spanish household sector by their riskiness, shows mortgages are the least risky loan type (especially those with a loan-to-value ratio below 80 percent), while credit cards and credit lines are the most risky. The figure shows that the default rate on consumer loans is considerably higher than on mortgages, but that the default rate for both mortgages (solid line) and consumer loans (dashed line) increased during 2007 and 2008, which plateaued between 2009 and 2011, before again increasing in the following years. Fig. 1b shows a sharp increase in mortgage disclosures rates during the survey period, while the Instituto Nacional de Estadística report a several-fold increase in individual insolvency procedures since 2004.

In the rest of the paper we will explore this increase in household default, and assess how household arrears differs between household types. We will also investigate the extent to which the overall change in arrears that can be attributed to changes in credit applications and/or credit acceptances (as well as exploring other factors that may have contributed to changes in arrears). This will enable us to assess by how much more the increase in arrears would have been if there had not been change in the supply and/or the demand for credit.

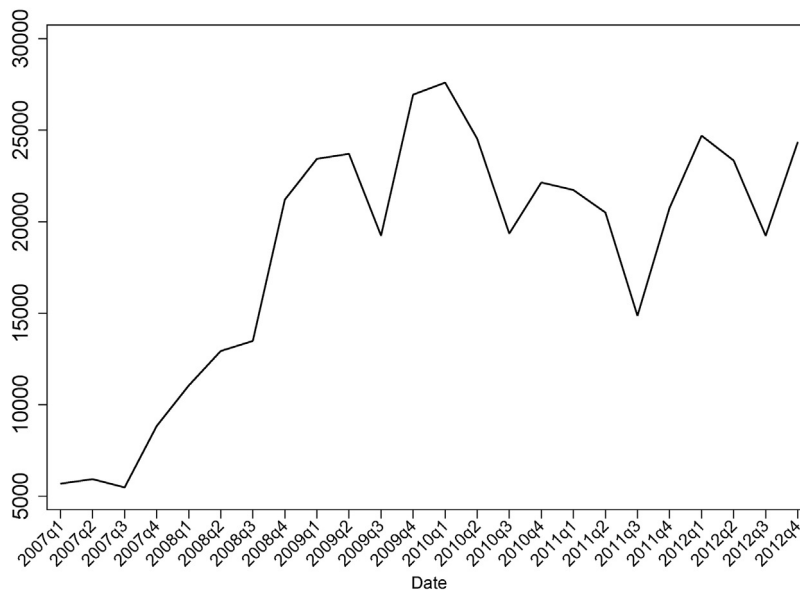
## 3. Data

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 start-

a: Households' default rate



b: Number of foreclosures



**Fig. 1.** (a) 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. (b) Number of foreclosures. *Note:* Total number of foreclosures at courts of first instance in Spain, 2007–2012. *Source:* CGPJ: Estadística Judicial.

ing in 2002 (e.g. we have data for 2002, 2005, 2008 and 2011). 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>1</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 4000 households included in each year of the analysis.

Household-related variables are obtained using several questions asked to the household respondent. We utilize variables containing information on the level of education, marital status, house ownership, labour market status, age and the number of

<sup>1</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 et al., 2014, and references contained therein).

**Table 1**  
Summary statistics.

	2002		2005		2008		2011	
	mean	sd	mean	sd	mean	sd	mean	sd
Income	40.6	0.72	38.3	0.82	38.6	0.95	36.7	0.97
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	71.9	1.14
No. children	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	74.2	1.08
University (%)	17.3	0.78	19.3	0.89	19.0	0.98	21.6	1.10
Employed (%)	57.8	1.01	58.4	1.07	56.4	1.17	54.7	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	23.6	0.97
Self-employed (%)	10.8	0.66	9.9	0.65	10.8	0.79	10.7	0.86
Homeowner (%)	83.3	0.79	84.5	0.79	83.9	0.91	83.5	1.05
Applicant (%)	54.2	1.02	59.3	1.07	59.5	1.16	60.7	1.23
Borrow (%)	52.7	1.03	57.1	1.08	56.4	1.18	55.8	1.27
Arrears (%)	9.2	0.63	8.3	0.59	9.4	0.73	11.1	0.94
No. observations	4047		4701		4836		4684	

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. “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. Five imputations (following Rubin, 1987) and weights are used.

children living in the house. We also include variables containing information on household income (adjusted by the monthly consumer price index from Instituto Nacional de Estadística).

The main focus of the paper will be to exploit questions on debt holding. The first key variable is the dummy “apply” for whether the household applied for a loan during the last two years (or was discouraged from doing so because they believed they would have been rejected). The survey also allows us to construct the dummy “accept” which takes the value one if the application for credit was accepted and zero if it was rejected (where discouraged households are included with the rejected households). Lastly, households report whether they were unable to pay as scheduled any of their debt payments in the last year, for which we again construct a dummy called “arrears”.

The question on arrears covers a wide-range of different outcomes, since, at one extreme, the household may be facing court action for the recovery of the debt (or the household may be filing for bankruptcy because it is unable to pay), while the other extreme, it may have been a few days late on a single payment and otherwise have an exemplary repayment record. Moreover, the questions on applications and acceptances, unfortunately, covers a different time period than the question on arrears since the question on applications refers to the last two years, while arrears are reported during the last year.

Table 1 provides summary statistics for each wave of the survey for the variables included in the analysis and for the full sample of households (including those households who do not borrow) where these calculations, and the regressions, use all five imputations (see Rubin, 1987, for a discussion of multiple imputation). The table shows that average annual real household income (measured in thousands) fell over the survey period. While the fall in income between 2005 and 2011 is consistent with the recession during those years, the fall between 2002 and 2005 is more surprising. Nevertheless it can be explained by noting the change in household structure: there was an increase in the number of single adult households from 40.9% in 2002 to 44.4% in 2005 and a reduction in the proportion of couple households over this period. The table also shows that the proportion of households that have applied for a loan over the last two years (the variable “applicant”) has steadily increased between 2002 and 2011. But despite this increase, the proportion of households currently borrowing at first increased between 2002 and 2005, but then slowly fell between 2005 and 2011 (suggesting there was an increase in the proportion

of households that had their loan rejected). The pattern over time of household arrears displays the opposite pattern; at first it fell, and then between 2005 and 2011 it steadily increased.

#### 4. Regression results

An important aim of the paper is to investigate how the repayment behaviour of Spanish households has changed since the onset of the recent financial crisis, and to provide some insight as to what has caused this change. This requires not only studying arrears, but also households’ application behaviour, and the lending behaviour of credit institutions. We will investigate the determinants of whether the household applied for a loan; whether their loan application was accepted; and whether they repaid the debts on schedule or entered arrears. Fundamentally, we wish to understand how arrears changed over time. Consequently, we perform separate logit estimations for each wave of the data which enables us to understand how the household credit market differs over time, and particularly how it differs before and after the financial crisis. As explanatory variables, we include a set of household characteristics including: dummies for different age strata of the household, gender of the head, whether the household is headed by a couple, dummies for level of income (separated into six roughly equally sized groups), whether the household head has a university degree, number of children living in the house, a dummy for house ownership and three different dummies to indicate whether the head is self-employed, retired or unemployed (employed households are the left-out group).<sup>2</sup>

##### 4.1. The rate of arrears

Table 2 reports results for arrears over the last year for each wave of the survey. The regressions in the columns 2–5 include all households (where, clearly, non-borrowers will not report arrears). The results for the 2002 wave (the second column in Table 2) show that each age group is significantly different from the left-out group (households between 70 and 74). However, the LR test for the different age dummies shows that differences between the different age-groups is not statistically significant (see Meng and Rubin,

<sup>2</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 arrears to year-of-birth cohort effects.

**Table 2**  
Logit estimation results I.

	Pr(Arrears)				Pr(Arrears/Borrow)			
	2002	2005	2008	2011	2002	2005	2008	2011
Age 30–34	0.967* (0.496)	1.861*** (0.510)	1.588*** (0.468)	2.158*** (0.460)	−0.609 (0.572)	0.677 (0.559)	0.423 (0.498)	0.470 (0.487)
Age 35–39	0.821* (0.482)	1.796*** (0.505)	1.739*** (0.445)	1.741*** (0.448)	−0.435 (0.564)	0.697 (0.557)	0.596 (0.474)	0.363 (0.470)
Age 40–44	1.123** (0.477)	1.842*** (0.500)	1.685*** (0.437)	1.964*** (0.434)	−0.148 (0.560)	0.794 (0.552)	0.722 (0.465)	0.587 (0.460)
Age 45–49	0.957** (0.479)	1.796*** (0.494)	1.537*** (0.429)	1.822*** (0.424)	−0.178 (0.563)	0.768 (0.542)	0.646 (0.456)	0.619 (0.447)
Age 50–54	1.008** (0.474)	1.730*** (0.497)	1.456*** (0.430)	1.736*** (0.422)	−0.187 (0.561)	0.689 (0.544)	0.675 (0.456)	0.602 (0.442)
Age 55–59	0.840 (0.466)	1.244** (0.494)	1.361** (0.423)	1.514** (0.424)	−0.434 (0.543)	0.259 (0.539)	0.684 (0.454)	0.751* (0.448)
Age 60–64	0.762* (0.425)	0.605 (0.497)	1.010** (0.394)	1.088*** (0.397)	0.035 (0.512)	−0.221 (0.532)	0.539 (0.431)	0.311 (0.425)
Age 65–69	0.789*** (0.303)	0.775** (0.390)	−0.144 (0.415)	0.469 (0.401)	0.291 (0.394)	0.505 (0.424)	−0.389 (0.439)	−0.040 (0.429)
Couple	−0.073 (0.197)	0.307 (0.198)	0.195 (0.175)	0.314* (0.166)	−0.389* (0.224)	−0.007 (0.215)	−0.146 (0.194)	0.064 (0.182)
Income 15–25	−0.695*** (0.233)	−0.421** (0.184)	0.224 (0.208)	−0.153 (0.176)	−1.209** (0.291)	−0.668*** (0.201)	−0.195 (0.231)	−0.601** (0.200)
Income 25–35	−0.712*** (0.262)	−0.835*** (0.240)	0.367* (0.206)	−0.374* (0.196)	−1.364*** (0.278)	−1.255*** (0.253)	−0.256 (0.227)	−0.893*** (0.215)
Income 35–45	−0.797*** (0.279)	−0.936*** (0.254)	−0.332 (0.313)	−0.701*** (0.247)	−1.440*** (0.310)	−1.321*** (0.261)	−0.917*** (0.331)	−1.303*** (0.263)
Income 45–57	−0.841*** (0.289)	−1.320*** (0.365)	−0.411 (0.288)	−1.047*** (0.285)	−1.439*** (0.328)	−1.646*** (0.370)	−1.153*** (0.303)	−1.708*** (0.297)
Income >57	−1.690*** (0.310)	−1.520*** (0.302)	−0.716*** (0.261)	−1.041*** (0.236)	−2.433*** (0.363)	−1.881*** (0.313)	−1.397*** (0.275)	−1.649*** (0.250)
Homeowner	−0.763*** (0.155)	−0.690*** (0.147)	−0.345** (0.156)	0.161 (0.167)	−1.165*** (0.187)	−1.012*** (0.161)	−0.771*** (0.169)	−0.360** (0.183)
Univ	−0.934*** (0.237)	−0.818*** (0.214)	−0.987*** (0.202)	−1.044*** (0.193)	−0.993*** (0.252)	−0.752*** (0.218)	−0.880*** (0.207)	−0.998*** (0.201)
Unemployed	1.048*** (0.232)	0.489** (0.246)	0.865*** (0.189)	0.660*** (0.171)	1.225*** (0.292)	0.738*** (0.285)	1.134*** (0.213)	0.986*** (0.194)
Retiree	−0.297 (0.371)	−0.271 (0.368)	0.194 (0.314)	−0.234 (0.304)	−0.138 (0.410)	0.068 (0.408)	0.361 (0.330)	−0.081 (0.316)
Self-employed	−0.354 (0.240)	−0.189 (0.204)	0.539** (0.175)	0.315* (0.171)	−0.242 (0.260)	−0.131 (0.214)	0.584** (0.186)	0.327* (0.182)
Male	−0.467** (0.185)	−0.235 (0.185)	−0.381** (0.167)	−0.179 (0.160)	−0.448** (0.212)	−0.095 (0.205)	−0.241 (0.187)	−0.170 (0.175)
No. children	0.442*** (0.091)	0.310*** (0.080)	0.324*** (0.078)	0.227*** (0.077)	0.292*** (0.100)	0.236*** (0.088)	0.263*** (0.084)	0.205** (0.084)
Constant	−1.773*** (0.462)	−2.882*** (0.495)	−3.549*** (0.438)	−3.679*** (0.450)	1.413** (0.562)	−0.622 (0.549)	−1.036** (0.474)	−0.808* (0.486)
LR test (age)	0.2714	0.0016	0.0066	0.0002	0.6299	0.3181	0.5462	0.6322
LR test (income)	0.0004	0.0000	0.0004	0.0010	0.0000	0.0000	0.0000	0.0000
Observations	4047	4701	4836	4685	1724	2318	2296	2181

Standard errors in parentheses. Columns 2–5 estimate a logit regression model of whether the reported arrears during the last year using the whole sample of households. Columns 6–9 estimate a logit regression model of whether the reported arrears during the last year using the sample of households who have a loan. Reference age: 70–75. Reference income: less than 15,000 real euros. Likelihood ratio (LR) test files report *p*-value of the joint significance test of the dummies, following [Meng and Rubin \(1992\)](#).

\* *p* < 0.1.

\*\* *p* < 0.05.

\*\*\* *p* < 0.01.

1992, for a discussion of the LR test). 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 income-dummies are all equal. Owning a house reduces arrears.

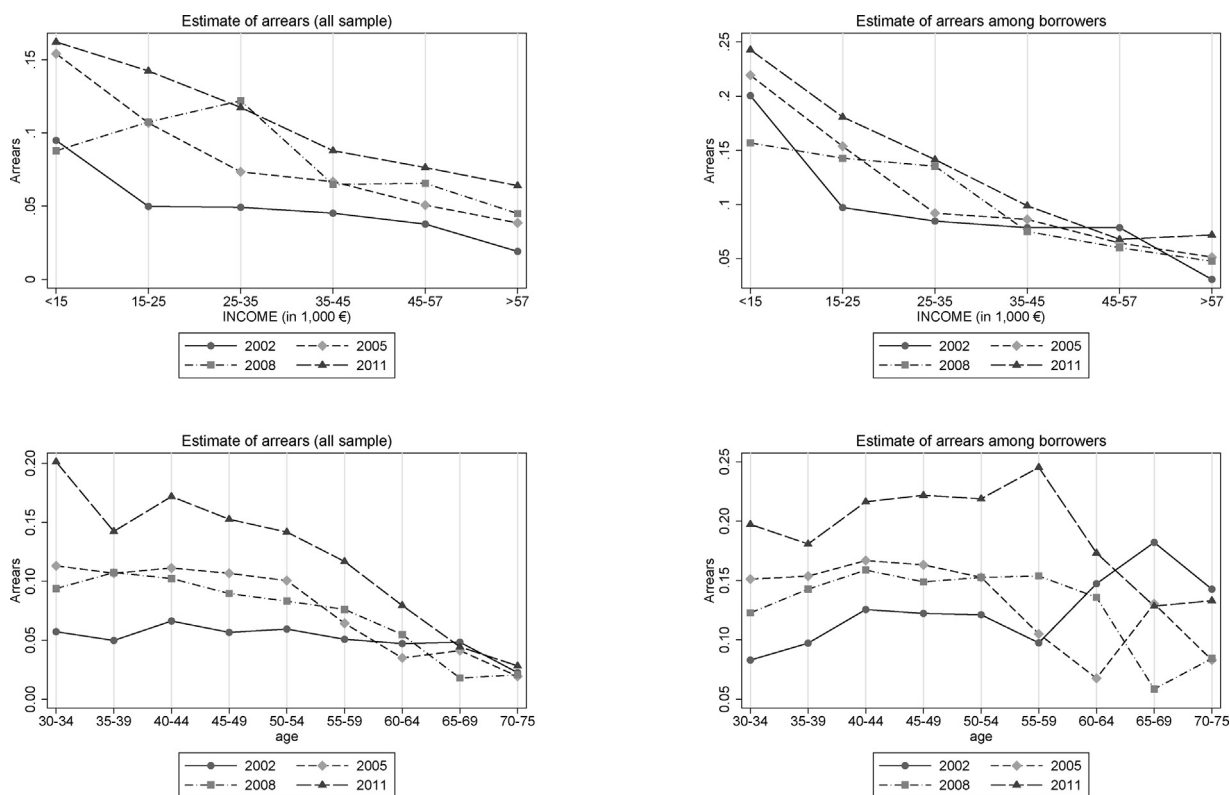
The results are similar in the remaining three waves. The effect of a university education, of being unemployed and of children remain significant; however, male is only significant in the 2008 wave. The effect of being self-employed gets larger over time, and is significant in the last two waves of 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 age-dummies are larger. Moreover, unlike in 2002, the LR test which tests whether the coefficients are different (at the bottom of the table) is now significant in the 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.

Columns 6–9 of [Table 2](#) looks at the repayment behaviour of borrowers.<sup>3</sup> The results for the sub-sample of borrowers are mostly

<sup>3</sup> [Grant and Padula \(2016\)](#) estimate what they describe as “the true propensity to repay” which they argue can be bounded between the estimates on the whole





**Fig. 2.** The rate of arrears by income and age. Note: The two left-hand figures report the predicted probability of the household entering arrears during the last year using the whole sample, while the two right-hand figures report the predicted probability of the household entering arrears during the last year where the sample is restricted to households who borrow. Predicted values obtained from logit estimations (Table 2) applied to a reference household: headed by a man, 45–49 years old that lives in couple, house owner employed, house owner, no children and total household income sums up between 15,000 and 25,000 euros (in 2010 real terms) per year.

similar to the results for the whole sample. They show that university education consistently reduces arrears, but the number of children raises arrears. In the sample of borrowers, age is not significant in any wave (the LR test never rejects the null that all age-groups default at the same rate); this finding differs from the regressions using the whole sample. 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.

The results for age and income are also shown in Fig. 2. It plots how arrears changes as income changes (in the top panel) and as age changes (in the bottom panel), holding other variables at their median value.<sup>4</sup> The top-left panel plots the rate of arrears 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 bottom-left panel looks at arrears among different age-groups. It shows that the rate of arrears is highest among younger households, but lower among older households. The figure also shows that arrears at younger ages increased between 2002 and 2005, and increased again between 2008 and 2011. This results in the age-profile being much steeper at the end of the sample period than at the beginning.

population, and the estimates on the population of borrowers, e.g., between the estimates in columns 2–5 and columns 6–9.

<sup>4</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 15,000 and 25,000 euros per year (in 2010 real terms).

The two right hand panels show arrears among borrowers. The top panel shows how arrears falls with income. It shows the differences between low income and high income households are even sharper than in the panel on the left which includes all households. The bottom-right panel of Fig. 2 looks at age, and shows that there seems to be no clear pattern to the age-profile of arrears. This is in contrast to the bottom-left panel where there is a clear age-profile to arrears for 2005–2011. However, for households below 60, the rate of arrears increased steadily between waves at a similar amount for each age-group (the pattern is less clear-cut for older households).

#### 4.2. Applications and acceptances

Table 2 showed there are some differences between arrears among borrowers and arrears in the whole population. This suggests that whether a credit application is made and accepted might have a role in explaining arrears among the whole population of Spanish households. Furthermore, changes in arrears over time may be partly explained by changes in the pool of borrowers. The first four columns of Table 3 report the determinants of loan applicants, where the left-hand-side variable is a dummy for whether the household reports that they applied for a loan during the last two years. 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; home-owners are more likely to apply; while having children increases the demand for loans. These results help to explain the rate of arrears among university graduates: the first four columns of Table 2 showed graduates are less likely to be in arrears, while here we have shown that these households are less

**Table 3**  
Logit estimation results II.

	Pr(Application)				Pr(Accept/Apply)			
	2002	2005	2008	2011	2002	2005	2008	2011
Age 30–34	2.339** (0.234)	1.959** (0.212)	2.073** (0.222)	2.659** (0.259)	1.376 (1.182)	1.730** (0.830)	1.058 (0.849)	1.647** (0.576)
Age 35–39	2.019** (0.222)	1.711** (0.202)	2.203** (0.209)	2.141** (0.209)	1.349 (1.168)	1.239 (0.796)	1.385 (0.846)	1.269** (0.523)
Age 40–44	1.693** (0.218)	1.379** (0.194)	1.598** (0.191)	1.828** (0.193)	1.671 (1.193)	2.093** (0.883)	1.691* (0.867)	1.894** (0.550)
Age 45–49	1.484** (0.208)	1.397** (0.179)	1.528** (0.179)	1.611** (0.172)	0.889 (1.117)	1.612** (0.807)	1.746** (0.854)	1.579** (0.508)
Age 50–54	1.513** (0.202)	1.284** (0.179)	1.220** (0.171)	1.381** (0.160)	1.437 (1.147)	1.381* (0.767)	1.360* (0.804)	2.024** (0.547)
Age 55–59	1.500** (0.194)	1.068** (0.166)	0.957** (0.166)	1.021** (0.158)	1.812 (1.090)	2.365** (0.918)	1.957** (0.859)	0.982** (0.480)
Age 60–64	0.914** (0.180)	0.699** (0.154)	0.648** (0.146)	0.706** (0.138)	1.634* (0.989)	1.608** (0.664)	1.245 (0.759)	1.298** (0.437)
Age 65–69	0.574** (0.148)	0.444** (0.129)	0.125 (0.127)	0.401** (0.123)	0.870 (0.470)	0.506 (0.352)	0.962** (0.474)	0.583* (0.336)
Couple	0.361** (0.104)	0.426** (0.096)	0.438** (0.090)	0.184** (0.090)	−0.413 (0.472)	1.084** (0.349)	0.667** (0.319)	0.707** (0.252)
Income 15–25	0.132 (0.146)	0.197* (0.116)	0.277** (0.122)	0.095 (0.123)	0.817 (0.505)	0.324 (0.304)	1.083** (0.300)	0.919** (0.242)
Income 25–35	0.280* (0.151)	0.407** (0.120)	0.671** (0.122)	0.191 (0.123)	1.200* (0.683)	1.018** (0.393)	1.780** (0.405)	1.612** (0.317)
Income 35–45	0.344* (0.177)	0.376** (0.139)	0.425** (0.138)	0.200 (0.140)	1.875** (0.934)	1.424** (0.672)	1.836** (0.507)	2.812** (0.693)
Income 45–57	0.229 (0.172)	0.276 (0.168)	0.748** (0.145)	0.480** (0.147)	0.963 (0.938)	2.022 (1.089)	2.336** (0.640)	2.852** (0.675)
Income >57	0.463** (0.150)	0.331** (0.120)	0.692** (0.128)	0.334** (0.127)	2.002** (0.760)	3.170** (1.118)	3.967** (1.061)	3.261** (0.528)
Homeowner	0.263** (0.104)	0.222** (0.098)	0.151 (0.102)	0.0218** (0.104)	1.629** (0.340)	0.837** (0.285)	1.994** (0.253)	1.492** (0.206)
Univ	−0.197** (0.089)	−0.291** (0.081)	−0.325** (0.080)	−0.285** (0.081)	0.108 (0.507)	0.206 (0.389)	0.546 (0.439)	0.066 (0.288)
Unemployed	0.216 (0.180)	0.113 (0.177)	−0.013 (0.140)	0.040 (0.130)	−0.347 (0.670)	−1.415** (0.414)	−1.290** (0.328)	−0.932** (0.276)
Retiree	−0.158 (0.150)	−0.491** (0.134)	−0.139 (0.124)	−0.171 (0.126)	−0.853 (0.989)	−0.858 (0.684)	−0.091 (0.742)	−0.351 (0.414)
Self-employed	−0.169 (0.105)	−0.088 (0.099)	0.021 (0.099)	0.095 (0.101)	−0.281 (0.677)	−0.203 (0.529)	−0.372 (0.433)	−0.471 (0.337)
Male	−0.167 (0.102)	−0.071 (0.095)	−0.156* (0.091)	0.091 (0.088)	0.837 (0.453)	−0.140 (0.360)	−0.275 (0.327)	−0.081 (0.260)
No. children	0.328** (0.059)	0.297** (0.056)	0.250** (0.057)	0.284** (0.060)	0.119 (0.266)	0.052 (0.180)	0.326* (0.175)	0.040 (0.140)
Constant	−2.133 (0.230)	−1.518 (0.198)	−1.741 (0.196)	−1.600 (0.192)	0.274 (1.064)	0.399 (0.751)	−1.045 (0.812)	−1.175 (0.499)
LR test (age)	0.0000	0.0000	0.0000	0.0000	0.4628	0.0658	0.2827	0.0776
LR test (income)	0.0699	0.0476	0.0004	0.0575	0.1520	0.0007	0.0000	0.0000
Observations	4047	4701	4836	4685	1773	2405	2399	2349

Standard errors in parentheses. Reference age: 70–75. Reference income: less than 15,000 real euros. Likelihood ratio (LR) test files report *p*-value of the joint significance test of the dummies, following Meng and Rubin (1992).

\* *p* < 0.1.

\*\* *p* < 0.05.

\*\*\* *p* < 0.01.

likely to want a loan. Similarly, children raise the demand for loans and increase the rate of arrears. However, couples do not have higher arrears even though they have higher credit demand. The observed effect of male on applications is consistent with their arrears in Table 2 since the two waves where males had lower 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 LR test reported at the bottom of the table shows that the differences across age-groups are statistically significant). The results for unemployment are not significant. This shows the high rate of arrears we found earlier is not due to their high demand for loans since unemployed households are no more likely to apply for a loan than other types of household.

The last four columns in Table 3 look at whether the credit application was accepted or rejected by the lender (e.g. whether the

applicant is credit constrained) in each wave of the survey. The regression runs a Logit regression model where the left-hand side variable is a dummy variable for whether the loan is accepted, and the regression is run using the sample of applicant households. 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 we found that 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 significant only in 2008, even though Table 2 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 LR test does not reject the null in the 2002 wave). This is consistent with the fact our results showed these households are the least likely to enter arrears. Similarly, except in 2002, unemployed households are more likely to be refused credit; Table 2 shows these households are significantly more likely to be in arrears.

Fig. 3 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 more clearly suggests, 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 2 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.

## 5. Explaining the change in arrears

The regression results in Table 2 shows which factors affect arrears in each year. While the results for unemployment and income seem plausible and intuitive, other results, such as the effect of male households, are surprising. 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. The results also show that the effect of some of the variables seems to have changed over the sample period. 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. Recall that for a household to enter arrears 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 arrears 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. It would be useful to disentangle these three different possible explanations for the results we observe. Figs. 2 and 3 provided some indication of the effect of age and income on arrears; in this section we will explore the role of age, income, and other characteristics in explaining arrears 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 arrears of household  $i$ , given characteristics  $X_i$  as  $Pr^t(D_i = 1|X_i)$ . And we can compare how the arrears 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 2 and 3. Using the coefficients reported in Tables 2 and 3 and using Eq. (1), we can compute the probability of arrears for each household in the sample, given their characteristics. We can then calculate the arrears rate in the whole population in wave  $t$  by taking the weighted average of each individual household probability of arrears in that wave. Consequently we can investigate how the arrears rate has changed over time.

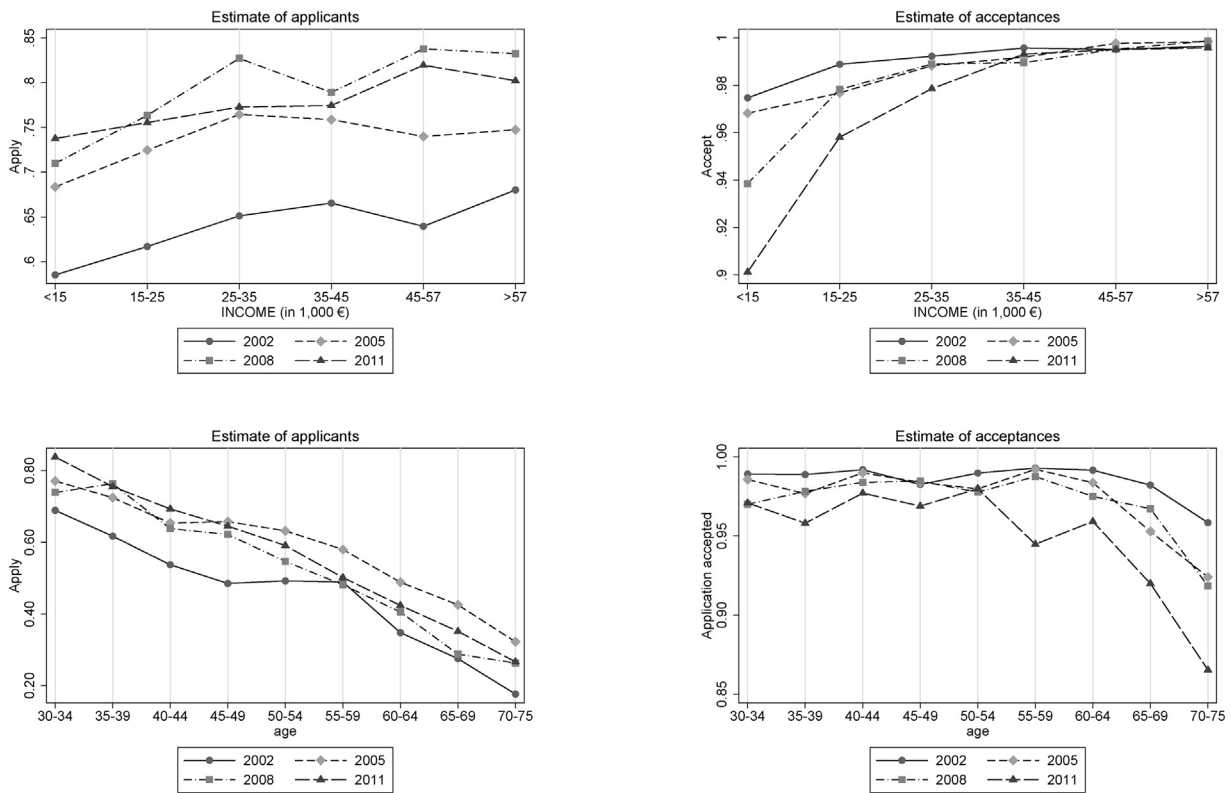
Of fundamental interest, however, is to understand what has caused the change in arrears rates over time. First note that the arrears rate between two periods can change because the distribution of underlying household characteristics has changed. To calculate how changes in characteristics affect arrears between two waves 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  $Pr^t(D|X_{t+1})$ ). Arrears can also change because the composition of borrowers has changed. Using Eq. (1), we can decompose the overall change in the arrears rate between two periods for a household with characteristics  $X$ , to changes in the arrears behaviour of borrowers, to changes in acceptance behaviour of lenders, and to changes in application behaviour of households between those waves. Eq. (1) has written the probability of arrears in wave  $t$  as  $Pr^t(D|A = 1, C = 1, X_t) \cdot Pr^t(C|A = 1, X_t) \cdot Pr^t(A|X_t)$ . This formulation uses the estimates for application, acceptance and borrower behaviour (or arrears behaviour of borrowers) for wave  $t$  that have already been estimated. A measure of the effect of changes in application behaviour of households can be obtained by using the period  $t + 1$  estimated application regression but with the period  $t$  characteristics. That is, to investigate how changes in applications affects the overall level of arrears 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 the estimated arrears 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 lenders' acceptance behaviour and of the repayment behaviour of borrowers by, in turn, using the next period estimate for lenders' acceptance behaviour  $Pr^{t+1}(C|A = 1, X_t)$ , and arrears 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 4 reports the predicted arrears rate in each wave of the data (compiled as the weighted sum of each household's predicted arrears rate using the logit estimates in Tables 2 and 3). The table shows that predicted arrears fell from 9.3% to 8.3% between 2002 and 2005, before increasing to 9.5% in





**Fig. 3.** The rate of applications and acceptances by income and age. *Note:* The two left-hand figures report the predicted probability of the household applying for a loan during the last two years, while the two right-hand figures report the predicted probability that the loan application is accepted rather than rejected. Predicted values obtained from logit estimations (Table 3) applied to a reference household: headed by a man, 45–49 years old that lives in couple, employed, house owner, no children and total household income sums up between 15,000 and 25,000 euros (in 2010 real terms) per year.

**Table 4**  
Decomposing the change in default.

	2002	2005	2008	2011
$Pr^t(D X_t)$	9.28	8.31	9.45	11.10
$Pr^t(D X_{t+1})$	9.48	8.53	9.40	.
$Pr^t(D X_t)$ using:				
$Pr^{t+1}(A X_t)$	10.58	7.86	9.95	.
... and $Pr^{t+1}(C A=1, X_t)$	10.47	7.37	9.72	.
... and $Pr^{t+1}(D C=1, A=1, X_t)$	8.13	8.72	10.55	.

*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  $t + 1$ .

2008 and more sharply to 11.1% in 2011. This pattern closely mirrors the raw data in Table 1. The second row of Table 4 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 arrears rate would have remained at 9.5%. The table shows that the predicted rate of arrears in 2005 is 8.3%, hence it means changes in household characteristics can not explain the change in arrears between these two waves. The top row of Table 4 shows that the predicted rate of arrears increased from 8.3% in 2005 to 9.5% in 2008. The second row shows that changes in characteristics alone increases arrears to 8.5%, meaning, again, changes in characteristics had only a small role in the change in arrears between 2005 and 2008. Finally, this decomposi-

tion for the change between the last two waves shows that changes in characteristics did not increase arrears, but arrears increased to 11.1%.

The results in Table 2 had shown that both income and unemployment are significant when explaining which households enter arrears. This is consistent with the results reported in Ampudia et al. (2016). However, the results in Table 4 show that changes in characteristics (of which income and unemployment are important components) had little effect on the change in arrears between waves. This is true even between the last two waves of the survey 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 result contradicts Blanco and Gimeno (2012) who argued that changes in unemployment explain the increase in default. During this period, this result suggests that additional insights can be gained exploring the change in behaviour rather than the change in characteristics. The next three rows of Table 4 separate the change in the level of arrears 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 where we will hold characteristics at their current level.

The table shows that using the 2005 coefficient estimates for application behaviour of households, but the 2002 characteristics, would have results in an increase in arrears rates from 9.3% to 10.6% (this is shown by the third row of the results for 2002). Using the 2005 estimates of both applications and acceptances (the fourth row) would have reduced this rate very slightly to 10.5%. The two rows of the decomposition exercise suggest that there was an increase in the proportion of households borrowing, and that the decline in the arrears rate between 2002 and 2005 was despite the expansion in borrowing. The last row additionally investigates

**Table 5**  
Decomposing the change in default by age-group.

	30–34 years old				35–39 years old			
	2002	2005	2008	2011	2005	2005	2008	2011
$\Pr^t(D X_t)$	12.16	13.40	11.25	20.52	11.37	11.40	15.12	11.86
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	12.48	13.27	12.12	.	13.00	11.65	15.15	.
... and $\Pr^{t+1}(C A=1, X_t)$	12.27	10.97	13.10	.	13.14	11.19	14.05	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	11.23	10.37	18.10	.	11.43	14.29	12.58	.
	40–44 years old				45–49 years old			
	2002	2005	2008	2011	2005	2005	2008	2011
$\Pr^t(D X_t)$	15.11	12.42	13.37	15.02	10.10	11.41	12.21	14.72
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	16.51	11.90	14.41	.	12.04	10.87	12.57	.
... and $\Pr^{t+1}(C A=1, X_t)$	16.26	11.30	14.23	.	11.93	11.01	11.59	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	12.64	12.76	13.87	.	11.43	10.73	13.62	.
	50–54 years old				55–59 years old			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	8.66	7.01	7.62	13.55	6.78	3.67	9.21	9.73
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	10.44	5.70	9.01	.	7.92	3.17	9.06	.
... and $\Pr^{t+1}(C A=1, X_t)$	10.42	5.15	9.65	.	7.97	2.94	8.69	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	6.25	7.48	12.35	.	3.87	8.43	9.19	.
	60–64 years old				65–75 years old			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	6.77	2.09	3.93	4.74	4.82	4.42	3.50	2.55
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	8.41	1.92	4.54	.	5.76	3.81	3.62	.
... and $\Pr^{t+1}(C A=1, X_t)$	8.09	1.75	4.39	.	5.58	3.72	3.33	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	2.21	3.94	4.74	.	4.81	3.31	2.75	.

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  $t$ . 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  $t+1$ .

the effect of changes in the arrears among borrowers (using the 2002 characteristics), which shows that the arrears rate would have fallen to 8.1%. The results in this column shows that between 2002 and 2005 the increase in borrowing was countered by a much larger fall in the arrears rate among borrowers, and this change in borrower behaviour is the major explanation for the fall in arrears in the whole population.

We found that nearly a quarter of the increase in arrears between 2005 and 2008 can be explained by changes in household characteristics. However, the second column of Table 4 shows that changes in applications and changes in acceptances (e.g. using the 2008 logit estimates but the 2005 characteristics) together would have reduced the arrears rate from 8.3% to 7.4% as credit conditions slightly tightened. It shows that a great deal of the change in arrears in the top row of the table can be explained by a rebound in the arrears among of borrowers (the bottom row) between 2005 and 2008. However, the full change in arrears requires a change in both characteristics and in the repayment behaviour of borrowers.

The top row of Table 4 shows how arrears increased from 9.5% to 11.1% between 2008 and 2011. The surge in arrears between these two years can partly be explained by an increase in credit applications, which would have raised arrears to 9.9%. However, the fourth row shows lenders reduced the availability of credit, which slightly reduced the default rate.<sup>5</sup> The most substantial contribution to the

<sup>5</sup> Blanco and Gimeno (2012) associate, for almost the same period of time, the increase in credit with a fall in default ratios that are related to the sample of borrowers rather than the whole population as in our case.

increase in default in the top row of the table between 2008 and 2011, however, was due to changes in the arrears behaviour of borrowers (shown by the bottom row of the 2008 column).<sup>6</sup> Overall, the table suggests that changes in the repayment behaviour of borrowers (rather than changes in the pool of borrowers) are the most important explanation for the changes in arrears 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 5 we investigate the differences in arrears across age-groups. 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 arrears given their other characteristics. The general pattern shows that, on the whole, older households have lower rates of arrears than younger households. For example, in 2002, although arrears are highest among households aged 40–44 (at 15.1%), the pattern otherwise shows that the rate of arrears fell from 12.2% for households

<sup>6</sup> Blanco and Gimeno (2012) argue that unemployment is the main explanation for the surge in default rate in these years. (e.g. characteristics are the most important explanation); Ampudia et al. (2016) make a similar argument. These authors argue the debt-to-income ratio plays an important role in explaining the evolution of default rate.

**Table 6**  
Decomposing the change in default by income.

	<15,000 euros				15,000–25,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	15.05	13.08	8.73	15.44	10.56	10.95	11.65	12.62
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	17.93	11.32	10.37	.	12.46	10.30	12.17	.
... and $\Pr^{t+1}(C A=1, X_t)$	17.28	9.19	10.32	.	12.26	10.13	11.45	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	12.80	7.64	13.31	.	11.23	11.43	12.38	.
	25,000–35,000 euros				35,000–45,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	9.40	7.60	11.87	13.71	8.87	7.19	9.81	8.61
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	10.00	8.14	11.55	.	9.89	6.71	10.51	.
... and $\Pr^{t+1}(C A=1, X_t)$	9.92	8.12	11.23	.	9.96	6.60	10.63	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	7.90	11.07	13.97	.	7.34	8.68	9.43	.
	45,000–57,000 euros				>57,000 euros			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	8.48	4.19	7.95	6.53	3.94	3.05	5.20	3.98
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	9.76	4.36	8.56	.	4.23	3.05	5.21	.
... and $\Pr^{t+1}(C A=1, X_t)$	10.04	4.33	8.44	.	4.25	3.06	5.17	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	4.87	6.97	6.70	.	3.41	5.03	4.35	.

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  $t$ . 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  $t+1$ .

aged 30–34 to 4.8% for households aged 65–75 when investigating differences across age groups.

Three of the four age-groups under 50 saw a slight increase in arrears 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 aged 30–34 years old, although there was an increase in applications (the second row shows applications increased arrears to 12.5%), there was also a reduction in acceptances (the third row shows arrears falling to 12.3%), hence a small increase in their incidence of borrowing. However, they sharply reduced their level of arrears conditional on getting a loan; the fourth row shows arrears falling to 11.2%. Moving from the bottom row of the 2002 column to the top row of the 2005 column shows the effect of changes in characteristics between these two waves, showing characteristics increased arrears from 11.2% to 13.4%. Thus 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 arrears due to an increase in applications between 2002 and 2005 (shown by the difference between the first and the second row in each case) which was mostly accommodated by lenders (the changes in acceptances had little effect on arrears since there is little difference between the second and third row for 2002). They also all saw an improvement in the repayment behaviour of borrowers as the bottom row of the 2002 column shows a reduction in arrears compared to the third row. 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 (going from the bottom row for 2002 to the top row for 2005 barely changes arrears).

A less clear pattern is observed for the period 2005–2008. The very youngest and oldest cohorts experienced a modest decline in their arrears, while the other age-groups all saw their rate of arrears 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 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 younger households.

Finally, we analyse the period 2008–2011, in which most groups experienced a surge in their arrears rate. The youngest households (30–34 years old) shows the largest increment, since arrears increased from 11.3% to 20.5%; while all factors contribute to that rise, changes in borrower behaviour (the difference between the third and fourth row) 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 arrears among borrowers makes the largest contribution to this increase. The table shows that 45–49 years old households experience a similar surge in arrears of 2.5%, which is mostly explained by the worsening repayment behaviour of borrower households that more than compensates for the more restrictive lending behaviour of banks. For 60–64 years old households, repayment and application behaviour by households, as opposed to the restrictive granting behaviour by banks, explain most of the increase in the overall arrears rate. The results for 65–75 years old households show the opposite results, as for this age-group the overall level of arrears fell between 2008 and 2011; although applications slightly increased (the second row shows they increased to 3.6%), 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 rate of arrears. The other group that experienced a decline in arrears is the 35–39 years old age-group; in this case the fall is explained by their better repayment behaviour (the movement from the third to the fourth row) and by the more restrictive granting behaviour by banks (the reduction in arrears by moving from the second to the third row).

**Table 7**  
Decomposing the Change in default by employment status, house ownership and education.

	Employed				Unemployed			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	9.80	9.03	9.49	12.71	29.11	21.11	22.75	20.99
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	11.12	8.82	9.70	.	33.06	17.86	25.11	.
... and $\Pr^{t+1}(C A=1, X_t)$	11.21	8.43	9.65	.	30.56	14.08	22.80	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	8.71	9.45	12.35	.	20.21	18.36	22.04	.
	Retired				Self-employed			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	4.94	4.42	3.80	3.44	7.97	8.34	12.29	9.67
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	5.76	3.81	4.21	.	9.17	8.27	13.07	.
... and $\Pr^{t+1}(C A=1, X_t)$	5.61	3.72	3.94	.	9.14	7.70	13.51	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	4.68	3.87	3.43	.	7.84	12.79	8.92	.
	University education				Non university education			
	2002	2005	2008	2011	2002	2005	2008	2011
$\Pr^t(D X_t)$	3.75	3.15	2.99	3.21	10.44	9.55	10.97	13.27
$\Pr^t(D X_t)$ using:								
$\Pr^{t+1}(A X_t)$	4.13	3.31	2.84	.	11.94	8.95	11.62	.
... and $\Pr^{t+1}(C A=1, X_t)$	4.07	3.15	2.80	.	11.81	8.38	11.34	.
... and $\Pr^{t+1}(D C=1, A=1, X_t)$	3.26	3.03	3.40	.	9.15	10.08	12.24	.

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  $t$ . 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  $t+1$ .

### 5.2.3. Income

Table 6 divides the sample into six different income groups. The top row of each sub-table shows that the level of arrears decreased between 2002 and 2005 for all except the 15–25,000 income group. For all income groups, there was an increase in the application rate (the predicted arrears in the second row increases compared to the top row). While lenders reduced their acceptance rate for the lowest three income groups (shown by the difference between the second and third row), there is a slight increase in the acceptance rate of for the other income groups. All income groups saw a fall in the rate at which actual borrowers fell into arrears between 2002 and 2005 (the move to the bottom row in each sub-table reduces arrears), which explains most of the fall in arrears reported in the top row for each group (e.g. the move from the results for 2002–2005).

Between 2005 and 2008 the overall rate of arrears fell sharply, from 13.1% to 8.7%, for the lowest income group. This fall in arrears among the poorest households can be explained by the large fall in applications (reducing arrears to 11.3%), in acceptance by lenders (further reducing arrears to 9.2%), and in the repayment of loans by borrowers (reducing arrears to 7.6%). All other income groups saw an increase in the rate of arrears between 2005 and 2008, with especially large increases among middle income groups as households with an income of 25–35,000 euros increased arrears from 7.6% to 11.9%, households with income of 35–45,000 euros increased arrears from 7.2% to 9.8%, while households with income of 45–57,000 euros increased arrears from 4.2% to 8.0%. Changes in application behaviour of households (shown by the change in arrears in the second row) do not explain this increase since the increase in the rate of applications is rather small (and applications actually fell for the 35–45,000 euro group). Similarly, the third row shows that there was also a small reduction in the rate at which applicants received credit. Arrears among borrowers fell for the lowest income group. However, the change in overall arrears for all the other income groups between 2005 and 2008 is mostly

attributable to the increase in the rate of arrears among borrowers (shown by the increase in arrears in the bottom row).

Between 2008 and 2011, all except the 25–35,000 euro income group saw an increase in credit applications (the effect on arrears is shown in the second row), and almost all groups saw a substantial increase in the rate at which credit was granted (shown by the third row). The rate of arrears among actual borrowers, shown by the bottom row, increased sharply for the lowest three income groups, but improved for the three highest income groups. Changes in characteristics (shown by the move from the bottom row of the 2008 column to the top row of the 2011 column) 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 35–45,000 group. By far the largest part of the explanation of the changes in overall arrears is due to changes in the repayment behaviour of borrowers.

### 5.2.4. Employment and education

The top four panels of Table 7 investigate 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 4. The top row of the sub-table shows that the overall rate of arrears fell between 2002 and 2005, before increasing in 2008 and then, for employed households, increasing again in 2011. As in Table 4, the fall in arrears between each wave is mainly attributable to the changing arrears behaviour of borrowers (shown by the move from the third and the fourth row of the panel). The unemployed group have much higher rates of arrears in all the waves, but the top row shows this rate fell sharply between 2002 and 2005. The bottom row of the panel shows this is due to a sharp reduction in the rate at which unemployed borrowers entered arrears. Their small increase in arrears between 2005 and 2008 is mainly due to changes in the households' characteristics (the second row shows 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 (shown in the third row) and in arrears among borrowers (shown in the fourth row).

Retired households have the lowest rate of arrears among all employment categories, and the top row of this panel shows they 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 rate of arrears among 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 arrears rate.

Except in 2008, self-employed households had lower arrears 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 fell in 2011. The second row of the self-employment panel shows that the increase in arrears between 2002 and 2005 is largely due to an increase in the rate of applications, as the fourth row shows 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 (shown in the fourth row), as 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 leading to an overall reduction in arrears.

The bottom two panels of Table 7 contrast households with a university education with those who did not go to college. The top row shows that university educated households are, in all waves, much less likely to enter arrears. University educated households experienced a decline in arrears from 2002 to 2008, where the increasing tendency to apply for loans (shown in the second row) is more than compensated by an improvement in repayment behaviour among borrowers (shown in the fourth row). 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 from 10.4% to 9.6% in 2005, and increased their arrears to 11.0% in 2008 and then, more substantially to 13.3%, in 2011. The third row of the panel shows that rate of applications increased in 2005 and again in 2011, but fell in 2008, while the third row shows there were also small reductions in the rate of acceptances over time. However, the fourth row shows that most of the changes in the overall rate of arrears in 2005 and 2008 was due to changes in the rate of arrears among borrowers, which fell in 2005, but increased in 2008. In 2011, increases in applications, in arrears among borrowers, and in characteristics all caused similarly large increases in the overall change in arrears 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 arrears behaviour of Spanish households before and after the recent crisis, an issue that has attracted the attention of a number of researchers. Our paper complements the analysis made in other papers that have hitherto used aggregate data or data from lenders' administrative records. 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 enter arrears, but also how this has changed over the sample period. Moreover, there is separate information on applications, acceptances and arrears (however, note the different time frame of these questions as applications and acceptances are over the last two years while arrears are during the last year). These questions allow us to distinguish between different explanations for the changes in the level of arrears observed for Spanish households. Our paper conducts a decomposition exercise where it apportions the rise in default to a part caused by changes in applications, a part caused by changes in acceptances, and a part caused by changes in borrower behaviour, as well as a part caused by changes in household characteristics.

The raw results show that the rate of arrears fell between 2002 and 2005, and then rose in 2008 and again in 2011. Blanco and Gimeno (2012) and Ampudia et al. (2016) highlighted the role of unemployment and low wealth in explaining arrears. Our regression results also show that lower income and unemployed households are more likely to enter arrears, 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 arrears during and after the crisis: although we also find that 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. Thus the results reported in this paper do not provide much support for the argument put forward by Blanco and Gimeno (2012) for Spain (or for Foote et al., 2009, for US households).

A key contribution of our analysis is the decomposition exercise. The results suggest that the overall rate at which Spanish households enter arrears fell between 2002 and 2005 and that this occurred despite the increase in credit applications which was mostly met by lenders. Similarly, the increase in arrears between 2005 and 2008 happened even though applications fell between these two years. Maddaloni and Peydró (2011) and Díaz-Serrano (2015) both suggested that weakening lending standards were an explanation for the increase in arrears during the crisis (as did Mian and Sufi, 2009, and Demyanyk and Van Hemert, 2011, for US households). However, the evidence presented here does not support their argument. Dell'Arricia et al. (2012) argue instead that there was an increase in credit demand among American households prior to the sub-prime crisis. However, our study shows that applications fell between 2005 and 2008, the period in which arrears increased. Rather than the change in arrears being driven by either increases in credit demand, or a softening in lending standards, this study shows that changes in the arrears behaviour of households given credit drove these changes. Between 2008 and 2011 there was an increase in the incidence of applications among Spanish households and in arrears among those receiving a loan, which together explain a substantial proportion of the change in arrears between these two years.

These results suggest that changes in the behaviour of actual borrowers is driving the arrears rate of Spanish households, rather than changes in the type of households that borrow. Our findings thus seem to support the claim made by Guiso et al. (2013) for US households; borrowers became more willing to enter arrears regardless of their circumstances. Note that since applications and acceptances fell when arrears increased, we cannot attribute this increase to a change in the composition of borrowers with new borrowers being higher credit risks since our results showed that fewer households were borrowing. Although the decomposition exercise can not explain the reason for the increased willingness to default which Guiso et al. (2013) suggest, we believe it is consistent with a decline in the stigma attached to default over time, and



an increase in the sympathy with which the civil courts deal with debtor households.

The overall picture of arrears masks substantial variation in the experience of arrears among different household types. For example, the oldest households in the sample did not see an increase in their rate of arrears, while for some (but not all) of the younger households, the increase in arrears was substantial; middle-income households increased their rate of arrears although the very richest and poorest households did not; while unemployed households have higher rates of arrears, only employed and self-employed households increased the rate at which they entered arrears; university educated households had little change in their rate of arrears, but poorly educated households both had higher arrears, and their rates increased substantially through this period.

For most groups, repayment behaviour among borrowers drove these changes in arrears, 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 arrears among borrowers, we cannot explain why borrowers did change their behaviour.

Lastly, we make a note of caution. First, we have been investigating arrears, which we earlier noted covers a range of behaviour from being a few days late on a single payment, to facing legal action for the recovery of debt. It may well be true that each incident of arrears has become more serious following the recession. Moreover, 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 changes in arrears, 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.

## References

- Akin, O., García Montalvo, J., García Villar, J., Peydró, J.L., Raya, J.M., 2014. The real estate and credit bubble: evidence from Spain. *SERIEs* 5 (2–3), 223–243, <http://dx.doi.org/10.1007/s13209-014-0115-9>.
- Ampudia, M., van Vlokhoven, H., Zochowski, D., 2016. Financial fragility of euro area households. *J. Financ. Stab.* 27, 250–262, <http://dx.doi.org/10.1016/j.jfs.2016.02.003>.
- Bernardino, A.C., Gutiérrez, P.J., 2012. El crédito al sector privado en España: del crecimiento desbordado a la fuerte restricción. *REVESCO* 109, 13–44, <http://dx.doi.org/10.5209/rev.REVE.2012.v109.40651>.
- Bernardino, A.C., Martín de Vidales, I., 2014. Crisis y cambios estructurales en el sector bancario español: Una comparación con otros sistemas financieros. *Estudios de Economía Aplicada* 32 (2), 197–213.
- Blanco, R., Gimeno, R., 2012. Determinants of default ratios in the segment of loans to households in Spain. In: Banco de España Working Paper, No 1210, <http://dx.doi.org/10.2139/ssrn.2007059>.
- Bover, O., Casado, J.M., Costa, S., Du Caju, P., McCarthy, Y., Sierminska, E., Tzamourani, P., Villanueva, E., Zavadil, Y., 2016. The distribution of debt across euro area countries: the role of individual characteristics, institutions and credit conditions. *Int. J. Cent. Bank.* 12, 71–128 <http://www.ijcb.org/journal/ijcb16q2a3.htm>.
- Bover, O., Coronado, E., Velilla, P., 2014. The Spanish Survey of Household Finances (EFF): description and methods of the 2011 wave. In: Occasional paper no. 1407. Banco de España, <http://dx.doi.org/10.2139/ssrn.2514206>.
- Campbell, J.Y., Cocco, J.F., 2015. A model of mortgage default. *J. Finance* 70, 1495–1554, <http://dx.doi.org/10.1111/jofi.12252>.
- Cecchetti, S.G., Mohanty, M.S., Zampolli, F., 2011. The real effects of debt. In: BIS Working Papers, No 352. <https://ssrn.com/abstract=1946170>.
- Christelis, D., Georgarakos, D., Haliassos, M., 2013. Differences in portfolios across countries: economic environment versus household characteristics. *Rev. Econ. Stat.* 95 (1), 220–236, <http://dx.doi.org/10.1162/REST.a.00260>.
- Crook, J., 2006. Household debt demand and supply. In: Bertola, G., Disney, R., Grant, C. (Eds.), *The Economics of Consumer Credit*. MIT Press, pp. 63–92.
- Dell'Arricia, G., Igan, D., Laeven, L., 2012. Credit booms and lending standards: evidence from the subprime mortgage market. *J. Money Credit Bank.* 44, 367–384, <http://dx.doi.org/10.1111/j.1538-4616.2011.00491.x>.
- Demyanyk, Y., Van Hemert, O., 2011. Understanding the sub-prime mortgage crisis. *Rev. Financ. Stud.* 24 (6), 1848–1880, <http://dx.doi.org/10.1093/rfs/hhp033>.
- Díaz-Serrano, L., 2015. Banks, Lies and Bricks: The Determinants of Home Value Inflation in Spain during the Housing Boom. CREIP Working Paper, 09–2015.
- Duygan, B., Grant, C., 2009. Household arrears: what role do institutions play? *Econ. Policy* 57, 107–140, <http://dx.doi.org/10.1111/j.1468-0327.2009.00215.x>.
- Elul, R., Souleles, N.S., Chomsisengphet, S., Glennon, D., Hunt, R., 2010. What 'triggers' mortgage default? *Am. Econ. Rev.* 100 (2), 490–494, <http://dx.doi.org/10.1257/aer.100.2.490>.
- Foote, C., Gerardi, K., Goette, L., Willen, P., 2009. Reducing foreclosure: no easy answers. *NBER Macroecon. Annu.* 24, 89–138.
- Gerlach-Kristen, P., Lyons, S., 2015. Mortgage arrears in Europe: the impact of monetary and macroprudential policies. In: Swiss National Bank Working Paper.
- Grant, C., Padula, M., 2016. The repayment of unsecured debt by European households. *J. R. Stat. Assoc. (Ser. A)* 181, 59–83, <http://dx.doi.org/10.1111/rssa.12248>.
- Guiso, L., Sapienza, P., Zingales, L., 2013. The determinants of attitudes toward strategic default on mortgages. *J. Finance* 68 (4), 1473–1515, <http://dx.doi.org/10.1111/jofi.12044>.
- Igan, D., Leigh, D., Simon, J., Topalova, P., 2014. Dealing with household debt. In: *Financial Crises: Causes, Consequences, and Policy Responses*. International Monetary Fund.
- Keys, B.J., Mukherjee, T., Seru, A., Vig, V., 2010. Did securitization lead to lax screening? Evidence from subprime loans. *Q. J. Econ.* 125 (1), 307–362, <http://dx.doi.org/10.1162/qjec.2010.125.1.307>.
- Maddaloni, A., Peydró, J.L., 2011. Bank risk-taking, securitization, supervision, and low interest rates: evidence from the Euro-area and the US lending standards. *Rev. Financ. Stud.* 24 (6), 2121–2165, <http://dx.doi.org/10.1093/rfs/hhr015>.
- Mayer, C., Pence, K., Sherland, S.M., 2009. The rise in mortgage defaults. *J. Econ. Perspect.* 23 (1), 27–50 <http://www.jstor.org/stable/27648293>.
- Meng, X.L., Rubin, D.B., 1992. Performing likelihood ratio tests with multiply-imputed data sets. *Biometrika* 79 (1), 103–111, <http://dx.doi.org/10.1093/biomet/79.1.103>.
- Mian, A., Sufi, A., 2009. The consequences of mortgage credit expansion: evidence from the U.S. mortgage default crisis. *Q. J. Econ.* 124 (4), 1449–1496, <http://dx.doi.org/10.1162/qjec.2009.124.4.1449>.
- Rubin, D.B., 1987. Multiple Imputation for Nonresponse in Surveys. John Wiley & Sons, <http://dx.doi.org/10.1002/9780470316696>.
- Sánchez-Martínez, M.T., Sánchez-Campillo, J., Moreno-Herrero, D., 2016. Mortgage debt and household vulnerability: evidence from Spain before and during the global financial crisis. *Int. J. Housing Markets Anal.* 9 (3), 400–420, <http://dx.doi.org/10.1108/IJHMA-07-2015-0038>.
- Saurina, J., 2009. Loan loss provisions in Spain. A working macroprudential tool. *Revista de Estabilidad Financiera of the Bank of Spain* 17, 11–26.
- Schwartz, E.S., Torous, W.N., 1993. Mortgage prepayment and default decisions: a Poisson regression approach. *Real Estate Econ.* 21, 431–449, <http://dx.doi.org/10.1111/1540-6229.00619>.