HOUSEHOLD CREDIT DELINQUENCY: DOES THE BORROWERS' INDEBTEDNESS PROFILE PLAY A ROLE?*

*Luísa Farinha***

*Ana Lacerda***

1. INTRODUCTION

The recent economic crisis, in a context of high households' indebtedness level, exacerbated the concerns about the debt sustainability and the short-term ability of households to honour their debt payments. In fact, over the course of more than a decade, households' indebtedness has significantly increased in most European economies. The dynamics of the increase in the households' indebtedness reflected demand factors partly explained by the changeover to a new regime characterised by lower and less volatile interest rates. The deregulation process, that removed barriers to entry and increased market competition, affected credit supply, leading to a greater access to credit. In addition, the existence of lower transaction costs (to a large extent information costs) following the rapid technological development set the ground for the supply of new products.

This new environment promoted an intensification of households' relations with the banking system, both in terms of the frequency of utilization and the diversity of credit products. In fact, this interaction is so intense that households' shocks related to their economic conditions (e.g., transition to unemployment) are believed to be first reflected in their credit profile (e.g., their number of loans, use of credit cards, etc.) before they entry in default. In fact, prior to default, a more intense usage of the credit card, a renegotiation of credit conditions or getting into new loans, for instance, is expected to occur, delinquency being expected to occur only after these changes in the borrower credit profile. In this context, our study departs from the literature that relies on the importance of adverse conditions on employment and/or health to explain credit delinquency and focus on the indebtedness profile of households, namely the diversity of products and the nature of banking relationships. The analysis allows exploring the interactions between the different credit products and their relation with delinquency.

The empirical evidence shows that both the level and dynamics of defaults on mortgages differ significantly from those observed in consumer credit and other credit. In fact, default rates on mortgages, which in Portugal stand for around 75 per cent of the credit granted to households, tend to be significantly lower than in other household credit segments. In order to consider this evidence, our analysis is run separately for five credit segments, namely housing credit, auto credit, credit card debt, other consumer credit and other loans. As far as we know, existent literature analyses specific

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credit segments and does not investigate the potential differences between credit segments. Moreover, as previously stressed, we address the interaction between segments, which is also a novelty of our work. The innovation of our analysis is also related with the data, as it does not rely on survey data. Our dataset has information on the amounts of outstanding credit of all Portuguese households with responsibilities to the banking system, with information segmented by credit type and financial institution.

The paper is organised as follows. Section 2 focuses on the related literature. Section 3 presents the empirical analysis. Section 4 concludes.

2. RELATED LITERATURE

Recent empirical literature on household credit delinquency assesses the relative importance of different variables in predicting default. The analysis is conducted for different segments and uses as explanatory factors boath loans' and borrowers' characteristics. In Gross and Souleles (2002) using a panel dataset of credit card accounts from several different card issuers, representative of all open accounts in 1995 in the United States, the credit card bankruptcy and delinquency are analysed. They find that several risk controls are highly significant in predicting bankruptcy and delinquency and that the propensity to default increased significantly between 1995 and 1997 in the United States. The credit card bankruptcy and delinquency is also analysed in Agarwal *et al.* (2009), with an emphasis on the impact of social capital formation. After controlling for some borrower's characteristics as well as for the legal and economic environments, they find that default/bankruptcy risk rises and then falls over the lifecycle. Borrowers who own a home, are married, continue to live in their state of birth or move to a rural area have a lower risk of default/bankruptcy. The conclusions are derived from a panel dataset from a large financial institution that issues credit cards nationally. In Agarwal *et al.* (2008) the analysis focus on the probability of default and prepayment of automobiles loans, with data coming from a large financial institution that originates directly this type of loans. The fact that the car is new or used, that it is a luxury or economic, the credit risk score of the loan holder, the LTV, income changes, changes in the employment situation and the market interest rate proved to be relevant in their analysis.

Empirical evidence on the determinants of default for insured residential mortgages can be found in Campbell and Dietrich (1983). The statistical significance of contemporaneous payment to income, loan to value ratios (LTV), unemployment rates, age and original loan to value ratio is reported. In a very recent paper, Elul *et al.* (2010) found that the mortgage default is significantly associated with both negative equity (as measured by LTV) and illiquidity (as measured by high credit card utilization), with comparably sized marginal effects. Moreover, the two factors interact with each other. County level unemployment shocks and the existence of a second mortgage imply significantly higher default risk.

Using data from US households' filings for bankruptcy several studies identify factors not related to adverse conditions on employment and/or health to explain bankruptcy. Fay *et al.* (2002) estimated

a model of the household bankruptcy filing decision, using data from the PSID on bankruptcy filings.[1] They also find support for the strategic model of bankruptcy, which predicts that households are more likely to file when their financial benefit from filing is higher, while finding little support for the hypothesis that households file when adverse events that reduce their ability to repay occur (the nonstrategic model of bankruptcy). They also present evidence that households are more likely to file for bankruptcy if they live in districts with higher aggregate filing rates. Livshits *et al.* (2010) using a heterogeneous agent life-cycle model with competitive lenders find that income shocks and expense uncertainty cannot fully explain the rise in bankruptcies. The rise in filings appears mainly to reflect changes in the credit market environment, namely a decrease in the transaction cost of lending and in the cost of bankruptcy. In Dick and Lehnert (2010) a relation between U.S. credit supply and personal bankruptcy rates is reported. They find that the banking deregulation in the 1980s and 1990s, leading to a relaxation of entry restrictions, explains at least 10% of the rise in bankruptcy rates. Increased competition impelled banks to adopt new risk scoring methods, allowing for new credit extension to existing and previously excluded households.

3. EMPIRICAL ANALYSIS

3.1. Data

Our analysis relies on the Central Credit Register, managed by Banco de Portugal, which brings together information provided by all credit institutions operating in Portugal. The dataset collects monthly information on all loans granted to households and potential credit liabilities, namely over-drafts facilities and personal guarantees. The information on loans is categorized by credit product allowing for decomposition into housing credit, auto credit, credit card debt, other consumer credit and other loans.[2] It is also possible to disentangle if credit was granted to a single person (individual credit) or to more than one person (joint credit). This dataset also provides information on residual and original maturities of the loans. The frequency of the data is monthly and covers the period from January to May 2010. For each month there are around 20 million observations that correspond to approximately 5 million borrowers. The richness of the database used in this analysis allows us to characterise borrowers' credit profile according to several dimensions such as type of credit he holds, size of exposures, number of banks and loans, average loan maturities, and guarantees. This rich-ness is expected to compensate the fact that data on social and economic characteristics of borrow-ers (apart from their age, residence location, and entrepreneurial activities) is not available.

3.2. Model and variables

The objective of this analysis is to assess the impact on credit delinquency of several features that characterise borrowers' situation in the credit market. As our data allows taking into account the possible borrower's heterogeneity across credit segments, the analysis is carried out separately by

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(1) PSID - Panel Study of Income Dynamics.

(2) Other loans refer mainly to credit granted to self employed or owners of non-incorporated businesses.

credit segment. Consistently with prudential criteria, we consider that delinquency in a given segment occurs if the borrower has overdue credit in that segment for at least three consecutive months, after being uninterruptedly a non-defaulter for at least three months. In this sense, we considered only borrowers that do not have overdue credit during the period from January to March 2010, studying the determinants of being delinquent during the subsequent period.[3] In order to assess the impact of several factors on delinquency, a regression analysis of the following type was carried out

$$DEL_i^J = \alpha^J + \sum_k \beta_k^J X_{ik}^J + \sum_k \delta_k^J Y_{ik}^J + \sum_k \gamma_k^J Z_{ik}^J + \boldsymbol{\eta^J D}_i^J + \theta^J M_{\boldsymbol{i}}^{\boldsymbol{J}} + \varepsilon_i^J$$

where the dependent variable that measures delinquency of borrower i in credit segment J is a binary variable that assumes the value 1 when the borrower is in default in April and May 2010 and 0 otherwise. The regressors are evaluated in March 2010. As already mentioned, the credits segments under analysis are: housing credit, auto credit, credit card debt, other consumer credit and other loans.

The existence of default is modelled as a function of three main groups of variables. The first, identified as X_{ik}^J, captures the nature and characteristics of the responsibilities of each borrower *vis-à-vis* the banking system. Variables that characterize the contractual nature of the loans are also considered, identified as Y_{ik}^J. The explanatory variables also include personal borrower characteristics (age, residence location, being a guarantor or not, being an entrepreneur or not), identified as Z_{ik}^J. For each credit segment, the first set of variables includes dummies indicating the type of credit each borrower holds and variables for the amount that each borrower holds. The inclusion of these variables allows us to identify the direct effect of credit granted in one segment on delinquency in that segment and the interactions between credit granted in one segment and delinquency in another. Each of these variables was broken down in two, as individual and joint credit can be measured separately. These variables besides being useful in capturing the financial position of each borrower may provide indication on the marital status, which is relevant in the credit risk characterization of each borrower. The number of loans that each borrower has in each segment, as well as the number of banks granting credit to each borrower, is also considered as an explanatory variable of default. A larger number of loans and banks may be a sign of higher credit risk, as borrowers with a more solid financial position tend to have exclusive relationships and, therefore, diversification may be a sign of difficulty of obtaining credit from the usual bank. The debt service payment is also considered as an explanatory variable.

The impact on delinquency of the maturity at origination and the time elapsed since origination of the loans is also explored in our analysis, included in the second group of variables identified in the regression equation. The square of elapsed time is also included to account for the eventual non-linearity in the impact of this variable on delinquency. The group of variables Y_{ik}^J also includes information on the existence of guarantees, which may be real guarantees, personal guarantees or other guarantees. The existence of guarantees is expected to have some discriminant power that may dif-

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[3] As the last available month in our database is May 2010, in this analysis borrowers are considered defaulters if they have overdue credit in April and May 2010.

fer with the type of guarantee. Real guarantees are expected to lower the probability of delinquency, as the non-payment of overdue instalments may be associated with the loss of the related property and in the case that households are responsible for the total amount that is owed other personal assets may have to be deliver to the bank. On the other side, personal guarantees may be associated with a higher probability of default, as anedoctical evidence points out that they are required for riskier borrowers.

At last, we considered personal characteristics of the borrower, identified as Z_{ik}^J. These characteristics include the borrowers' age and residence location as well as the borrowers' condition as guarantor to other parties and as an entrepreneur. Considering his position as a guarantor to other parties, we were able to disentangle between guaranties to housing credit, car loans, other consumer credit or other credit. Guarantors are expected to be less risky, in the sense that being a guarantor to other parties may be associated with enhanced financial position. On the other side, being an entrepreneur is typically associated with a higher risk profile. In order to control for regional differences in economic conditions we also introduced location dummies (*per distrito*) to account for the borrower residence.

We also control for the characteristics of the bank granting the credit, as the choice of the bank may be a sign of the borrowers' attitude towards risk. For this purpose in each credit segment we included a set of bank dummies (D_i^J) and the market share of the main bank (M_i^J) in our estimated model. An enumeration and description of the used variables is presented in the Appendix.

3.3. Sample characterization

The number of borrowers in our sample is 3 million.[4] Around 69 per cent of these borrowers have a housing loan, housing loans accounting for nearly 90 per cent of the total amount of credit granted to these borrowers. Around 45 per cent of the borrowers have credit card debt and 36 per cent have at least a loan for other consumer purposes. 78 per cent of the borrowers holding housing debt have a joint housing loan and only 25 per cent have an individual housing loan. This specially contrasts with credit card debt where the proportions are respectively 32 and 82 per cent. Concerning default, we observe that 5 per cent of the borrowers get into default in one of the credit segments. The percentage of borrowers holding housing debt and getting into default in that segment is significantly lower (0.5 per cent).

Table 1 provides a characterisation of the sample presenting summary statistics of some variables broken down by credit segment and separating the defaulters from the non-defaulters. For the comparison between defaulters and non-defaulters a t-test on the equality of means and a non-parametric test on the equality of medians were performed. Borrowers that exhibited delinquency tend to have higher average and median amounts of housing loans, credit card debt and other consumer credit. However, in general, the abovementioned tests do not allow us to conclude about this differentiation in the car loans and other credit segments. According to information provided in Table 1 we cannot establish a unique profile for all credit segments in what concerns the maturity at origination and

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(4) These are the borrowers that did not have overdue credit during the period from January to March 2010 at least in one of the credit segments and have complete and consistent information on all the variables used in the analysis.

Table 1

MAIN CHARACTERISTICS OF DEBTOR'S PROFILE: SUMMARY STATISTICS

Housing loans

Variable	Non-defaulting							Defaulting						
	N	p5	median	mean	p95	min	max	N	p5	median	mean	p95	min	max
Credit (in euros)	1951926	5861.0	63603.0	74036.2	181941.0	53.0	696095.3	9896	14246	75157.97	89866.1	217053.9	54	436648.1
Individual credit (in euros)	481598	6724.0	58390.0	65590.9	150000.0	52.0	335701.9	2457	11834	65533	74511.7	172253	368	332628.8
Joint credit (in euros)	1521263	5398.0	63765.0	74230.9	184000.1	52.0	408500.1	7898	12390	75462.49	89420.0	215389	54	407962.8
Number of banks	1951926	1	1	1.0	1	1	6	9896	1	1	1.1	2	1	4
Maturity at origination	1951926	15	27.5	27.0	35	0.125	35	9896	15	27.5	28.3	35	0.375	35
Time elapsed since origination	1951926	0.003	5	5.5	15	0.003	34.875	9896	0.003	5	4.9	12.5	0.003	32
Debt service payments	1951926	69.0	267.0	291.4	605.0	1.0	1306.0	9896	67	299	328.0	702.0001	5	1299
Number of loans (individual)	481598	1	1	1.1	2	1	9	2456	1	1	1.2	2	1	5
Number of loans (joint)	1521262	1	1	1.2	2	1	8	7894	1	1	1.3	2	1	5
Major bank market share	1951926	0.011	0.160	0.1	0.228	0.000	0.228	9896	0.0043383	0.1100439	0.1	0.228329	0.0000545	0.228329
Debtor's age	1951926	29	42	43.5	63	19	95	9896	28	41	42.2	59	20	95

Car loans

Variable	Non-defaulting							Defaulting						
	N	p5	median	mean	p95	min	max	N	p5	median	mean	p95	min	max
Credit (in euros)	490920	1237.0	7153.0	8497.8	20375.0	53.0	65128.0	7398	1129.0	7148.0	8956.9	23168.0	68.0	58655.0
Individual credit (in euros)	243530	1142.0	6477.0	7678.3	18285.0	53.0	35414.0	4203	1031.0	6247.0	7742.4	19469.0	68.0	34449.0
Joint credit (in euros)	258992	1280.0	7572.0	8887.7	21058.0	50.0	38951.0	3587	1069.0	7647.0	9401.1	24305.0	100.0	38195.0
Number of banks	490920	1	1	1.1	2	1	6	7398	1	1	1.2	2	1	5
Maturity at origination	490920	3.0	7.5	5.8	7.5	0.1	27.5	7398	3.0	7.5	6.2	7.5	0.1	15.0
Time elapsed since origination	490920	0.003	0.6	2.1	4.5	0.003	12.5	7398	0.003	2.9	2.6	6.8	0.003	8.5
Debt service payments	490920	100.0	217.0	232.4	417.0	1.0	773.0	7398	99.0	212.0	230.7	421.0	19.0	773.0
Number of loans (individual)	243522	1	1	1.0	1	1	5	4196	1	1	1.1	2	1	4
Number of loans (joint)	258989	1	1	1.1	2	1	5	3577	1	1	1.2	2	1	3
Major bank market share	490920	0.001	0.004	0.028	0.228	0.000	0.228	7398	0.001	0.004	0.009	0.011	0.000	0.228
Debtor's age	490920	24	40	41.6	63	19	95	7398	24	37	39.2	60	19	86

Credit card debt

Variable	Non-defaulting							Defaulting						
	N	p5	median	mean	p95	min	max	N	p5	median	mean	p95	min	max
Credit (in euros)	1284986	131.0	772.0	1581.3	5963.0	50.0	27867.0	22121	198.0	1570.0	2736.9	9551.0	50.0	27211.0
Individual credit (in euros)	1054350	118.0	749.0	1522.1	5760.0	50.0	16795.0	20676	178.0	1478.5	2576.7	8955.0	50.0	16776.0
Joint credit (in euros)	416566	106.0	500.0	1025.4	3893.0	50.0	11964.0	5978	122.0	631.0	1215.8	4502.0	50.0	11787.0
Number of banks	1284986	1	1	1.4	3	1	11	22121	1	2	1.9	4	1	9
Number of loans (individual)	1051122	1	1	1.4	3	1	11	16822	1	1	1.7	4	1	9
Number of loans (joint)	416360	1	1	1.1	2	1	6	5757	1	1	1.1	2	1	5
Major bank market share	1284986	0.001	0.110	0.092	0.228	0.00003	0.228	22121	0.001	0.034	0.061	0.228	0.00004	0.228
Debtor's age	1284986	26	43	44.7	68	19	95	22121	24	39	40.4	62	19	95

(to be continued)

Table 1 (continued)

MAIN CHARACTERISTICS OF DEBTOR'S PROFILE: SUMMARY STATISTICS

Other consumption credit

Variable	Non-defaulting							Defaulting						
	N	p5	median	mean	p95	min	max	N	p5	median	mean	p95	min	max
Credit (in euros)	1017054	394.0	4916.0	9557.0	33993.0	50.0	165211.0	12378	498.0	6942.0	12711.3	45208.0	51.0	136035.0
Individual credit (in euros)	481022	203.0	1968.0	4812.6	19153.0	50.0	59648.0	7797	240.0	2718.0	5724.1	22178.0	50.0	59474.0
Joint credit (in euros)	663788	656.0	6114.0	11155.7	38809.0	50.0	120562.0	7903	385.0	8015.0	14261.6	51147.0	50.0	119607.0
Number of banks	1017054	1	1	1.3	3	1	9	12378	1	2	1.9	4	1	12
Maturity at origination	1017054	1.6	6.9	7.8	27.9	0.1	35.0	12378	2.9	6.1	7.2	25.7	0.1	35.0
Time elapsed since origination	1017054	0.003	0.012	1.8	7.1	0.003	34.6	12378	0.003	0.7	2.0	6.7	0.003	20.0
Debt service payments	1017054	12.0	110.0	147.1	420.0	1.0	834.0	12378	18.0	114.0	156.3	443.0	1.0	826.0
Number of loans (individual)	480484	1	1	1.3	3	1	9	7217	1	1	1.7	4	1	9
Number of loans (joint)	663694	1	1	1.5	3	1	12	7798	1	2	2.0	5	1	11
Major bank market share	1017054	0.002	0.110	0.100	0.228	0.000005	0.228	12378	0.002	0.110	0.081	0.160	0.000005	0.228
Debtor's age	1017054	26	43	43.8	65	19	95	12378	25	40	41.5	62	19	86

Other credit

Variable	Non-defaulting							Defaulting						
	N	p5	median	mean	p95	min	max	N	p5	median	mean	p95	min	max
Credit (in euros)	500836	296.0	6502.0	17228.7	71127.0	50.0	736969.1	18683	365.0	5988.0	16592.9	70506.0	50.0	612365.1
Individual credit (in euros)	264368	193.0	4263.0	10765.2	40855.0	50.0	288788.1	10471	233.0	2920.0	9326.2	35005.0	50.0	287960.9
Joint credit (in euros)	266197	814.0	8459.0	21723.6	89482.0	50.0	530000.2	10265	680.0	8380.0	20686.9	87056.0	52.0	500131.0
Number of banks	500836	1	1	1.1	2	1	8	18683	1	1	1.3	2	1	7
Maturity at origination	268912	1.8	7.5	9.0	27.5	0.1	35.0	7324	1.8	7.5	8.6	27.4	0.1	35.0
Time elapsed since origination	264636	0.003	2.1	2.8	7.5	0.003	24.5	6690	0.003	2.0	2.7	7.5	0.003	20.0
Number of loans (individual)	264297	1	1	1.1	2	1	16	10229	1	1	1.2	2	1	6
Number of loans (joint)	266076	1	1	1.2	2	1	13	9993	1	1	1.3	3	1	8
Major bank market share	500836	0.000	0.007	0.023	0.160	0.0000001	0.228	18683	0.000	0.007	0.018	0.119	0.000005	0.228
Debtor's age	500836	27	44	45.2	67	19	95	18683	25	42	43.4	65	19	95

Sources: Banco de Portugal (Central Credit Register) and authors' calculations.
Note: N is the number of observations (borrowers); for each variable, P5 and P95 are the values of the respective percentiles, for non-defaulting and defaulting borrowers.

the time elapsed since origination of the loans. Concerning housing credit, the mean of maturity at origination is higher for defaulters and time elapsed slightly higher for non-defaulters. The default borrowers of car loans present mean values of maturity at origination and time elapsed higher than the non-default borrowers. In the case of time elapsed the median is also higher for default borrowers. The performed statistical tests do not allow us to conclude about this differentiation in the median. The loans labelled as other consumer credit and other credit present a distinct profile *vis-à-vis* housing credit. In the case of other consumer credit, the group of non-defaulters presents higher mean and median values for the maturity at origination and lower values of the mean and the median of time elapsed since origination. The differences go in the same direction but are less significant in the case of the other credit segment.

The dummy variables that concern the existence of guarantees and the role of the borrower as a guarantor are presented in Table 2A. As expected, more than 90 per cent of the borrowers with housing loans are protected by a real guarantee. Personal guarantees are also relevant in this credit segment as more than 10 per cent of the borrowers have personal guarantees in housing credit. The existence of guarantees seems to have some discriminant power, as the proportion of borrowers with a personal guarantee in the group of defaulters is higher than in the non-defaulters group, as presented in Table 2A. The same pattern is observed if we consider car loans or other consumer credit. The existence of real guarantees also seems to have some discriminant power, in particular in the car loans segment. In fact, for this segment the proportion of borrowers with real guarantees is substantially higher in the defaulting group than in the non-defaulting group. Concerning other guarantees, a different pattern is observed, as the proportion of borrowers with other guarantees is higher in the non-defaulting group than in the defaulting group. Considering the existence of guarantees to other parties, the same profile applies to all segments and to all possible guarantees, as the defaulting group tends to present a higher proportion of borrowers that are guarantying other parties' loans. Table 2A also shows that households that are entrepreneurs are a minority and their proportion tends to be slightly higher among defaulter than among non-defaulters in all the credit segments, except in other credit.

Table 2B presents the distribution of non-defaulters and defaulters according to the borrower's age class. The information provided in this table suggests that default tends to decrease with the age of the borrower. In fact, the proportion of borrowers above 50 years old is higher among the non-defaulters group than among the defaulters in all the credit segments analysed.

3.4. Estimation results

In order to test the impact of borrowers' indebtedness profile on delinquency a separate regression by credit segment was carried out. Table 3 presents the marginal effects of the regressors on the probability of getting into default in each of the credit segments.[5] Marginal effects were computed for a reference debtor that belongs to the youngest age bracket and is neither an entrepreneur nor

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[5] In the logit model the estimated regression coefficients do not give directly the marginal effects of the regressors on the dependent variable. In fact, the marginal effects are a function of the estimated coefficients and vary with the values of the regressors.

Table 2

PERSONAL CHARACTERISTICS OF NON-DEFAULTING AND DEFAULTING BORROWERS

Table 2A

DISTRIBUTION ACCORDING TO THE PRESENCE OF GUARANTEES AND ENTREPRENEURSHIP

Housing loans

	Non-defaulting		Defaulting	
	YES	NO	YES	NO
Borrower has a real guarantee	0.927	0.073	0.956	0.044
Borrower has a personal guarantee	0.112	0.888	0.186	0.814
Borrower has other guarantees	0.022	0.978	0.024	0.976
Borrower serves as a guarantor for third parties				
on housing credit	0.106	0.894	0.106	0.894
on car loans	0.007	0.993	0.017	0.983
on other consumer credit	0.035	0.965	0.066	0.934
on other credit	0.026	0.974	0.091	0.909
Borrower is not entrepreneur	0.973	0.027	0.949	0.051
Total number of borrowers	1951926		9896	

Car loans

	Non-defaulting		Defaulting	
	YES	NO	YES	NO
Borrower has a real guarantor	0.152	0.848	0.298	0.702
Borrower has a personal guarantee	0.116	0.884	0.145	0.855
Borrower has other guarantees	0.063	0.937	0.031	0.969
Borrower serves as a guarantor for third parties				
on housing credit	0.054	0.946	0.040	0.960
on car loans	0.040	0.960	0.054	0.946
on other consumer credit	0.037	0.963	0.050	0.950
on other credit	0.020	0.980	0.038	0.962
Borrower is not entrepreneur	0.973	0.027	0.967	0.033
Total number of borrowers	490920		7398	

Credit card debt

	Non-defaulting		Defaulting	
	YES	NO	YES	NO
Borrower serves as a guarantor for third parties				
on housing credit	0.059	0.941	0.040	0.960
on car loans	0.008	0.992	0.013	0.987
on other consumer credit	0.048	0.952	0.056	0.944
on other credit	0.035	0.965	0.047	0.953
Borrower is not entrepreneur	0.967	0.033	0.966	0.034
Total number of borrowers	1284986		22121	

Table 2B

DISTRIBUTION ACCORDING TO AGE

Housing loans

	Non-defaulting	Defaulting
Age class of the borrower		
< 30 years	0.068	0.073
>= 30 and < 40 years old	0.345	0.358
>= 40 and < 50 years old	0.311	0.349
>= 50 and < 65 years old	0.239	0.203
>= 65 years old	0.037	0.017
Total	1.000	1.000

Car loans

	Non-defaulting	Defaulting
Age class of the borrower		
< 30 years	0.184	0.232
>= 30 and < 40 years old	0.302	0.329
>= 40 and < 50 years old	0.243	0.247
>= 50 and < 65 years old	0.229	0.167
>= 65 years old	0.041	0.025
Total	1.000	1.000

Credit card debt

	Non-defaulting	Defaulting
Age class of the borrower		
< 30 years	0.113	0.201
>= 30 and < 40 years old	0.287	0.322
>= 40 and < 50 years old	0.263	0.255
>= 50 and < 65 years old	0.255	0.187
>= 65 years old	0.082	0.034
Total	1.000	1.000

(to be continued)

Table 2 (continued)

PERSONAL CHARACTERISTICS OF NON-DEFAULTING AND DEFAULTING BORROWERS

Table 2A

DISTRIBUTION ACCORDING TO THE PRESENCE OF GUARANTEES AND ENTREPRENEURSHIP

	Other consumption credit			
	Non-defaulting		Defaulting	
	YES	NO	YES	NO
Borrower has a real guarantee	0.096	0.904	0.091	0.909
Borrower has a personal guarantee	0.111	0.889	0.164	0.836
Borrower has other guarantees	0.319	0.681	0.290	0.710
Borrower serves as a guarantor for third parties				
on housing credit	0.060	0.940	0.049	0.951
on car loans	0.008	0.992	0.016	0.984
on other consumer credit	0.073	0.927	0.084	0.916
on other credit	0.028	0.972	0.062	0.938
Borrower is not entrepreneur	0.967	0.033	0.952	0.048
Total number of borrowers	1017054		12378	

	Other credit			
	Non-defaulting		Defaulting	
	YES	NO	YES	NO
Borrower has a real guarantee	0.155	0.845	0.113	0.887
Borrower has a personal guarantee	0.195	0.805	0.161	0.839
Borrower has other guarantees	0.139	0.861	0.078	0.922
Borrower serves as a guarantor for third parties				
on housing credit	0.063	0.937	0.050	0.950
on car loans	0.009	0.991	0.014	0.986
on other consumer credit	0.055	0.945	0.063	0.937
on other credit	0.121	0.879	0.121	0.879
Borrower is not entrepreneur	0.940	0.060	0.954	0.046
Total number of borrowers	519519		18683	

Table 2B

DISTRIBUTION ACCORDING TO AGE

	Other consumption credit	
	Non-defaulting	Defaulting
Age class of the borrower		
< 30 years	0.128	0.168
>= 30 and < 40 years old	0.284	0.308
>= 40 and < 50 years old	0.262	0.266
>= 50 and < 65 years old	0.271	0.225
>= 65 years old	0.055	0.033
Total	1.000	1.000

	Other credit	
	Non-defaulting	Defaulting
Age class of the borrower		
< 30 years	0.101	0.135
>= 30 and < 40 years old	0.270	0.284
>= 40 and < 50 years old	0.268	0.273
>= 50 and < 65 years old	0.285	0.255
>= 65 years old	0.076	0.054
Total	1.000	1.000

Sources: Banco de Portugal (central Credit REgister) and author's calculations.

Table 3

ESTIMATION RESULTS: LOGIT MARGINAL EFFECTS (The dependent variable takes the value of 1 in the presence of default and 0 otherwise)					
	Housing loans	**Car loans**	**Credit card debt**	**Other consumer credit**	**Other credit**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
D Housing credit (only individual)	-0.000518*	-0.034973***	-0.002251***	-0.004508***	-0.017723***
	(-2.39)	(-4.48)	(-4.70)	(-4.46)	(-5.32)
D Housing credit (only joint)		-0.035032***	-0.001015*	-0.003415***	-0.012148***
		(-5.89)	(-2.07)	(-4.21)	(-4.02)
D Housing credit (individual and joint)	0.002565*	-0.041667***	-0.001893**	-0.005281***	-0.020054***
	(2.56)	(-6.46)	(-2.84)	(-5.54)	(-6.73)
D Car loans (only individual)	0.001076	-0.016716*	0.000263	-0.000313	0.021211
	(1.54)	(-2.41)	(0.32)	(-0.20)	(1.46)
D Car loans (only joint)	0.000190		0.001585	0.001862	0.007900
	(0.52)		(1.44)	(0.92)	(0.83)
D car loans (individual and joint)	0.002105	0.122987***	0.002625	0.000979	0.028795
	(1.53)	(3.33)	(1.39)	(0.36)	(1.18)
D Credit card debt (only individual)	-0.000741***	-0.016566***		-0.003732***	-0.010711***
	(-10.66)	(-4.23)		(-5.87)	(-5.37)
D Credit card debt (only joint)	0.000021	0.010301	0.002964***	0.003456*	-0.000284
	(0.10)	(1.02)	(4.01)	(2.46)	(-0.07)
D Credit card debt (individual and joint)	-0.000852***	-0.018565**	-0.000700*	-0.003559***	-0.012737***
	(-9.22)	(-2.87)	(-2.41)	(-4.96)	(-4.76)
D Other consumption credit (only individual)	0.001952***	0.019048**	0.002219***	-0.002876***	0.039666***
	(5.95)	(2.79)	(6.08)	(-4.63)	(4.85)
D Other consumption credit (only joint)	0.010043***	0.079597***	0.003895***		0.085916***
	(10.79)	(5.80)	(8.51)		(6.45)
D Other consumption credit (individual and joint)	0.014283***	0.076109***	0.007142***	0.004370***	0.144228***
	(7.54)	(4.43)	(7.80)	(3.38)	(5.74)
D Other credit (only individual)	0.001344***	0.040025***	0.000152	0.003513**	-0.012891
	(4.07)	(3.47)	(0.50)	(3.04)	(-1.94)
D Other credit (only joint)	0.005644***	0.059673**	0.004786***	0.026311***	
	(5.33)	(2.82)	(4.27)	(4.20)	
D Other credit (individual and joint)	0.008094***	0.081275**	0.004286***	0.024738***	-0.010739***
	(4.37)	(2.69)	(3.48)	(3.64)	(-5.23)
Housing credit (individual)	-0.000085*	0.005087*	0.000092	0.000446	0.003082**
	(-2.23)	(2.18)	(0.86)	(1.89)	(2.66)
Housing credit (joint)	-0.000173***	0.004897***	-0.000080	0.000244*	0.001080*
	(-5.24)	(3.51)	(-1.33)	(1.96)	(2.06)
Car loans (individual)	-0.000094*	-0.006442***	-0.000093	0.000021	-0.001507
	(-2.18)	(-4.11)	(-1.07)	(0.11)	(-1.75)
Car loans (joint)	-0.000057	-0.008351***	-0.000246**	-0.000292	-0.001076
	(-1.58)	(-4.72)	(-2.80)	(-1.60)	(-1.31)
Credit card debt (individual)	0.000258***	0.006801***	0.001017***	0.001432***	0.003679***
	(10.11)	(5.64)	(20.04)	(5.92)	(5.77)
Credit card debt (joint)	0.000055	0.000372	0.000301***	-0.000095	0.000459
	(1.81)	(0.29)	(5.45)	(-0.74)	(0.77)
Other consumption credit (indiv)	-0.000100***	0.000218	-0.000191***	0.000428***	-0.001776***
	(-5.75)	(0.34)	(-6.11)	(4.42)	(-4.38)
Other consumption credit (joint)	-0.000251***	-0.003848***	-0.000331***	-0.000527***	-0.003326***
	(-13.18)	(-5.35)	(-11.16)	(-4.43)	(-6.48)
Other credit (indiv)	-0.000080***	-0.001341	0.000020	-0.000041	0.000797*
	(-4.04)	(-1.72)	(0.52)	(-0.50)	(2.41)
Other credit (joint)	-0.000174***	-0.002378*	-0.000308***	-0.000854***	0.001905***
	(-7.27)	(-2.11)	(-5.40)	(-4.91)	(4.71)
Credit card limit	-0.000127***	-0.003823***	-0.000577***	-0.000594***	-0.001642***
	(-11.34)	(-6.42)	(-26.72)	(-6.01)	(-6.18)
Number of banks - housing credit	0.000433***	-0.003645	0.000443	0.000603	0.000512
	(6.71)	(-0.71)	(1.91)	(1.27)	(0.32)
Number of banks - auto credit	0.000396***	0.019377**	0.001078***	0.001673***	0.005639**
	(4.02)	(2.90)	(5.11)	(3.37)	(2.92)
Number of banks - credit card	0.000062*	0.006049***	0.013686***	0.001159***	0.003263***
	(2.19)	(4.41)	(24.97)	(5.48)	(4.82)
Number of banks - credit card (undrawn)	-0.000402***	-0.014015***	-0.001106***	-0.002563***	-0.007931***
	(-10.66)	(-6.21)	(-15.74)	(-6.20)	(-6.65)
Number of banks - other consumption credit	0.000515***	0.009275***	0.000962***	0.004557***	0.007054***
	(13.09)	(5.82)	(15.57)	(6.28)	(6.59)
Number of banks - other credit	0.000392***	0.006919**	0.000968***	0.001163***	0.015854***
	(7.56)	(3.12)	(8.95)	(4.21)	(6.92)

(to be continued)

Table 3 (continued)

LOGIT MARGINAL EFFECTS					
(The dependent variable takes the value of 1 in the presence of default and 0 otherwise)					
	Housing loans	Car loans	Credit card debt	Other consumer credit	Other credit
	(1)	(2)	(3)	(4)	(5)
Maturity at origination - respective segment	0.000032***	-0.000649		-0.000122***	-0.000132**
	(8.63)	(-4.42)		(-4.42)	(-2.64)
Elapsed maturity - respective segment	0.000020**	0.003630***		0.000459***	0.000105
	(3.13)	(4.25)		(5.30)	(0.56)
Square of elapsed maturity - respective segment	-0.000001	-0.000053		-0.000020**	-0.000018
	(-1.92)	(-0.39)		(-3.06)	(-0.99)
Debt service payments - respective segment	0.000448***	0.008090***		0.000944***	
	(9.89)	(4.06)		(5.46)	
Number of loans (individual - respective segment)	0.000576***	0.013776*	-0.012608***	-0.001826***	-0.004378***
	(8.42)	(2.07)	(-24.99)	(-5.59)	(-4.51)
Number of loans (joint) - respective segment	0.000730***	0.007057	-0.011773***	0.000249*	-0.001824*
	(13.03)	(1.14)	(-23.41)	(1.99)	(-2.55)
D has not real guarantees - respective segment	0.000047	-0.028779***		-0.002063***	-0.000041
	(0.68)	(-6.71)		(-4.64)	(-0.05)
D has personal guarantees - respective segment	0.000305***	0.003671*		0.000329	0.001166
	(6.14)	(2.00)		(1.65)	(1.74)
D has other guarantees - respective segment	-0.000168*	-0.017754***		-0.001107***	-0.005416***
	(-2.04)	(-4.69)		(-4.67)	(-5.76)
D Guarantees to third parties - HC	-0.000158***	-0.003069	-0.000277*	-0.000707*	-0.000255
	(-3.90)	(-1.16)	(-1.96)	(-2.50)	(-0.22)
D Guarantees to third parties - CL	0.000496***	0.005799*	0.000698*	0.001290*	-0.000178
	(3.30)	(2.10)	(2.19)	(2.02)	(-0.07)
D Guarantees to third parties - OCC	0.000020	-0.000884	-0.000067	-0.000001	-0.002869**
	(0.37)	(-0.36)	(-0.53)	(-0.00)	(-2.77)
D Guarantees to third parties - OC	0.000775***	0.010702**	0.000432**	0.001809***	0.007936***
	(7.85)	(2.74)	(2.60)	(3.99)	(5.50)
D Entrepreneur	0.000541***	0.006732	0.000710***	0.002359***	-0.001992*
	(5.71)	(1.87)	(3.64)	(4.37)	(-2.05)
D Age class of the borrower (30-40 years)	-0.000058	-0.001853	-0.000672***	-0.000927***	-0.003579**
	(-1.12)	(-1.19)	(-7.90)	(-4.03)	(-3.26)
D Age class of the borrower (40-50 years)	0.000058	-0.005500**	-0.000942***	-0.001560***	-0.002316*
	(1.03)	(-3.09)	(-10.39)	(-5.10)	(-2.17)
D Age class of the borrower (50-65 years)	-0.000007	-0.016146***	-0.001508***	-0.002661***	-0.004828***
	(-0.10)	(-5.97)	(-14.97)	(-5.83)	(-4.02)
D Age class of the borrower (more than 65 years)	-0.000201*	-0.020286***	-0.002273***	-0.003757***	-0.008421***
	(-1.96)	(-5.65)	(-18.26)	(-5.97)	(-5.17)
Major bank market share - respective segment	-0.000341	-0.414369***	-0.005030*	0.018955***	0.032781**
	(-0.57)	(-5.52)	(-2.20)	(3.81)	(2.66)
R-sqr	0.131	0.109	0.268	0.123	0.110
Number of observations	1957310	497711	1304653	1027833	268793

Sources: Banco de Portugal (Central Credit Register) and authors' calculations.
Notes: Robust z-statistics in parentheses, *** p<0.001, ** p<0.01, * p<0.05. A description of the variables is presented in Appendix A. Marginal effects were computed for a reference debtor that belongs to the youngest age bracket and is neither an entrepreneur nor a guarantor of credit to third parties. In each model this debtor has credit only in the respective segment. He has only joint credit in the case of housing credit, car loans other consumption credit and other credit. In the case of credit card debt, the reference debtor has only individual credit. The amount of credit, the number of banks, the number of loans, the maturities and the debt service payments are evaluated at the respective median values corresponding to each type of debtor. The reference debtor has real guarantees in all the credit segments, except in credit card debt. The five different credit segments are treated independently

a guarantor of credit to third parties. In each model this debtor has credit only in the respective segment. He has only joint credit in the case of housing credit, car loans other consumer credit and other credit. In the case of credit card debt, the reference debtor has only individual credit. The amount of credit, the number of banks, the number of loans, the maturities and the debt service payments are evaluated at the respective median values corresponding to each type of debtor. The reference debtor has real guarantees in all the credit segments, except in credit card debt. The results are discussed in what follows.

Nature and characteristics of the responsibilities of the borrower vis-à-vis the banking system

One of the main objectives of this study is to investigate the potential interactions across different credit segments and their impact on the probability of getting into default in the segments under analysis. Our results provide clear evidence on a significant number of interactions. It is worth noting, for instance, that holding housing debt lowers significantly the probability of getting into default in the other credit segments. However, comparing the magnitudes of the estimated marginal effects, the results also suggest that the impact of being a holder of car loans, other consumer loans or other loans tends on the probability of default in housing credit is smaller than their impact on the probability of default in the other segments. Moreover, the results also suggest that the cross effects of the size of the exposures and the number of bank relationships tend to be smaller in the case of the probability of default in housing credit. These results partly reflect the nature of housing as subsistence good and the need to avoid above all mortgage foreclosure. Additionally, our results are also likely to reflect bank practices in granting credit. Anecdotic evidence on those practices suggests that this may be an important source of interactions.

As referred above, the results suggest that housing loans borrowers have a smaller probability of getting into default in all of the remaining credit segments. This result may be interpreted as a signal that housing loans are granted to less risky households in the sense that they tend to belong to higher income/wealth strata. The same result is obtained for borrowers that have credit card debt, that is, credit card holders tend to default less in the other credit segments. The opposite result is obtained for households that have other consumer credit and other credit. In fact, borrowers that have loans for these purposes tend to exhibit higher probability of default in the other credit segments. It should be stressed, however, that for borrowers of other consumer credit and other credit, the larger their exposure the lower is the probability of default in all other credit segments.

The results provide strong evidence on the impact of the size of each exposure on the delinquency of the respective segment, although the sign of the effect observed in different segments is not always the same. Concerning housing credit and car loans, the size of the exposure seems to reflect a higher repayment capacity as holders of larger exposures tend to have a lower probability of default in the respective credit segment. On the contrary, credit card borrowers with a higher debt amount exhibit higher probability of default. This may be related to the fact that high exposures are possibly associated with borrowers that do not make full payment of their balances, which are riskier borrowers. It should be remarked that we are also controlling for the effect of the credit card limit and that the results suggest that for borrowers that have credit cards, the larger is their credit card limit the lower tends to be the probability of default. In the case of other credit borrowers, the larger is the exposure the higher tends to be the probability of default in the segment. Concerning other consumer credit less obvious results are obtained as higher individual exposures are associated with higher probability of default, while higher joint exposures are associated with lower probabilities of default.

Our model allows distinct impacts of individual and joint credit on the probability of default in the respective segment. The estimated results suggest that borrowers that have joint credit tend to have a higher probability of default than those that have only individual credit in all credit segments except in

credit card debt where the results are less obvious.

The results also suggest that in each segment the number of banks granting credit to borrowers is also an indicator of the risk degree of the borrower. The higher is the number of banks where he borrows the higher is the probability that he gets into default in the respective credit segment. There is also evidence of effects across different credit segments, as a higher number of banks in one segment tend to increase the probability of default in other segment. A distinct effect is captured when analysing the number of credit cards, proxied by the number of banks potentially granting credit card debt. In this case, the results suggest that borrowers with more credit cards exhibit lower probabilities of default, in all other credit segments. This result suggests that additional credit cards are granted to borrowers that belong to higher income/wealth strata, being in line with the negative sign of the effect of the credit card limit on the probability of default.

The number of loans the borrower has in the housing credit segment is also capturing borrowers' risk position. The results suggest that households that have more loans have a higher probability of getting into default. An opposite result is obtained in the credit card debt and other credit.

The larger the amount of debt service payments the higher the probability of default. Though this is measured in absolute terms, we interpret this result as the effect of the debt service ratio since we are controlling for the scale effect by including the amount of credit which also proxies the income/wealth strata of borrowers.

Contractual characteristics of the loans

The results point out that borrowers whose housing loans have a higher average maturity at origination tend to have higher probabilities of default, while the opposite holds for other consumer credit and other credit. The results concerning the effect of the original maturity of housing loans suggest that longer maturities are associated with borrowers with a lower repayment capacity. The results on the effect of time elapsed since origination also suggest that as time goes by the probability that a loan gets into default increases. In the case of housing credit this result may partly be explained by the fact that relatively recent loans largely predominate in the data as a consequence of the relatively recent credit growth. A negative and significant sign of the square of this variable in the case of other consumer credit, suggests that the positive effect of time elapsed tends to vanish with time, but the magnitude of the coefficient is not sufficiently large to compensate for the positive effect for reasonable values of the original loan maturities. Nevertheless, in the case of credit for other purposes an increase in time elapsed may be associated with a lower probability of default if the loan has already been granted a considerable time ago.

Borrowers that have got a personal guarantee in order to have access to housing credit are likely to be riskier, this being reflected on a higher probability of getting into default. This result suggests that the requirement of personal guarantees to particular types of borrowers, namely the youngest, should be encouraged in order to avoid that losses materialise. On the other hand, if borrowers have other guarantees (for instance financial guarantees) their probability of getting into default is lower. This

suggests that borrowers that can use this type of guarantees are likely to belong to higher income/ wealth class. Having a real guarantee does not seem to affect the probability of getting into default in housing credit, although the impact is positive in the car loans segment. The fact that we obtain a statistically non-significant effect in the case of housing loans may be due to the lack of cross-section variability in this indicator since almost all housing loans are mortgages.

Personal characteristics of the borrower

Borrowers age is likely to strongly influence his ability to pay for his debts in due time, as the probability of default of the youngest borrowers is significantly higher than the probability of default of borrowers in all the other age classes. This result is less clear in the housing credit segment. In fact, in this segment, the results suggest that only the oldest borrowers have a lower probability of default than the youngest, the probability of default in the other age classes not being statistically different.

According to our results, the location of borrowers' residence is likely to affect his probability of default. The inclusion of location dummies (whose marginal effects are omitted in Table 3, because of space reasons) globally improves the quality of the regression. There is also evidence that a higher probability of default may be linked to particularly adverse economic conditions in certain locations.

Borrowers that give guarantees to third parties in the housing credit segment tend to have a lower probability of default in that segment, which corroborates the idea that guarantors have an enhanced financial position. However, an opposite result is obtained in the case of borrowers that give guarantees to third parties in the car loans and other credit segments. This suggests that the high risk of borrowers in these segments (particularly other credit) is transmitted to the borrowers that give the guarantee.

The results also suggest that the probability of getting into default in any credit segment is higher if the borrower is an entrepreneur, as the involvement in small business activities is likely to increase the volatility of their income and, therefore, their credit risk.

As the choice of the bank may be a sign of the borrowers' attitude towards risk the models also control for the characteristics of the credit institutions. Besides the inclusion of dummy variables that take the value 1 if a bank is the main bank of the borrower the estimated models also include as an explanatory variable the market share of the major bank for the borrower in the specific segment of credit. In the case of housing credit this variable does not seem to affect the borrower's probability of default. In the car loans segment and to a lesser extent in credit card debt segment, higher market shares are associated with lower probability of default.

4. CONCLUSIONS AND FUTURE RESEARCH

This study analyses the incidence of delinquency in household's debt repayment behaviour. Using a unique dataset we investigate the role of households' responsibilities *vis-à-vis* the banking system as determinants of entry in default. A separated analysis by credit segment allows us to identify possible interactions across different credit segments. Credit characteristics, such as the amount of credit granted by segment, the respective number of loans, as well as the number of banks granting them, are considered in the analysis. The impact of the contractual characteristics of the loans, such as their maturity and the existence of guarantees are also considered. In our analysis we also control for personal characteristics of the borrowers, namely their age and place of residence, and a few characteristics of the financial institutions. Our empirical results provide new evidence on the role of these characteristics in explaining default.

One of the main objectives of this study is to investigate the potential interactions across different credit segments. Our results provide clear evidence on a significant number of interactions. It is worth noting, that holding housing debt lowers significantly the probability of getting into default in the other credit segments. However, the probability of default in housing credit is less likely to be affected than the probability of default in the other credit segments by the fact that debtors hold other types of debt, by the size of the exposures and by the number of bank relationships. These results partly reflect the nature of housing as a subsistence good and the need to avoid above all mortgage foreclosure.

According to our results, borrowers that have housing credit and those that have at least one credit card tend to have a lower probability of default in all other segments. In the case of housing loans, that exhibit the largest median exposure, the larger is the exposure the lower is the probability of default in the respective segment. The same holds for car loans which come in second place in terms of the median value of the exposures. On the contrary, in the case of credit card debt, larger exposures are associated with higher probabilities of getting into default. Cross effects of exposures are not very obvious except in the case of credit card debt where larger exposures are associated with a higher probability of default in all segments. Our results suggest, as expected, that the higher is the number of credit cards the lower is the probability of default. However, in general, borrowers with more credit relationships are likely to be more risky. Our results confirm that higher loan maturities are related to borrowers with a lower repayment capacity. Additionally, we find that the probability of getting into default increases with the passage of time, at least for loans recently contracted but, as expected, this effect tends to vanish near the end of the contract. The results also suggest that borrowers that have got personal guarantees tend to have a higher probability of default reinforcing the importance of its requirement in order to avoid the materialisation of losses.

This study presents static evidence on the effect of a large variety of factors in explaining the probability of default in households' credit. As more data become available, more interesting results may be obtained, namely on the effect of the same type of factors on the duration of default spells. This will be the object of future research.

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Appendix

EXPLANATORY VARIABLES

Variables	Variable type	Description
D Housing credit (only individual)	Dummy	Takes the value 1 if the borrower holds housing credit (only individual credit)
D Housing credit (only joint)	Dummy	Takes the value 1 if the borrower holds housing credit (only joint credit)
D Housing credit (individual and joint)	Dummy	Takes the value 1 if the borrower holds housing credit (both individual and joint credit)
D Car loans (only individual)	Dummy	Takes the value 1 if the borrower holds car loans (only individual credit)
D Car loans (only joint)	Dummy	Takes the value 1 if the borrower holds car loans (only joint credit)
D car loans (individual and joint)	Dummy	Takes the value 1 if the borrower holds car loans (both individual and joint credit)
D Credit card debt (only individual)	Dummy	Takes the value 1 if the borrower holds credit card debt (only individual credit)
D Credit card debt (only joint)	Dummy	Takes the value 1 if the borrower holds credit card debt (only joint credit)
D Credit card debt (individual and joint)	Dummy	Takes the value 1 if the borrower holds credit card debt (individual and joint credit)
D Other consumption credit (only individual)	Dummy	Takes the value 1 if the borrower holds other consumption credit (only individual credit)
D Other consumption credit (only joint)	Dummy	Takes the value 1 if the borrower holds other consumption credit (only joint credit)
D Other consumption credit (individual and joint)	Dummy	Takes the value 1 if the borrower holds other consumption credit (individual and joint credit)
D Other credit (only individual)	Dummy	Takes the value 1 if the borrower holds other credit (only individual credit)
D Other credit (only joint)	Dummy	Takes the value 1 if the borrower holds other credit (only joint credit)
D Other credit (individual and joint)	Dummy	Takes the value 1 if the borrower holds other credit (individual and joint credit)
Housing loans(individual)	Continuous	Logarithm of the value of loans granted to a single person for house purchases (euro)
Housing loans (joint)	Continuous	Logarithm of the value of loans granted to more than one person for house purchases (euro)
Car loans (individual)	Continuous	Logarithm of the value of loans granted to a single person for car financing (euro)
Car loans (joint)	Continuous	Logarithm of the value of loans granted to more than one person for car financing (euro)
Credit card debt (individual)	Continuous	Logarithm of the amounts already drawn on credit cards (as individual credit) (euro)
Credit card debt (joint)	Continuous	Logarithm of the amounts already drawn on credit cards (as joint credit) (euro)
Other consumer credit (individual)	Continuous	Logarithm of the value of consumer credit (other than car credit and credit cards amounts already drawn) granted to a single person (euro)
Other consumer credit (joint)	Continuous	Logarithm of the value of consumer credit (other than car credit and credit cards amounts already drawn) granted to more than one person (euro)
Other credit (individual)	Continuous	Logarithm of the value of other credit granted to a single person (euro)
Other credit (joint)	Continuous	Logarithm of the value of other credit granted to more than one person (euro)
Credit card limit (individual)	Continuous	Logarithm of the undrawn amounts on credit cards (as individual credit) (euro)
Credit card limit (joint)	Continuous	Logarithm of the undrawn amounts on credit cards (as joint credit) (euro)

(to be continued)

Appendix (continued)

EXPLANATORY VARIABLES

Variables	Variable type	Description
Number of banks – HC	Discrete	Number of banks granting housing credit to the borrower
Number of banks – CL	Discrete	Number of banks granting auto credit to the borrower
Number of banks – CC	Discrete	Number of banks granting credit through credit cards to the borrower (drawn amounts)
Number of banks – CC (undrawn)	Discrete	Number of banks granting credit through credit cards to the borrower (undrawn amounts)
Number of banks – OCC	Discrete	Number of banks granting other consumer credit to the borrower
Number of banks – OC	Discrete	Number of banks granting other credit to the borrower
Maturity at origination – respective segment	Continuous	Expressed as an average of the different loans in the respective segment (years)
Residual maturity – respective segment	Continuous	Expressed as an average of the different loans in the respective segment (years)
Debt service payments – respective segment	Continuous	Logarithm of the value of debt service payments in the respective segment (euro)
Number of loans – respective segment	Discrete	Number of loans the borrower holds in the respective segment
D Real guarantees – respective segment	Dummy	Takes the value 1 if the borrower has at least one real guarantee in the respective segment
D Personal guarantees – respective segment	Dummy	Takes the value 1 if the borrower has at least one personal guarantee in the respective segment
D Other guarantees – respective segment	Dummy	Takes the value 1 if the borrower has at least one guarantee of other type in the respective segment
D Guarantees to third parties – HC	Dummy	Takes the value 1 if the borrower gave guarantee to ensure the payment of housing loans granted to other borrowers
D Guarantees to third parties – CL	Dummy	Takes the value 1 if the borrower gave guarantee to ensure the payment of car loans granted to other borrowers
D Guarantees to third parties – OCC	Dummy	Takes the value 1 if borrower gave guarantee to ensure the payment of other consumer loans granted to other borrowers
D Guarantees to third parties – OC	Dummy	Takes the value 1 if borrower gave guarantee to ensure the payment of other loans granted to other borrowers
D households	Dummy	Takes the value 1 if borrower is not an entrepreneur
D Age class of the borrower (30-40 years)	Dummy	Takes the value 1 if borrower's age is 30 years old or more and less than 40
D Age class of the borrower (40-50 years)	Dummy	Takes the value 1 if borrower's age is 40 years old or more and less than 50
D Age class of the borrower (50-65 years)	Dummy	Takes the value 1 if borrower's age is 50 years old or more and less than 60
D Age class of the borrower (more than 65 years)	Dummy	Takes the value 1 if borrower's age is 65 years old or more
Major bank market share - respective segment	Continuous	Market share in total credit of the segment of the borrower's major lender in the segment (HC, CL, CC, OCC, OC)

Sources: Banco de Portugal (Central Credit Register) and authors' calculations.
Note: HC, CL, CC, OCC, OC holds respectively for housing credit, car loans, credit card debt, other consumer credit and other credit.