

When are consumer loans collateralized in emerging markets? Evidence from Vietnam

By

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Abstract

When are consumer loans collateralized? We use cross-sectional data on 32,655 bank loans raised by Vietnamese consumers between 2007 and 2011 to answer this question. Based on information about the bank's assessment of the borrower's ex ante risk and the borrowers' personal as well as financial characteristics, we directly investigate the observed-risk hypothesis as well as the quality-signaling hypothesis. We find evidence in favor of both. Ex-ante riskier borrowers are more likely to pledge collateral. At the same time, borrowers with the ability to pledge assets prefer collateralized loans in order to benefit from a reduction in their interest costs.

Keywords: Collateral, consumer loans, observed-risk hypothesis, quality-signaling hypothesis, loan pricing, emerging markets.

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1. Introduction

While there is a significant amount of research addressing the role as well as the determinants of collateral for commercial loans, there is little empirical work on the factors that affect decisions to pledge collateral for consumer loans. Theoreticians have argued that collateralization is a useful tool in resolving asymmetric information problems associated with both adverse selection and moral hazard and providing respite against default and bankruptcy loss. Empirical evidence based on accounting data supports these arguments for commercial loans. In contrast, evidence for consumer loans is not available due to the fact that public information about individual borrowers is almost impossible to obtain. However, in consumer lending the information asymmetry problem is especially severe and collateral is thus essential. Using a unique and confidential dataset of more than 30,000 consumer loans from one of the largest private banks in Vietnam, we are able to answer the following questions regarding the choice between collateralized and uncollateralized consumer loans: Does the bank require riskier borrowers to pledge collateral? How does the availability of pledgable assets influence the borrower's loan choice? How does the relationship between bank and borrower influence the loan choice?

Our analysis contributes to the understanding of the consumer banking market in a developing country, e.g. Vietnam, which is currently engaging in a process of economic liberalization. Prior empirical evidence on collateral almost exclusively focusses with developed economies with a few exceptions for Thailand (Menkhoff et al., 2006) and Mexico (La Porta et al., 2003). In emerging markets with potentially severely underdeveloped financial systems, information asymmetry problems between borrowers and lenders are severe and collateral is an important instrument of dealing with these information asymmetry problems. At the same time, however, collateral might only provide weak protection in case of borrower default if loan contracts cannot be fully enforced in emerging countries with weak legal systems (Menkhoff et al., 2006). Given these counteracting forces, we expect collateral to play a different role in emerging than in developed economies. As such, we cannot assume that existing developed-market evidence on the use of collateral is also valid in emerging markets. An investigation of the use of collateral in emerging markets is therefore essential.

Drawing on current theories, we empirically model the use of collateral as a function of borrower characteristics such as ex-ante credit quality, wealth and age of the borrower, loan characteristics such as loan amount and duration, the scale and scope of the borrower-lender relationship, credit market characteristics and regional governance conditions. We test this comprehensive model for the

determinants of collateral using cross-sectional data on 32,655 consumer loans granted between 2007 and 2011 to Vietnamese borrowers. In line with the major empirical findings for commercial loans in developed markets we find, first, that the likelihood of pledging collateral is higher among borrowers who are observed by the bank as ex ante riskier borrowers. We also find that among borrowers with the same level of observed risk, wealthier borrowers are more often pledging collateral. In addition, the bank-borrower relationship matters. The scale and scope of this relationship have opposite effects on collateral: collateral increases with the duration of the relationship and number of prior loans, and decreases in its scope which is measured by the number of different services that the borrower purchases from the bank.

Our paper makes three main contributions. First, we use data on consumer loans in an emerging market. Thereby, we can obtain new insights that differ from those papers that study corporate loans mostly in developed markets. Second, this study is among a few (Elsas et al., 2000; Macheuer et al., 1998) that use an internal ex ante credit risk score, which directly reflects how the bank observes a borrower's credit profile. This allows us to better test the observed-risk hypothesis than most previous studies. Indeed, our results are consistent with the idea that observationally riskier borrowers are more likely to pledge collateral. Finally, we observe information regarding the borrower's wealth. This allows us to differentiate between the bank's requirement to pledge collateral for risky borrowers and the borrowers' ability to pledge collateral.

The paper is structured as follows: Section 2 provides an overview of the relevant existing theory and empirical evidence on the determinants of collateral use focusing on the borrower quality and the bank-borrower relationship. Section 3 describes the Vietnamese banking market. Section 4 presents our empirical model and derives our hypotheses. Section 5 describes the data, variables and methodology. We present the results of our empirical analysis in section 6. Section 7 concludes.

2. Determinants of collateral

2.1. Collateral and borrower quality

Collateral is a defining feature of the loan contract, together with the interest rate, maturity, size, and any possible covenants. Drawing from current theories, collateral helps banks to solve two main problems. First, liquidating collateral in case of default limits a bank's losses. Second, collateral can solve the problem of asymmetric information between banks and borrowers arising when borrowers own private information that is not available to banks. Theories about collateral

solving the asymmetric information problem can be divided into two main streams. First, collateral can be used as a signaling instrument providing banks with valuable information about the borrower's quality that would not be available otherwise. High-quality borrowers who have private information about their good creditworthiness know that their likelihood of loan default and consequent loss of their collateral are unlikely. Therefore, high-quality borrowers are more willing to pledge collateral in return for more favorable contract terms than low-quality borrowers (Stiglitz and Weiss, 1981; Bester, 1985; Chan and Kanatas, 1985; Besanko and Thako, 1987). Banks offer a menu of contracts to borrowers: one loan contract with high collateral and low interest rate and another loan contract with low collateral and high interest rate. Borrowers choose their preferred contract and signal their status as high-quality borrowers when selecting the collateralized loan. Second, collateral helps to solve the problem of moral hazard after the loan is granted (Booth et al., 1991). Collateral provides an incentive to borrowers to exert optimal effort, as their payoff in the case of default is lower with collateral than without collateral. The presence of collateral is therefore associated with lower ex-post default. In general, these quality-signaling theories that view collateral as a solution to the asymmetric information problem predict a negative relation between presence of collateral and the borrower's risk level, both ex-ante and ex-post.

However, collateral requires monitoring and increases legal costs that reduce the benefit of collateral for a bank. More importantly and contradictory to the arguments of the asymmetric information theories, there is a common view among bankers that collateral is associated with riskier borrowers (Berger and Udell, 1990; Jimenez and Saurina, 2004; Inderst and Mueller, 2006). The observed-risk hypothesis reflects this view and argues that banks are able to identify risky borrowers through ex-ante screening. Since collateral helps to reduce the loss given default, banks require more collateral from borrowers with higher default risk.

Although a substantial amount of empirical work is devoted to banking issues, there are only a limited number of studies investigating the determinants of collateral in bank loans. Moreover, this scarce empirical literature has not settled whether collateral is associated with riskier or safer borrowers. On one hand, empirical studies explain the use of collateral as a consequence of adverse selection and/or moral hazard and conclude that the presence of collateral is a signal of safe borrowers. In this context, Jimenez, Salas, and Saurina (2006) find that the possibility of using collateral to signal credit quality occurs mainly among young borrowers who have no previous record of financial or commercial activities. Focusing on the associations between collateral, banking relationship

and risk premium, Degryse and Van Cayseele (2000) find a negative link between the presence of collateral and the loan's interest rate (a proxy for risk premium) for a sample of 18,000 Belgian loans. On the other hand, the majority of studies find that collateral is associated with high-risk borrowers and therefore support the observed-risk hypothesis. In an early study Berger and Udell (1990) investigate the relationship between collateral and credit risk for a sample of one million loans from US banks and find that banks require more collateral from risky borrowers while at the same time charging them higher interest rates. Jimenez and Saurina (2004) analyze 3 million loans provided by Spanish banks and find a positive relation between the ex post credit risk and the presence of collateral. Booth and Booth (2006) examine the relation between the borrowing cost and the presence of collateral for sample of 977 US loans raised between 1987 and 1989 and find that a number of observable risk characteristics are related to the probability that a loan is secured. Regarding emerging markets La Porta et al. (2003) and Menkhoff et al. (2006) tentatively confirm the observed-risk hypothesis for Mexico and Thailand and we thus consider ex ante risk as one of the core determinants of collateralization in our sample of Vietnamese consumer loans.

2.2. Collateral and bank-borrower relationship

The theories and empirical studies of relationship lending are also inconclusive about the influence of bank-borrower relationships on collateral (Greenbaum et al., 1989; Sharpe, 1990; Boot et al., 1994). On the one hand, the strength of the bank-borrower relationship indicates the degree of information asymmetry between bank and borrower. Thus, the incidence of collateral should decline with the strength of the relationship, e.g. with the reduction in the information asymmetry. On the other hand, the ability of the bank to privately observe proprietary information about the borrower can generate a lock-in problem, e.g. a situation where it is costly for the borrower to switch to another lender. In this case the incidence of collateral should increase with the strength of the relationship (Sharpe, 1990; Rajan, 1992). Proxies for the intensity of the bank-borrower relationship consist of scale proxies including the duration of the relationship (Dianmon, 1991; Petersen et al., 1994) and the number of prior loans as well as scope proxies such as the number of bank products used by the borrower.

The empirical evidence regarding the influence of bank-borrower relationships on collateral is limited to corporate lending. Using the 1987 NSSBF data, Berger and Udell (1995) find that in the US the use of collateral falls with the length of the bank-borrower relationship. Chakraborty and Hu (2006) use the 1993 NSSBF

data and share the same conclusion. Moreover, they find that the use of collateral decreases with the scope of the relationship. Degryse and Cayseele's (2000) findings based on European data also indicate that collateral requirements decrease with the duration of relationship and increase with its scope. In line with the locked-in hypothesis, Elsas and Krahnen (2000), Lehmann and Neuberger (2001) and Machauer and Weber (1998) document a higher fraction of collateralized loans when borrowing from a housebank. Regarding emerging markets, La Porta et al. (2003) find that the incidence and degree of collateral are significantly lower for Mexican borrowers with a strong bank relationship. Menkhoff et al. (2006) analyze 560 credit files of Thai commercial banks. As long credit relationships do not reduce collateral requirement, they conclude that market imperfections result in a lock-up effect for housebank borrowers in Thailand. Overall, the evidence on the relationship between bank-borrower relationships and collateral is inconclusive.

3. The Vietnamese banking market

In 1987, Vietnam started its transformation to a market economy. Part of this process is the replacement of the monopoly of state-owned banks by a two-level banking system consisting of a national central bank on one level and state-owned as well as commercial banks on another level.¹ Projects to modernize the inter-bank market, to create an international accounting system, and to allow outside audits of major Vietnamese banks are ongoing. However, the banking system continues to suffer from lack of capital, inadequate provisions for possible loan losses, low profitability, inexperience in capital markets, and the slow pace of institutional reform. With respect to risk assessment and management, there are numerous difficulties including a lack of transparency in non-performing loan disclosure. In order to improve risk management in light of Basel II, Vietnam's central bank has been reviewing its risk management regulations. As part of a broader strategy - which also addresses the banks' business strategy, assets and liability management, and internal audit - all state-owned commercial banks and joint-stock commercial banks have been asked to develop a comprehensive credit manual which takes international practices in risk management into account.

In this double-level banking system, the national central bank is not engaged any more in trading activities, nor is it directly involved in the process of acquiring or

¹ In 2005, this second level of the Vietnamese banking system contained five state-owned commercial banks, one social policy bank, 31 foreign bank branches, 40 foreign credit institution representative offices, five joint-venture commercial banks, 36 domestic joint-stock commercial banks, seven finance companies, and the Central People's Credit Fund System with 23 branches and 888 local credit funds.

locating capital in the banking and financial market. Commercial banks and other financial companies perform these activities. These banks also provide banking services to corporations and individuals including traditional services like payment transactions, deposit taking, lending, issuing credit and debit cards and modern services like Internet banking. This second level is dominated by the state owned commercial banks, which accounts for almost of 80% of commercial bank operations in Vietnam in 2005. However, despite the inadequacy of the legal framework and transitional problems, private commercial banks have made significant progress due to their more customer-oriented approach and distinct profit motive.

Among commercial banks in Vietnam, about 60% to 70% of a bank's capital assets are employed for lending activities and profit from lending accounts for a major part of bank's total profit. Strategically these banks focus on the retail sector, i.e. lending to consumers, entrepreneurs, and SMEs. During Vietnam's recent period of high economic growth and transformation to a market economy, there has been an increasing demand of loans from the retail sector. Lending volumes have grown substantially since 1990 and although state owned enterprises are still the dominant users of credit, their share in bank credit fell from 86% in 1991-1992 to 58% in December 2005 due to growing loan demand from retail borrowers. Within the retail credit sector, joint stock commercial banks play an important role as they account for more than 50% of outstanding loan value. Nevertheless, consumer credit continues to encounter barriers to growth due to, for example, the unreliable credit rating systems and complicated application procedures in Vietnam. However, the government and other financial institutions are expected to increase their efforts to resolve these issues in the near future.

Due to its strategic focus on retail lending, i.e. on consumer lending, the bank from which our data originates has developed competencies regarding the risk assessment during the initial screening of its borrowers. As a first step in the process of credit approval at the bank, borrowers have to complete a loan application form which requires personal information (age, address, occupation, marital status, relation with any other bank, income, home ownership, etc.) as well as information about the desired loan (amount, purpose and etc). Secondly, all information provided by the borrowers is certified by the bank regarding its correctness. Thirdly, a set of quantitative rules is used by credit officers as a benchmark for their lending decision. Generally, if the requested loan amount is less than 100 million Vietnamese dong (VND, approximately 3,000 euro) and all the criteria are met at the minimum required level then the loan application will be approved without requiring collateral. If the loan amount is more than 100 million VND then all criteria will be assessed at a more critical level and a collateral

requirement becomes more likely. The criteria that the bank uses to assess their borrowers include the borrower's monthly income, her occupation, years with the current employer, the industry of occupation, etc. These criteria are combined into a simple ex ante risk score. For more detailed information about how this score is computed, please refer to Table A1 in the appendix. Recently, the bank has implemented a sophisticated credit scoring system in some of its branches to replace the existing set of rules. We also consider this new risk score generated when testing the robustness of the impact of the ex ante risk score measure on the collateral use.

4. Empirical model and hypotheses

We model collateral as determined by borrower characteristics, the bank-borrower relationship, economic conditions and controls for loan characteristics, bank branch operational characteristics and regional governance characteristics. We use a Probit regression model to estimate the probability of a loan being secured by collateral. Our dependent variable is a binary variable Collateral_D , which takes the value of one if a loan is collateralized and zero otherwise. The probability of a loan being secured is thus given by equation (1) where Φ is the standard normal distribution function.

$$\begin{aligned} \text{Prob}(\text{Collateral}_D = 1) = & \Phi(\alpha + \sum_i \beta_i \text{Borrower characteristics}_i + \\ & \sum_j \gamma_j \text{Bank Borrower Relationship Characteristics}_j + \\ & \sum_k \delta_k \text{Economic Conditions}_k + \sum_l \mu_l \text{Controls}_l + \sum_m \rho_m \text{Time Dummies}_m + \varepsilon) \end{aligned} \quad (1)$$

Borrower characteristics include the borrower's *Ex-ante risk score* as described in Table A1 in the appendix, a dummy Home owner_D indicating whether the borrower owns rather than rents her place of residence and the borrower's *Age*. The scale of the bank-borrower relationship is measured by the number of *Years with bank* and the *Number of prior loans* that the borrower obtained from the bank. The scope of the bank-borrower relationship is indicated by the *Number of bank products* that the customer purchases from the bank, a dummy indicating if the borrower has a business relationship with another bank (Other bank_D) and a dummy indicating whether the borrower is from the neighborhood where the bank branch is located (Local borrower_D). The proxy for economic conditions in Vietnam is the *Base rate*, a policy tool used by Vietnam State Bank.

We include three sets of control variables to measure loan, bank branch and regional characteristics. Loan characteristics include proxies for *Loan duration* and *Loan size*. We include bank branch controls as our data consists of loans from one

bank with a large number of branches spread over the country. We specifically control for the operational characteristics of branches by the distance from their the headquarter (*Distance to headquarter*) and by a dummy to indicate whether the branch is a main branch in the province (*Main branch_D*).² We consider two regional control variables. First, the *Provincial legal index* measures how transparent and supportive the provincial legal framework is toward enterprises. A higher value indicates a more supportive legal framework. Second, a dummy *Municipality_D* indicates whether the bank branch is located in one of the five most economically developed municipalities in Vietnam. Finally, we include year dummies indicating the time of loan signing. Details on the definitions of all variables can be found in Table A2 in the appendix.

Next to the incidence of collateral modeled in equation (1), we also analyze the degree of collateral using a Tobit model. We construct an index, which is based on the collateral value to loan value ratio and ranges from zero to five with higher values indicating a higher degree of collateral. Since this collateral index contains a cluster of zeros, OLS would result in biased and inconsistent coefficients and the Tobit model as an extension of a censored regression model is an appropriate choice (Elsas et al., 2000; Lehmann et al., 2001; La Porta et al., 2003). In order to reduce the impact of outliers, i.e. loans with very high collateral to loan ratio, we use a *Collateral index* instead.

Predictions regarding the independent variables are derived from the previous theoretical and empirical research on the determinants of collateral. We focus our testable hypotheses on three main determinants: borrower quality, the bank-borrower relationship and economic conditions. First, for consumer loans in an emerging market, the information asymmetry problem can be quite severe and a lender might therefore heavily rely on collateral to overcome the information asymmetry problem and to reduce loss given default. It is therefore particularly important in our paper to test hypotheses between collateral and borrower quality. Second, in emerging markets the bank-borrower relationship plays a very important role. Thus, it is critical to understand how the bank-borrower relationship influences the use of collateral. Third, the recent financial crisis has dramatically changed the economic conditions and we want to study how this influences the use of collateral.

² In each city or province, the bank operates several branches and generally considers one of them - or two in big cities or provinces - as a main branch. These main branches have more authority regarding loan decisions e.g. authority to approve larger loans or to approve higher interest rate reduction.

First, we hypothesize that borrowers that the bank observed as more risky are more likely to pledge collateral. This hypothesis is directly based on the observed risk argument and in line with empirical findings (Boot et al., 1991; Berger and Udell, 1990; Jimenez and Saurina, 2004). In contrast to these studies that use proxies for ex ante default risk, we can directly observe the *Ex ante risk score* of each borrower and thus directly measure the credit quality as perceived by the bank. The higher the score the lower the borrower's credit risk. A positive coefficient for this proxy indicates that the observed risk hypothesis holds.

Second, we hypothesize that given the same observed credit quality, wealthier borrowers are more likely to pledge collateral in order to benefit from a lower borrowing rate. This hypothesis is based on the quality signaling argument and the menu of loan contracts that is offered (Bester, 1985; Chan and Kanatas, 1985; Besanko and Thakor, 1987a). Knowing that secured loans will be charged a lower interest rate, borrowers who are able to pledge collateral have a strong incentive to do so. Collateral in Vietnam is typically provided in form of real estate. Thus, we proxy the ability to pledge collateral by a dummy variable that indicates whether the borrower owns his place of residence. In addition, *Age* of borrower is also included as a simple proxy for wealth.

Third, we hypothesize that the likelihood of pledging collateral decreases with the length of the borrower-lender relationship if the benefits of relationship lending dominate and increases with the length of the relationship if the costs of the "hold-up" problem dominate. This hypothesis is based on studies about the effect of relationship lending on the likelihood of collateral (Boot, 2000; Berger and Udell, 2002, Jimenez et al, 2006). In addition, Boot et al. (1991) find that collateral can be a solution to problems of moral hazard and Boot and Thakor (1994) show that relationship lending can be viewed as a substitute for collateral in terms of reducing moral hazard as the repeated interaction between borrowers and lenders helps to build trust. In this case, *Years with bank* or *Number of prior loans* should carry a negative coefficient. In contrast, bank borrower relationships can result in a higher likelihood of collateral use if severe hold-up problems exist (Greenbaum et al, 1989; Sharpe, 1990; Rajan, 1992, Farinha and Santos, 2002). If so, the coefficient of *Years with bank* or *Number of prior loans* should be positive. Moreover, as another aspect of the borrower-lender relationship, we include *Other bank_D* indicating whether or not the borrower has a relation with other banks. When there is competition among lenders or when there are various sources of lending, there is a smaller hold-up effect. One last characteristic of the borrower-lender relationship that can influence the hold-up effect is the dummy *Local borrower_D* which indicates whether the borrower comes from the area where the

branch locates as the bank can easily value and monitor the collateral and the borrower.

Fourth, we hypothesize that the likelihood of collateral decreases with the number of different financial services that a borrower purchases from the bank. We base this hypothesis on a number of studies that differentiate between the scale and scope of the lending relationship and the use of collateral (Degryse and Cayseele, 2000; Petersen and Rajan, 1994; Chakraborty and Hu, 2000). We focus on the scale of a lending relationship in hypothesis three. Regarding the scope of the lending relationship we consider that lenders have better access to private information when borrowers use non-loan financial services (such as checking accounts, saving accounts, or other financial services). This information can easily be quantified, transmitted, and combined with other available information to effectively assess different aspects of the borrower's profile. An increased scope should therefore reduce the need for collateral. We measure the scope with the *Number of bank products* used by the borrower, which can consist of a saving account, a current debit account and a credit card. We predict a negative coefficient for this explanatory variable.

Fifth, we hypothesize that the use of collateral increases during economic downturns. It is commonly believed that uncertainty increases during economic downturns and that banks would require more collateral to overcome the increase in adverse selection and moral hazard problems as well as reduce loss given default. To the best of our knowledge, Jiminez (2006) is the only study that investigates the relation between the use of collateral and economic conditions using GDP and interest rates to proxy for economic conditions. Our data allows us to test this hypothesis in two ways: First, since our sample period includes the 2007/08 banking crisis, we can use time dummies to identify when the crisis hit the Vietnamese banking market. Second, we use the *Base rate* as a proxy for economic conditions. The *Base rate* has been employed by the State Bank of Vietnam as a powerful monetary instrument in order to control lending rates in Vietnam. Specifically, commercial banks are only allowed to charge their borrowers a maximum lending rate equal to 150 times the *Base rate*. During crisis times government raises the *Base rate* to control inflation and to create more room for commercial banks to increase their lending interest rate. We predict a positive coefficient for the *Base rate*.

In assigning control variables we include some loan characteristics such as *Loan duration* and *Loan size*. Though all bank branches belong to one single bank their operation can differ from each other and the differences in operation can influence the use of collateral. We argue that the way one branch operates depends on its

authority hierarchy and therefore include in the left hand side of equation (1) the dummy variable $Main\ branch_D$ indicating whether the loan is granted by a main bank branch with higher authority or not. Additionally, we control for the $Distance\ to\ headquarter$ from each branch. We believe this distance also plays a role in defining the way each branch operates. Finally, we control for the regional characteristics by including the $Provincial\ legal\ index$ that shows enterprises in different provinces have different view on how transparent and supportive the provincial legal framework and $Municipality_D$, taking value of 1 if the branch is located in one of the five municipalities³ and 0 otherwise.

5. Data and descriptive statistics

Our sample represents consumer loans granted between January 2007 and June 2011 by all 163 branches of a commercial bank in Vietnam. In total 32,655 loans were raised by retail borrowers mainly to pay for living expenses but also to finance weddings or to pay university tuition fees. Table 1 provides a snapshot of this part of the bank's outstanding loan portfolio. 52% of the bank's consumer loans are collateralized and on average, the collateral value is more than five times as large as the loan value. In a survey of collateral usage in different countries, Menkhoff et al. (2006) find that in mature markets, the percentage of collateralized loans varies between 13% and 88% and the collateral to loan ratio ranges from 0.32 to above 1. For Mexico and Thailand, La Porta et al. (2003) and Menkhoff et al. (2006) document 53% to 84% collateralized loans and collateral to loan ratios from 5.3 to 29. In comparison our values for Vietnam are at the lower end of this scale. Hainz et al. (2003) indicate that collateral plays an especially important role in transition economies leading to high levels of collateral. As such our Vietnamese data appear to be reasonable.

Table 1 Characteristics of the bank's loan portfolio

This table presents the fraction of collateralized loans and the average of collateral value for the whole loan sample and for different loan types

	All loans	Small loans	Large loans	Short-term loans	Long-term loans
Number of loans signed 2007-2011	32,655	21,244	11,411	21,408	11,247
Fraction of collateralized loans average	51.7%	37.1%	79.0%	36.8%	80.1%
Value of collateral in collateralized loans					
Collateral value (ml VND)	1,461	885	1,959	1,516	1,412
Collateral to loan value ratio	5.1	4.9	5.6	4.3	6.7
Average interest rate					
Uncollateralized loans	24.1%	24.5%	22.3%	24.2%	23.5%
Collateralized loans	18.8%	18.6%	19.1%	17.9%	19.7%

³ The five municipalities in Vietnam include Ha Noi, Ho Chi Minh city, Hai Phong, Da Nang, and Can Tho. These municipalities are the highest ranked-cities and form the most developed urban areas in the country. They are centrally controlled by the government and serve as the core development areas.

Table 2 presents summary statistics for the explanatory variables of the model for the whole sample in Panel A and separately for collateralized versus uncollateralized loans in Panel B. The *Ex-ante risk score* reveals that our bank focuses on relatively safe borrowers: The average score is 41 out of a maximum of 50. Collateralized loans are associated with on average riskier borrowers with a score of 40.60 compared to 41.37 for uncollateralized loans. This provides initial support for the observed-risk hypothesis. The percentage of home owners among borrowers is 63% but the differences between uncollateralized versus collateralized loans are substantial: 38% versus 86%. This supports the idea that borrowers provide collateral if they are able to do so – possibly in order to benefit from the lower interest rates for collateralized loans as documented in Table 1. Regarding the bank-borrower relationship, borrowers with collateralized loans have a longer relationship and more prior loans but use fewer bank products and are less likely to have another banking relationship. Surprisingly, more uncollateralized loans seem to be granted when the *Base rate* is higher. Furthermore, collateralized loans have longer maturities, are larger in size and are more likely to be made by a branch further away from the bank's headquarter.

In Panel C of Table 2 we present separate statistics for four sub-samples. First we differentiate small from large loans. Loans of less than 100 million VND, which account for almost 65% of the sample, are classified as small loans. Loans of more than 100 million VND are classified as large loans. As discussed above, the bank is more likely to require collateral for loans above 100 million VND. This is confirmed by Table 1 that shows the frequency of collateralization of small and large loans are 37.1% and 79.0%, respectively. Large loans are associated with better borrowers as shown by the *Ex-ante risk score* of 42.2 compared to 40.3 for small loans. Large loans are also granted to wealthier borrowers: 78% of borrowers who are granted a large loan own a house while only 55% of borrowers who are granted small loans own a house. Finally, large loans are associated with longer and stronger relationships with the bank. The differences we find between the terms and characteristics of loans of different size suggest that to preserve homogeneity, we should estimate the model separately for each size. Second, we differentiate between short-term loans with a maturity of less than 36 months and long-term loans. This separation follows Jimenez et al. (2006) who claim that loan terms differ substantially across loans of different maturities. In our sample collateralization rates do indeed differ with 36.8% for short-term loans compared to 80.1% for long-term loans. Furthermore, long-term loans are 50% larger on average than short-term loans. Long-term loans are granted to ex ante safer borrowers, to wealthier borrowers, and by branches further away from the headquarter.

Table 2 Descriptive statistics

This table presents descriptive statistics for all loans (Panel A), for collateralized versus uncollateralized loans (Panel B) and for four sub-samples (Panel C). The exact definitions and sources of our variables are listed in Table A2 of the appendix.

Panel A: All loans					
Variable	Mean	Minimum	Maximum	Standard deviation	Observations
<i>Borrower characteristics</i>					
Ex-ante risk score	40.97	15.00	50.00	6.85	32,655
Home owner _D	0.63	0.00	1.00	0.48	32,655
Age	39.10	19.00	88.00	10.11	32,655
<i>Bank-borrower relationship</i>					
Years with bank	2.26	0.00	10.00	2.65	32,655
Number of prior loans	4.96	0.00	519.00	12.87	32,655
Number of bank products	1.14	0.00	3.00	0.85	32,655
Other bank _D	0.06	0.00	1.00	0.24	32,655
Local borrower _D	0.94	0.00	1.00	0.24	32,655
<i>Economics conditions</i>					
Base rate	7.30	0.00	14.00	3.10	32,655
<i>Control variables</i>					
<i>Loan characteristics</i>					
Loan duration	39.10	1.00	360.00	21.21	32,655
Loan size (ml VND)	134.31	10.00	6,000.00	167.71	32,655
<i>Branch operation</i>					
Distance to head-quarter	46.80	0.00	1,047.38	139.45	32,655
Main branch _D	0.60	0.00	1.00	0.49	32,655
<i>Regional characteristics</i>					
Provincial legal index	4.14	2.79	6.70	0.74	32,655
Municipality _D	0.94	0.00	1.00	0.25	32,655

Panel B: Collateralized versus Uncollateralized loans						
Variable	Collateralized loans			Un-Collateralized loans		
	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations
<i>Borrower characteristics</i>						
Ex-ante risk score	40.60	6.54	16,883	41.37	7.15	15,772
Home owner _D	0.86	0.34	16,883	0.38	0.48	15,772
Age	43.87	9.93	16,883	33.99	7.46	15,772
<i>Bank-borrower relationship</i>						
Years with bank	2.87	2.82	16,883	1.60	2.29	15,772
Number of prior loans	8.07	16.42	16,883	1.63	5.73	15,772
Number of bank products	1.01	0.94	16,883	1.28	0.70	15,772
Other bank _D	0.05	0.21	16,883	0.08	0.28	15,772
Local borrower _D	0.96	0.20	16,883	0.92	0.27	15,772
<i>Economics conditions</i>						
Base rate	7.06	3.41	16,883	7.55	2.70	15,772
<i>Control variables</i>						
<i>Loan characteristics</i>						
Loan duration	46.16	25.09	16,883	31.54	12.12	15,772
Loan size (ml VND)	199.19	207.26	16,883	64.85	54.09	15,772
<i>Branch's operation</i>						
Distance to head-quarter	63.49	167.88	16,883	28.94	97.36	15,772
Main branch _D	0.64	0.48	16,883	0.57	0.50	15,772
<i>Regional characteristics</i>						
Provincial legal index	4.26	0.76	16,883	4.00	0.69	15,772
Municipality _D	0.92	0.26	16,883	0.95	0.22	15,772

(continued)

Panel C: Per loan types												
Variable	Small loans			Large loans			Short-term loans			Long-term loans		
	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations
<i>Borrower characteristics</i>												
Ex-ante risk score	40.33	6.96	21,244	42.17	6.49	11,411	40.56	7.01	21,408	41.76	6.46	11,247
Home owner _D	0.55	0.50	21,244	0.78	0.41	11,411	0.56	0.50	21,408	0.76	0.43	11,247
Age	37.57	9.97	21,244	41.94	9.76	11,411	38.14	10.14	21,408	40.91	9.81	11,247
<i>Bank-borrower relationship</i>												
Local borrower _D	0.94	0.24	21,244	0.94	0.24	11,411	0.94	0.25	21,408	0.95	0.22	11,247
Years with bank	1.91	2.43	21,244	2.91	2.91	11,411	2.14	2.59	21,408	2.48	2.74	11,247
Number of prior loans	3.40	7.87	21,244	7.87	18.59	11,411	4.10	11.35	21,408	6.61	15.21	11,247
Number of bank products	1.05	0.78	21,244	1.33	0.94	11,411	1.20	0.81	21,408	1.04	0.90	11,247
Other bank _D	0.07	0.25	21,244	0.05	0.22	11,411	0.07	0.25	21,408	0.06	0.23	11,247
<i>Economics conditions</i>												
Base rate	7.30	3.06	21,244	7.30	3.18	11,411	7.25	3.18	21,408	7.40	2.94	11,247
<i>Control variables</i>												
<i>Loan characteristics</i>												
Loan duration	35.50	16.12	21,244	45.80	27.11	11,411	26.45	10.51	21,408	63.18	14.55	11,247
Loan size (ml VND)	56.79	28.90	21,244	278.62	216.63	11,411	111.18	172.43	21,408	178.34	148.72	11,247
<i>Branch operation</i>												
Distance to head-quarter	44.26	132.18	21,244	51.52	151.96	11,411	39.87	127.35	21,408	59.99	159.15	11,247
Main branch _D	0.61	0.49	21,244	0.59	0.49	11,411	0.60	0.49	21,408	0.60	0.49	11,247
<i>Regional characteristics</i>												
Provincial legal index	4.12	0.72	21,244	4.17	0.77	11,411	4.10	0.72	21,408	4.21	0.77	11,247
Municipality _D	0.93	0.25	21,244	0.94	0.24	11,411	0.94	0.24	21,408	0.93	0.26	11,247

Table 3 illustrates how loan volumes and collateralization changes over time. While rising steadily to 3.790 loans in the fourth quarter of 2007, loan volumes dropped sharply during the financial crisis and lending came almost to a standstill in the third quarter of 2008. While loan volumes have since recovered, collateral levels have risen more persistently, in particular for large and long-term loans.

6. Regression results

6.1. Empirical evidence regarding our hypotheses

Table 4 presents the Probit model's estimations for the whole sample of consumer loans). Since the coefficients of Probit models cannot be interpreted directly, the marginal effect of each variable is additionally calculated and also presented in Table 4. The coefficient and marginal effect of the *Ex-ante risk score* are negative and significant therefore confirming our first hypothesis: In line with the observed risk hypothesis, borrowers with lower credit quality are more likely to pledge collateral. The marginal coefficient of the *Ex-ante risk score* indicates that, ceteris paribus, one point increase in *Ex-ante risk score* is likely to reduce the collateral requirement by 1.6%. This magnitude corresponds to those obtained for the emerging market of Mexico (La Porta, et al., 2003) and for developed markets (Degrayse and Van Cayseele, 2000; Harhoff and Korting, 1998; Lehmann and Neuberger, 2001). However, these studies need to approximate the borrower's ex ante credit risk while we directly measure the *Ex-ante risk score*. Hence, we are able to provide direct evidence for the observed-risk hypothesis in an emerging market like Vietnam.

Home owner_D has a positive and significant coefficient and the corresponding marginal effect indicates that, ceteris paribus, being a home owner is likely to increase the use of collateral by 31% compared to a borrower who does not own the house he lives in. We thus can confirm our second hypothesis and our results are in line with Booth and Booth (2006) who show that collateral pledging decisions are generally consistent with borrowing cost minimization. Existing studies are unable to distinguish between the borrowers' willingness to pledge collateral and their ability to do so. However, our proxy allows us to directly measure the ability to pledge collateral and we can thus test the hypothesis more accurately. Given the same level of observed credit risk and thus the same requirement from the bank's side to collateralize, borrowers with the ability to pledge collateral are more likely to do. So in return, they pay a lower interest rate as documented in Table 1. Similarly, the coefficient of *Age* is positive and significant and also indicates that – if age is a proxy for wealth – wealthy borrowers are more likely to pledge collateral.

Table 3 Bank lending and collateralization over time
 This table presents the number of new loans made by the bank over time.

Quarter	All loans		Small loans		Large loans		Short-term loans		Long-term loans	
	Number of loans	Fraction of collateralized loans	Number of loans	Fraction of collateralized loans	Number of loans	Fraction of collateralized loans	Number of loans	Fraction of collateralized loans	Number of loans	Fraction of collateralized loans
I2007	241	37%	221	36%	20	40%	172	26%	69	62%
II2007	1,657	49%	1,545	48%	112	60%	1,228	40%	429	75%
III2007	2,231	31%	1,956	29%	275	45%	1,638	25%	593	50%
IV2007	3,790	28%	3,109	24%	681	50%	2,663	19%	1,127	51%
I2008	2,960	34%	2,172	21%	788	70%	2,041	21%	919	63%
II2008	1,319	46%	905	28%	414	86%	949	36%	370	71%
III2008	43	70%	26	54%	17	94%	37	68%	6	83%
IV2008	842	71%	583	59%	259	96%	669	63%	173	100%
I2009	1,156	64%	762	49%	394	91%	865	52%	291	99%
II2009	1,353	59%	909	45%	444	88%	996	45%	357	100%
III2009	1,417	65%	888	51%	529	88%	954	47%	463	100%
IV2009	1,718	70%	964	53%	754	93%	1,052	52%	666	100%
I2010	956	63%	544	52%	412	78%	699	54%	257	88%
II2010	2,171	59%	1,188	45%	983	77%	1,303	42%	868	85%
III2010	2,851	55%	1,593	38%	1,258	76%	1,706	35%	1,145	83%
IV2010	2,837	59%	1,452	37%	1,385	83%	1,636	39%	1,201	87%
I2011	1,771	62%	835	39%	936	82%	989	41%	782	88%
II2011	1,977	59%	952	36%	1,025	81%	1,107	38%	870	85%
III2011	1,365	67%	640	47%	725	84%	704	46%	661	89%
Total	32,655	52%	21,244	37%	11,391	79%	21,236	37%	11,178	80%

Table 4 Determinants of the incidence of collateral

This table presents coefficients and marginal coefficients of the Probit regression for all loans. For each independent variable, the coefficient and the z-statistic are shown in the coefficient column and the marginal coefficient at the mean is shown in the marginal column. Standard errors are heteroskedasticity robust and clustered by borrower. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Incidence of collateral	
	coefficient	marginal effect
Intercept	-6.78 *** -33.84	
<i>Borrower characteristics</i>		
Ex-ante risk score	-0.04 *** -23.80	-0.016
Home owner _D	0.81 *** 33.93	0.312
Age	0.04 *** 32.19	0.016
<i>Bank-borrower relationship</i>		
Years with bank	0.08 *** 15.62	0.031
Number of prior loans	0.05 *** 17.54	0.019
Number of bank products	-0.63 *** -38.94	-0.247
Other bank _D	-0.23 *** -5.36	-0.091
Local borrower _D	0.01 0.21	0.004
<i>Economics conditions</i>		
Base rate	0.07 ***	0.027
Control variables		
<i>Loan characteristics</i>		
Loan duration	0.03 *** 41.45	0.010
Loan size	1.03 *** 62.79	0.403
<i>Branch operation</i>		
Distance to head-quarter	-0.02 ** -1.98	-0.010
Main branch _D	0.17 *** 7.67	0.067
<i>Regional characteristics</i>		
Provincial legal index	0.31 *** 15.82	0.120
Municipality _D	-0.41 *** -8.11 2.97	-0.152

(continued)

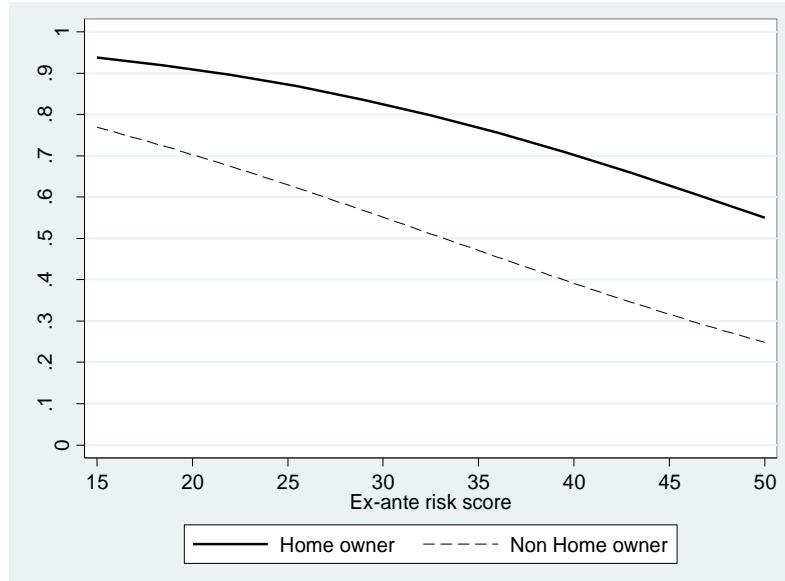
Quarterly dummies		
II-2007	0.08 **	0.030
	2.36	
III-2007	-0.04	-0.014
	-1.40	
IV-2007	-0.05 **	-0.021
	-2.48	
I-2008	-0.03 *	-0.012
	-1.70	
II-2008	0.02	0.007
	1.14	
III-2008	0.09 **	0.036
	2.83	
IV-2008	0.12 ***	0.046
	8.24	
I-2009	0.07 ***	0.028
	5.40	
II-2009	0.06 ***	0.022
	4.43	
III-2009	0.06 ***	0.023
	5.03	
IV-2009	0.06 ***	0.023
	5.61	
I-2010	0.01	0.005
	1.34	
II-2010	0.01	0.002
	0.67	
III-2010	0.00	0.000
	-0.01	
IV-2010	0.01	0.003
	1.18	
I-2011	0.01	0.002
	0.69	
II-2011	0.00	0.001
	0.53	
III-2011	0.01 *	0.005
	1.87	
log likelihood	-8,825	
pseudo R ²	0.610	
number of observations	32,655	

How do the effects of the *Ex-ante risk score* and *Home owner_D* relate to each other? We believe that the relation between collateralization and *Ex-ante risk score* reflects the bank's policy to demand more collateral from risky borrowers, whereas *Home owner_D* reflects the choice of the borrower. This can be seen as a simple demand-supply system of collateral. Figure 1 presents predicted probability of collateral relative to the level of the *Ex-ante risk score* for home owners and non-home owners. The predicted probability of pledging collateral for home owners lies persistently above the predicted probability of pledging collateral for non-home owners. This indicates that at each level of risk borrowers more frequently choose to pledge collateral if they are able to do so. This finding again confirms

our second hypothesis on the supply side of collateral. In addition, from the demand side the downward sloping lines confirm that the bank requires less collateral from safer borrowers, both home owners and non-home owners. The interaction between *Ex-ante risk score* and $Home\ owner_D$ regarding the collateral decision becomes visible when we compare the slope of the two lines. The slightly more negative slope for non-home owners indicates that for the same decrease in credit risk, the decrease in the collateralization requirement is larger for non-home owners than for home owners. Thus, non-home owners' collateral decision is slightly more sensitive to credit risk.

Figure 1 Interaction between $Home\ owner_D$ and *Ex ante risk score*

This figure presents the interaction between two factors, $Home\ owner_D$ and *Ex-ante risk score*, on the use of collateral.



Regarding our third hypothesis, our results for Vietnam are in line with existing findings for developed markets: Collateralization depends on scale of the bank-borrower relationship. The likelihood of collateralization increases with *Years with bank* and *Number of prior loans* by 3.1% and 1.9%, respectively. This indicates that one more year with the bank with one more prior loan in the past would increase the use of collateral by 5% in total. This finding confirms that the "hold-up" effect dominates the benefits of the lending relationship. In Vietnam it is not possible to pledge the same asset as collateral with different banks at the same time. Thus, the borrower tends to stay with the same bank that holds the pledged asset. Due to these institutional circumstances the hold-up effect is very persistent

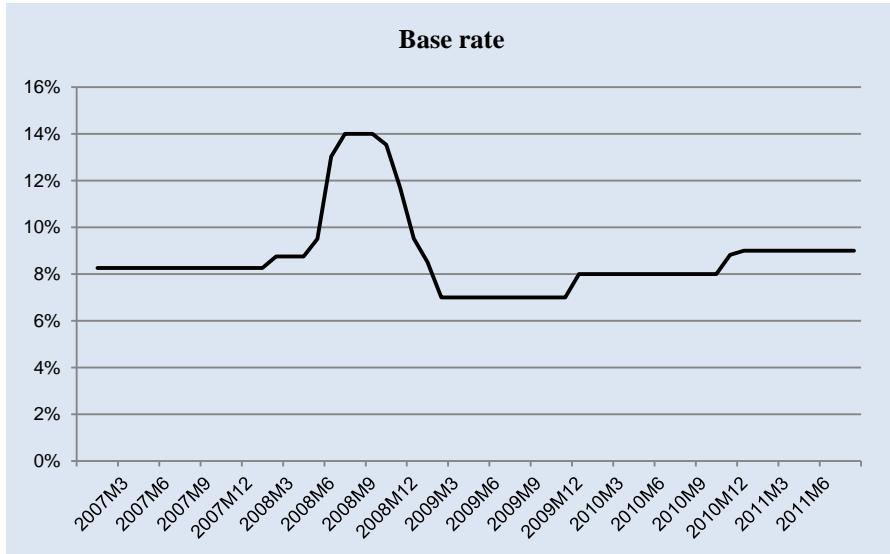
in Vietnam. This provides a support for the conclusion made in previous studies (Greenbaum et al., 1989; Sharpe, 1990; Rajan, 1992, Farinha and Santos, 2002) that a frequent borrower can be associated with higher likelihood of collateral use. In addition, a relationship with an *Other bank_D* has a negative coefficient indicating that the existence of an alternative lending source reduces the hold-up problem and consequently reduces the likelihood of collateralization. *Local borrower_D* is not significant.

The proxy for the scope of the lending relationship, *Number of bank products*, has a negative and significant coefficient for all loans. The corresponding marginal effect implies that, ceteris paribus, using one more service at the bank would reduce the likelihood of being asked for collateral by approximately 25%. Compared to the average fraction of collateralized loans of 51.7%, this effect is substantial. This result strongly confirms our fourth hypothesis and is furthermore consistent with the results found in the previous studies about the effect of the scope of the lending relationship on collateral use (Degryse and Cayseele, 2000; Petersen and Rajan, 1994; Chakraborty and Hu, 2000). Thus, while the scale of the lending relationship increases the likelihood of using collateral, its scope, e.g. the number of different services that the borrower uses from the same bank, actually reduces the incidence of using collateral. The information the bank acquires about the borrowers through different kinds of services, for example different types of account such saving account, or debit account, is important for a consumer loan because it is harder to access private information than business information. This convenient source of information helps the bank to reduce both adverse selection and moral hazard and therefore the bank requires less collateral.

In line with our fifth hypothesis about the relationship between economic conditions and the use of collateral, we find that the incidence of using collateral significantly increases during the crisis period. In particular, the time dummies from the third quarter of 2008 until the fourth quarter of 2009 have positive and significant coefficients and the collateral requirement peaks in the fourth quarter of 2008 corresponding to the time when the bank's lending volume is at its lowest (see Table 3). In addition, we find a significant and positive coefficient for the *Base rate*. It implies that during the economic downturns when the State Bank increases its *Base rate* (Figure 2), commercial banks require more collateral. The marginal coefficient shows that every 1% increase in the *Base rate* increases the likelihood of being asked for collateral by 2.7%. We conclude that over crisis periods when uncertainty increases and adverse selection and moral hazard become more severe, banks require more collateral as a solution to these asymmetric information problems and reduce their loss in case of default.

Figure 2 Change of the Base rate over time

This figure presents the *Base rate* over time. This base rate is deployed by the State Bank as a monetary instrument and commercial banks in Vietnam are allowed to charge a maximum lending rate of 150% of this Base rate.



Regarding control variables, *Loan size* and *Loan maturity* both increase the likelihood of collateralization. Branch characteristics also matter as *Distance to headquarter* has a negative and only marginally significant coefficient while *Main branch_D* has a positive and significant coefficient. Collateralisation is also a regional issue. The coefficient of the *Provincial legal index* is significantly positive. This result suggests that a better legal environment increases the use of collateral. This can be explained by the lower cost of collateralization in a good legal environment than in a bad one and therefore enhances the use of collateral. The negative coefficient of *Municipality_D* can be understood in the context of the difference in economic development between the first-class cities and the rest of Vietnam. *Municipality_D* - which is set equal to 1 for loans to borrowers in first-class cities - then implies that economic development reduces information asymmetries and thus reduces the likelihood of collateral.

For the four sub-samples of small versus large and short-term versus long-term loans, Panel A of Table 5 indicates many similarities but also some differences regarding the determinants of collateral incidence. In general, the results for the four sub-samples provide robust results for our five hypotheses. Some differences, however, emerge. The coefficient of *Home owner_D* is smaller for small loans than for large loans and is smaller for short-term loans than for long-term loans. We

interpret this as evidence that for large loans and long-term loans the collateralization is being more influenced by the demand side, e.g. the bank, while for small loans and short-term loans the decision to pledge collateral lies more in the hands of borrowers and therefore the ability to pledge collateral has more influence. *Years with bank* is negative but not significant for large loans and positive but less significant for long-term loans. This implies that the hold-up effect might only be important for small and short-term loans. Finally, large loans seem to be most vulnerable to the economic conditions as only large loans have a positive and significant coefficient for the *Base rate*. Large loans are also the first one that responds to the impact of the crisis as its coefficients for the quarterly dummy variables start to be positive and significant from the first quarter of 2008. The impact of the crisis also seems to be most persisted for this sub-sample as its coefficients for these time dummies stay positive and significant until the last quarter in our sample which is the third quarter of 2011 although their magnitude reduces from the beginning of 2009.

Panel B of Table 5 presents the results of the Tobit model regarding the determinants of the degree of collateral use. The model is estimated for the whole sample and for the four sub-samples. The model has the same explanatory variables as the model for collateral incidence. Overall, we can observe that the factors that determine whether or not collateral is provided also affect the amount of collateral in the same direction. Interestingly, the *Base rate* is now positive and significant for all four sub-samples. This result is consistent with the prediction by Boot et al. (1991) and Jimenez (2006) that the amount of collateral pledged in a particular loan will increase if the loan is granted in a period of higher interest rates.

Table 5 Determinants of collateral: incidence and degree

Panel A of this table presents the results of Probit regressions. The dependent variable is a dummy equal to one for collateralized loans and zero otherwise. For each independent variable, the first row shows the coefficient and the second row shows the z statistic. Panel B shows the results of Tobit regressions. The dependent variable is measured as the collateral to loan value index. In both panels, standard errors are heteroskedasticity robust and clustered by borrower. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The regression for all loans in Panel A is highlighted in bold. This regression corresponds to the regression shown in Table 4 and serves as our baseline regression.

Independent variable	Panel A: Incidence of collateral					Panel B: Degree of collateral				
	All loans	Small loans	Large loans	Short-term loans	Long-term loans	All loans	Small loans	Large loans	Short-term loans	Long-term loans
<i>Constant</i>	-6.78*** -33.84	-7.67 *** -29.89	-11.09 *** -23.46	-5.76 *** -24.39	-8.95 *** -15.06	-8.50 *** -32.07	-13.69 *** -31.85	-5.88 *** -10.89	-10.68 *** -24.81	-3.29 *** -9.97
<i>Borrower characteristics</i>										
Ex-ante risk score	-0.04*** -23.80	-0.04 *** -18.67	-0.04 *** -12.97	-0.03 *** -15.62	-0.06 *** -15.50	-0.04 *** -19.19	-0.06 *** -17.11	-0.03 *** -14.42	-0.04 *** -11.45	-0.04 *** -16.51
Home owner _D	0.81*** 33.93	0.92 *** 30.13	0.55 *** 13.12	0.82 *** 28.10	0.78 *** 16.14	1.63 *** 42.91	2.13 *** 34.10	0.78 *** 16.85	2.17 *** 34.32	0.97 *** 21.60
Age	0.04*** 32.19	0.04 *** 24.29	0.04 *** 17.37	0.04 *** 28.83	0.03 *** 12.48	0.06 *** 38.53	0.07 *** 25.67	0.04 *** 25.97	0.08 *** 31.14	0.03 *** 19.08
<i>Bank-borrower relationship</i>										
Years with bank	0.08*** 15.62	0.13 *** 19.95	-0.01 -1.59	0.11 *** 18.22	0.02 ** 2.11	0.14 *** 23.51	0.21 *** 16.35	0.02 *** 2.74	0.22 *** 22.39	0.05 *** 7.92
Number of prior loans	0.05*** 17.54	0.05 *** 11.47	0.04 *** 4.65	0.05 *** 23.98	0.05 *** 3.99	0.02 *** 8.26	0.06 *** 6.01	0.01 *** 7.52	0.03 *** 5.56	0.01 *** 6.71
Number of bank products	-0.63*** -38.94	-0.72 *** -31.73	-0.40 *** -16.84	-0.72 *** -34.24	-0.57 *** -18.12	-0.70 *** -38.05	-1.04 *** -30.34	-0.22 *** -12.52	-1.12 *** -34.57	-0.27 *** -14.85
Other bank _D	-0.23*** -5.36	-0.25 *** -4.69	-0.18 ** -2.43	-0.20 *** -3.78	-0.27 *** -3.26	-0.23 *** -3.95	-0.34 *** -3.66	-0.13 * -1.86	-0.33 *** -3.42	-0.05 -0.69
Local borrower _D	0.01 0.21	0.08 1.27	-0.10 -1.32	0.05 0.74	0.03 0.30	0.15 ** 2.30	0.32 ** 2.54	0.11 * 1.68	0.28 ** 2.39	0.15 ** 2.00
<i>Economics conditions</i>										
Base rate	0.07*** 2.97	0.05 1.55	0.12 *** 2.58	0.04 1.56	0.10 1.50	0.10 *** 4.06	0.09 ** 2.18	0.09 *** 3.87	0.07 * 1.89	0.10 *** 3.33
<i>Control variables</i>										
<i>Loan characteristics</i>										
Loan duration	0.03*** 41.45	0.03 *** 27.68	0.03 *** 29.33	0.00 -0.99	0.09 *** 24.37	0.03 *** 37.58	0.03 *** 22.13	0.02 *** 26.48	0.01 *** 5.36	0.02 *** 11.08
Loan size	1.03*** 62.79	1.24 *** 39.96	1.68 *** 30.27	0.96 *** 48.00	0.90 *** 23.30	1.10 *** 65.37	2.13 *** 41.06	0.72 *** 25.14	1.36 *** 47.20	0.42 *** 17.08
<i>Branch operation characteristics</i>										
Distance to headquarter	-0.02** -1.98	-0.04 ** -2.41	0.00 -0.88	0.00 -0.26	-0.10 *** -4.10	-0.05 *** -3.46	0.04 * -1.77	-0.10 *** -4.10	-0.10 ** -2.33	-0.10 *** -5.44
Main branch _D	0.17*** 7.67	0.17 *** 6.09	0.16 *** 3.94	0.21 *** 7.89	0.02 0.43	0.21 *** 7.33	0.23 *** 4.70	0.18 *** 5.62	0.37 *** 7.58	0.03 0.94

(continued)

<i>Regional characteristic</i>										
Provincial legal index	0.31***	0.33 ***	0.28 ***	0.23 ***	0.48 ***	0.36 ***	0.52 ***	0.18 ***	0.41 ***	0.29 ***
	15.82	13.58	8.07	10.30	11.50	13.51	11.84	5.70	9.57	8.93
Municipality _D	-0.41***	-0.46 ***	-0.38 ***	-0.42 ***	-0.60 ***	-0.10	-0.24 **	0.05	-0.44 ***	0.12 *
	-8.11	-7.40	-3.70	-6.84	-5.23	-1.50	-2.23	0.71	-4.18	1.76
<i>Quarterly dummies</i>										
II-2007	0.08**	0.07 *	0.20 **	0.07 *	0.05	0.14 ***	0.11 *	0.26 **	0.13	0.15 **
	2.36	1.79	2.68	1.82	0.91	2.89	1.84	2.04	1.78	2.38
III-2007	-0.04	-0.03	0.06	-0.03	-0.05	-0.04	-0.05	0.11	-0.06	-0.04
	-1.40	-1.10	1.08	-1.04	-1.20	-1.06	-1.08	1.08	-1.00	-0.77
IV-2007	-0.05**	-0.05 *	0.07	-0.05 **	-0.06	-0.08 **	-0.08 **	0.11	-0.11 **	-0.03
	-2.48	-1.90	1.54	-2.12	-1.56	-2.35	-2.10	1.40	-2.32	-0.78
I-2008	-0.03*	-0.04 *	0.13 ***	-0.04 *	-0.02	-0.05 **	-0.09 ***	0.19 ***	-0.09 **	0.00
	-1.70	-1.85	3.47	-1.91	-0.67	-1.98	-2.69	2.74	-2.08	0.00
II-2008	0.02	0.00	0.20 ***	0.01	0.02	0.03	-0.02	0.24 ***	0.00	0.05
	1.14	-0.18	5.70	0.41	0.80	1.01	-0.48	3.94	0.00	1.71
III-2008	0.09**	0.07 *	0.22 **	0.07 *	0.00	0.13 ***	0.11 **	0.26 ***	0.10 *	0.10
	2.83	1.98	2.92	2.03	-0.01	3.59	2.25	4.24	2.08	1.48
IV-2008	0.12***	0.11 ***	0.24 ***	0.09 ***		0.13 ***	0.13 ***	0.24 ***	0.13 ***	0.13 ***
	8.24	6.95	6.69	5.56		6.48	4.97	4.87	4.39	5.05
I-2009	0.07***	0.06 ***	0.19 ***	0.05 ***	0.19 ***	0.07 ***	0.07 **	0.20 ***	0.06 *	0.11 ***
	5.40	4.06	6.93	3.26	3.67	3.83	2.78	4.50	2.03	4.63
II-2009	0.06***	0.05 ***	0.16 ***	0.03 *		0.06 **	0.06 *	0.17 ***	0.04	0.09 ***
	4.43	3.41	5.78	2.09		3.21	2.30	4.25	1.58	4.13
III-2009	0.06***	0.05 ***	0.15 ***	0.04 ***	0.18 ***	0.06 ***	0.07 ***	0.16 ***	0.05 *	0.09 ***
	5.03	3.76	6.26	2.71	3.27	3.92	3.00	4.27	2.19	4.48
IV-2009	0.06***	0.05 ***	0.14 ***	0.04 ***	0.16 ***	0.06 ***	0.06 ***	0.15 ***	0.05 **	0.08 ***
	5.61	4.32	6.70	3.08	4.11	4.10	3.31	4.42	2.38	4.60
I-2010	0.01	0.01	0.08 ***	0.00	0.03 *	0.03 **	0.02	0.12 ***	0.02	0.06 ***
	1.34	1.20	4.37	0.43	1.95	2.44	1.22	3.57	0.96	3.26
II-2010	0.01	0.00	0.07 ***	-0.01	0.03 **	0.02	0.01	0.10 ***	0.00	0.05 ***
	0.67	0.46	4.36	-0.49	2.29	1.54	0.65	3.45	-0.15	3.40
III-2010	0.00	0.00	0.07 ***	-0.01	0.02 *	0.01	0.00	0.10 ***	-0.01	0.05 **
	-0.01	-0.38	4.25	-1.18	1.61	1.18	-0.14	3.50	-0.57	3.23
IV-2010	0.01	0.00	0.08 ***	0.00	0.03 **	0.02 **	0.01	0.11 ***	0.00	0.05 ***
	1.18	-0.07	5.31	-0.24	2.56	2.24	0.41	4.08	0.27	3.90
I-2011	0.01	0.00	0.07 ***	0.00	0.02	0.02	0.01	0.10 ***	0.00	0.04 ***
	0.69	0.39	4.75	-0.29	1.37	1.43	0.53	3.83	0.06	3.42
II-2011	0.00	0.00	0.06 ***	-0.01	0.02 *	0.02	0.00	0.10 ***	-0.01	0.05 ***
	0.53	-0.54	4.80	-0.94	2.01	1.70	0.00	3.95	-0.38	3.73
III-2011	0.01	0.01	0.07 ***	0.00	0.04 ***	0.02 **	0.01	0.09 ***	0.01	0.05 ***
	1.87	1.08	5.08	0.47	3.08	2.60	0.98	4.08	0.91	4.11
<i>log likelihood</i>	-8,825	-5,643	-2,808	-6,086	-2,115	-43,100	-22,200	-18,700	-22,800	-18,200
<i>pseudo R²</i>	0.610	0.597	0.522	0.568	0.615	0.223	0.259	0.119	0.240	0.134
<i>number of observations</i>	32,655	21,244	11,411	21,408	10,717	32,655	21,244	11,411	21,408	11,247

6.2. Economic relevance

Table 6 illustrates the change in the predicted probability of collateralization for a one-standard deviation change in each independent continuous variable or for a change from 0 to 1 for each independent dummy variable. The results are reported for our main regression shown in Table 4. Overall, the model predicts that 57.6% of loans are collateralized which is fairly close to the sample frequency of 51.7%. The largest impact on collateralization can be observed for *Loan size* (+38.6%) followed by *Home owner_D* (+31.2%). The effect of the *Ex-ante risk score* is only moderate with -1.6%. This can however be explained with the relatively low variability of the score as reported in Panel A of Table 2 and the similarity of the average scores for collateralized and uncollateralized loans as reported in Panel B of Table 2. The effect of the crisis shows a clear trend: From the second quarter of 2008 till the end of the sample period which is the third quarter of 2011 the likelihood of collateralization increases by 4.6% compared to the first quarter of 2007. In conclusion, the estimated coefficients of our Probit model reported in Table 4 generally imply an economically substantial impact of the significant borrower characteristics, bank-borrower relationships and economic conditions on the use of collateral.

In addition, Table A3 in the appendix shows the marginal effects of changes in values of the explanatory variables on the likelihood of collateralization for the whole sample and for four sub-samples. This result is obtained from the Probit estimation of table of Table 5. The marginal effects help to calibrate the economic significance of explanatory variables. For all the significant variables, the magnitude of these effects is much larger for small loans and short-term loans than for large loans and long-term loans. For example, a 10 points increase in the ex-ante risk score would increase the likelihood of collateralization by 13% and 11% for a small loan and a short-term loan, respectively, while it increases the likelihood of collateralization by only 5% and 3% for a large loan and a long-term loan, respectively. The explanation lies in our sample where large loans and long-term loans have by far higher probability of collateralization and so the room for these effects is not as big as that of the small loans and short-term loans. The quarterly dummies, which have a statistically significant effect, also show an economically significant effect here.

Table 6 The determinants of collateral-Economic relevance

This table presents the effect of a change in each independent variable from half a standard deviation below the mean to half a standard deviation above the mean on the predicted probability of collateral. If the independent variable is a dummy, a change from 0 to 1 is considered. All other independent variables are kept at their mean values. The overall predicted probability of collateral is calculated when all independent variables are at their mean.

	Predicted probability of collateralization		
	from	to	change
<i>Borrower characteristics</i>			
Ex-ante risk score	58.4%	56.8%	-1.6%
Home owner _D	37.6%	68.9%	31.2%
Age	56.8%	58.4%	1.6%
<i>Bank-borrower relationship</i>			
Years with bank	56.1%	59.2%	3.1%
Number of prior loans	56.7%	58.6%	2.0%
Number of bank products	69.4%	45.1%	-24.3%
Other bank _D	58.2%	49.1%	-9.1%
Local borrower _D	57.3%	57.7%	0.4%
<i>Economics conditions</i>			
Base rate	57.2%	58.0%	0.8%
<i>Control variables</i>			
<i>Loan characteristics</i>			
Loan duration	57.1%	58.1%	1.0%
Loan size	37.4%	76.0%	38.6%
<i>Branch operation characteristics</i>			
Distance to head-quarter	57.6%	57.6%	-0.01%
Main branch _D	53.6%	60.3%	6.7%
<i>Regional characteristics</i>			
Provincial legal index	51.6%	63.5%	12.0%
Municipality _D	71.8%	56.6%	-15.2%
<i>Quarterly dummies</i>			
II-2007	57.0%	60.0%	3.0%
III-2007	58.1%	56.7%	-1.4%
IV-2007	59.1%	57.0%	-2.1%
I-2008	58.4%	57.2%	-1.2%
II-2008	57.4%	58.1%	0.7%
III-2008	57.6%	61.1%	3.5%
IV-2008	56.4%	61.0%	4.6%
I-2009	56.5%	59.3%	2.8%
II-2009	56.5%	58.8%	2.2%
III-2009	56.3%	58.6%	2.3%
IV-2009	56.0%	58.2%	2.3%
I-2010	57.4%	57.9%	0.5%
II-2010	57.4%	57.6%	0.2%
III-2010	57.6%	57.6%	0.0%
IV-2010	57.1%	57.4%	0.3%
I-2011	57.4%	57.6%	0.2%
II-2011	57.5%	57.6%	0.1%
III-2011	57.2%	57.7%	0.5%
overall predicted probability of collateralization		57.6%	
fraction of collateralization loans in sample		51.7%	

6.3. Robustness of the results

Our study explores the *Ex-ante risk score* as one determinant of the use of collateral and its amount. As shown in Table A1 in the appendix, this score is generated using a list of simple rules made available by the bank to its loan officers for the loan assessing purpose. These rules have been employed at the bank for the whole sample period and our results so far show a solid relationship between this score and the incidence and degree of collateral. However, the bank has recently implemented a more sophisticated credit scoring system in some of its branches. We therefore perform a robustness test by replacing the *Ex-ante credit score* by with this *New ex-ante risk score*. Table 7 shows the results of our Probit (Regression 1 and 2) and Tobit (Regression 3 and 4) models. The *New ex-ante risk score* includes of several explanatory variables that are included in our model and a multicollinearity problem might thus exist. To avoid this problem, we include the *New ex-ante risk score* as well as its residual. The coefficients and the marginal effects are shown for Regression 1 and 2 where the *New ex-ante risk score* and the residual of the *New ex-ante risk score* are included, respectively. The coefficients are shown for Regression 3 and 4 with the *New ex-ante risk score* and the residual of the *New ex-ante risk score*, respectively. Except for the fact that the *New Ex-ante risk score* and its residual are not significant in the Tobit model, new model estimations leave the main result unchanged and the goodness fit of the model remains stable.

Table 7 Determinants of collateral, incidence and degree with new ex ante credit score, all loans

Panel A presents the coefficients as well as the marginal coefficients of Probit model where the New ex ante risk score or its residual is used in place of the *Ex ante risk score*. For each independent variable, the first row shows the coefficient (or the marginal coefficients) and the second row shows the z statistic. Panel B shows the results of Tobit regressions. The dependent variable is measured as the index of collateral to loan value ratio. In both panels, standard errors are heteroskedasticity robust and clustered by borrower. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Independent variable	Incidence of collateral (coefficients & marginal effects)				Degree of collateral(coefficients)	
	Regression 1		Regression 2		Regression 3	Regression 4
Constant	-7.33 *** -37.10		-8.75 *** -44.92		-10.23 *** -38.87	-10.34 *** -41.03
<i>Borrower characteristics</i>						
Ex-ante risk score _{new}	-0.03 *** -16.56	-0.01 *** -16.89			-0.002 -1.56	
Ex-ante risk score _{new, residual}			-0.03 *** -16.69	-0.01 *** -16.69		-0.002 -1.56
House owner _D	0.91 *** 37.50	0.35 *** 39.61	0.80 *** 33.73	0.31 *** 34.85	1.66 *** 42.99	1.65 *** 43.17
Age	0.04 *** 33.04	0.02 *** 33.10	0.05 *** 35.56	0.02 *** 35.56	0.06 *** 40.59	0.06 *** 41.36
<i>Bank-borrower relationship</i>						
Years with bank	0.12 *** 20.70	0.05 *** 20.89	0.07 *** 14.73	0.03 *** 14.73	0.14 *** 22.34	0.14 *** 23.11
Number of prior loans	0.05 *** 16.93	0.02 *** 17.26	0.05 *** 17.00	0.02 *** 16.99	0.02 *** 8.08	0.02 *** 8.08
Number of bank products	-0.61 *** -37.65	-0.24 *** -37.54	-0.66 *** -40.46	-0.26 *** -40.46	-0.72 *** -39.27	-0.73 *** -39.47
Other bank _D	-0.22 *** -5.12	-0.09 *** -5.07	-0.23 *** -5.39	-0.09 *** -5.36	-0.23 *** -4.00	-0.24 *** -4.02
Local borrower _D	0.02 0.42	0.01 0.41	0.01 0.23	0.00 0.23	0.15 ** 2.29	0.15 ** 2.28
<i>Economics conditions</i>						
Base rate	0.02 ** 2.19	0.01 ** 2.19	0.02 ** 2.06	0.01 ** 2.06	0.02 1.94	0.02 1.93
<i>Control variables</i>						
<i>Loan characteristics</i>						
Loan duration	0.02 *** 39.76	0.01 *** 39.88	0.02 *** 37.21	0.01 *** 37.21	0.02 *** 36.41	0.02 *** 37.17
Loan size	1.07 *** 55.98	0.42 *** 57.14	1.02 *** 57.69	0.40 *** 57.69	1.08 *** 64.31	1.08 *** 63.83
<i>Branch operation characteristics</i>						
Distance to head-quarter	-0.04 *** -3.63	-0.02 *** -3.65	0.03 ** -2.67	-0.01 ** -2.67	-0.10 *** -4.04	-0.10 *** -3.99
Main branch _D	0.17 *** 7.55	0.06 *** 7.53	0.18 *** 8.23	0.07 *** 8.23	0.21 *** 7.24	0.21 *** 7.28

<i>Regional characteristics</i>						
Provincial legal index	0.34 *** 17.80	0.13 *** 17.79	0.36 *** 18.45	0.14 *** 18.45	0.40 *** 14.70	0.40 *** 14.74
Municipality _b	-0.37 *** -7.33	-0.14 *** -7.88	-0.36 *** -7.25	-0.13 *** -7.77	-0.07 -1.06	-0.07 -1.06
<i>Quarterly dummies</i>						
II-2007	0.16 *** 5.09	0.06 *** 5.10	0.10 ** 3.23	0.04 *** 3.23	0.16 *** 3.37	0.16 *** 3.27
III-2007	0.10 *** 3.74	0.04 *** 3.76	0.00 -0.13	0.00 -0.13	-0.01 -0.22	-0.02 -0.42
IV-2007	0.06 ** 2.60	0.02 ** 2.62	-0.03 -1.39	-0.01 -1.39	-0.05 -1.65	-0.06 -1.87
I-2008	0.06 ** 3.18	0.02 *** 3.20	-0.02 -0.86	-0.01 -0.86	-0.04 -1.40	-0.05 -1.62
II-2008	0.10 *** 5.76	0.04 *** 5.78	0.04 * 2.15	0.01 ** 2.15	0.04 1.56	0.03 1.38
III-2008	0.17 *** 5.61	0.06 *** 5.62	0.10 *** 3.44	0.04 *** 3.44	0.14 *** 3.98	0.14 *** 3.86
IV-2008	0.19 *** 12.51	0.07 *** 12.56	0.12 *** 8.78	0.05 *** 8.78	0.14 *** 6.79	0.13 *** 6.64
I-2009	0.13 *** 9.85	0.05 *** 9.89	0.08 *** 5.83	0.03 *** 5.83	0.08 *** 4.15	0.07 *** 3.97
II-2009	0.11 *** 8.68	0.04 *** 8.71	0.06 *** 4.89	0.02 *** 4.89	0.06 *** 3.53	0.06 *** 3.34
III-2009	0.11 *** 9.07	0.04 *** 9.11	0.06 *** 5.26	0.02 *** 5.26	0.07 *** 4.24	0.07 *** 4.06
IV-2009	0.11 *** 9.91	0.04 *** 9.95	0.06 *** 5.95	0.02 *** 5.95	0.07 *** 4.48	0.06 *** 4.30
I-2010	0.05 *** 5.81	0.02 *** 5.84	0.01 1.54	0.01 1.54	0.04 *** 2.72	0.03 *** 2.52
II-2010	0.04 *** 5.39	0.02 *** 5.42	0.01 0.94	0.00 0.94	0.02 1.79	0.02 1.57
III-2010	0.04 *** 4.69	0.01 *** 4.72	0.00 0.28	0.00 0.28	0.02 1.40	0.01 1.19
IV-2010	0.04 *** 5.72	0.02 *** 5.75	0.01 1.19	0.00 1.19	0.02 ** 2.28	0.02 ** 2.07
I-2011	0.04 *** 5.14	0.01 *** 5.17	0.00 0.59	0.00 0.59	0.01 1.29	0.01 1.07
II-2011	0.03 *** 4.82	0.01 *** 4.85	0.00 0.29	0.00 0.29	0.02 1.52	0.01 1.30
III-2011	0.04 *** 6.13	0.02 *** 6.16	0.01 1.50	0.00 1.50	0.02 * 2.37	0.02 * 2.15
log likelihood	-8,897		-8,893		-43,300	-43,300
pseudo R ²	0.607		0.607		0.219	0.291
number of observations	32,655		32,655		32,655	32,655

7. Conclusions

In this study we identify the factors that influence the decision to secure a consumer loan in Vietnam. We focus our analysis on five main hypotheses regarding borrower quality, bank-borrower relationship and economic conditions. We test these hypotheses using a unique data set of loans originated by a large commercial bank in Vietnam between 2007 and 2011. Previous empirical research focuses on commercial loans in developed markets and shows that for these loans lenders require collateral for loans granted to borrowers with lower credit quality. The results in our study are based on a direct measure of credit risk as observed by the bank and confirm that the observed credit quality of the borrower is an important determinant of the use of collateral for consumer loans as well. In addition, we find that wealthier borrowers who are able to pledge collateral do so to benefit from low borrowing rates. We also find that the hold-up effect dominates the benefit of relationship lending in terms of a higher likelihood of collateral in new loans, especially for relatively small loans. However, the scope rather than scale of the borrower-lender relationship actually improves the terms of the loan contract as the usage of collateral decrease. Finally, we find that during crisis periods when uncertainty increases and lending resources are limited, collateralization also increases.

Overall, we find that both incidence and degree of collateralization are higher for consumer loans in Vietnam as a developing banking market compared to developed markets. Regarding determinants of collateral, our findings are in parts consistent with existing evidence from developed markets and for commercial loans. As a typical fact in developing markets the hold-up effect is particularly strong, especially for the small loans. If property right can be improved the borrower can make more flexible choices of pledging their asset, and thus reduce the hold-up problem.

8. Appendix

Table A1 Borrower characteristics included in the bank's ex-ante credit score

To calculate the ex ante risk score, all points are added up. A higher score indicates lower risk.

Characteristic	Subdivision	Points
Years in current employment/business	Unemployed or 0 years	0
	Less than 2 years but more than 0 years	5
	More than 2 years	10
Industry where the loan will be invested in	Transportation, Tourism, Store/Office renting,	0
	Service sector	
	Agriculture, Construction	5
	Other or consumer loan	10
Years of education	Less than 14 years or missing	0
	More than 14 and less than 16 years	5
	More than 16 years	10
Industry in which borrower is engaged	Unemployed	0
	Service sector	5
	Other	10
Monthly Income	No income	0
	Less than 7.000.000 VND (in Hanoi or HCM city) or less than 5.000.000 VND (in other provinces)	5
	More than 7.000.000 VND (in Hanoi or HCM city) or more than 5.000.000 VND (in other provinces)	10

Table A2 Variable sources and definitions

Unless otherwise indicated the variables are obtained from the Vietnamese bank which makes the loan. Subscript D indicates dummy variables.

Category	Variable	Definition
<i>Dependent variable</i>		
	Collateral _D	Dummy equal to 1 for collateralized loans, 0 otherwise.
	Collateral index	Index based on collateral to loan value ratio (CLR): 0 if unsecured; index=1 if 0<CLR<1; index=2 if 1<= CLR <1.5; index=3 if 1.5<=CLR<5; and index=4 if CLR>=5.
<i>Borrower characteristics</i>		
	Ex-ante risk score	Score assigned to borrower during initial screening process. Range from 0 to 50 with higher value indicating lower risk.
	Home owner _D	Dummy equal to 1 if the borrower is the owner of his current resident, 0 otherwise.
	Age	Age of borrower in years.
<i>Bank-borrower relationship</i>		
	Years with bank	Number of years since the first business contact (e.g. first loan or account) with the bank.
	Number of prior loans	Number of prior loans that the customer has had with the bank.
	Number of bank products	Number of different bank products that the customer uses with the bank. This includes saving accounts, debit accounts, prepaid cards and credit cards.
	Other bank _D	Dummy equal to 1 if the borrower indicated to the lender that she is holding accounts with another bank, 0 otherwise.
	Local borrower _D	Dummy equal to 1 if the borrower comes from the province where the branch locates, 0 otherwise.

(continued)

Economics condition

Base rate	Regulatory interest rate set by the Vietnamese central bank. Commercial banks are only allowed to lend at interest rates of 150% or less of this base rate. This base rate is adjusted over time, and being used by the State Bank of Vietnam as a monetary policy instrument. Source: This rate over time can be obtained at the official website of the State Bank of Vietnam: http://www.sbv.gov.vn/wps/portal/vn
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Control variables

<i>Loan characteristics</i>	
Loan duration	Loan duration in years.
Loan size	Natural Logarism of the size of the loan in million Vietnamese dong (VND).
<i>Branch operation characteristics</i>	
Distance to headquarter	Distance in km between branch and bank headquarters.
Main branch _D	Dummy equal to 1 if the bank classifies the branch, which makes the loan as one of the <i>main</i> branches in the province, 0 otherwise.
<i>Regional characteristics</i>	
Provincial legal index	An index measuring how transparent and supportive the provincial legal framework it towards enterprises. The original scale of the index ranges from 0 to 10 with higher values indicating better legal framework. Source: Provincial Competitiveness Index. PIC Survey instruments and methodology can be obtained at http://www.pcivietnam.org .
Municipality _D	Dummy equal to 1 if the branch is located in one of the 5 first class cities (or centrally governed municipalities) as defined by the Vietnamese government, 0 otherwise. Source: This information can be obtained at the official website of the Vietnamese government: http://www.chinhphu.vn

Table A3 Determinants of collateral: marginal coefficient

This table replicates the Probit regressions of Panel A in Table 5 but reports marginal coefficients in stead of coefficients. The dependent variable is a dummy equal to one for collateralized loans and zero otherwise. For each independent variable, the first row shows the marginal effect at the mean and the second row shows the p-value. Standard errors are heteroskedasticity robust and clustered by borrower. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	All loans	Small loans	Large loans	Short-term	Long-term loans
<i>Borrower characteristics</i>					
Ex-ante risk score	-0.016*** 0.001	-0.013*** 0.001	-0.005 *** 0.000	-0.011 *** 0.001	-0.003 *** 0.000
Home owner _D	0.312*** 0.009	0.293 *** 0.009	0.077 *** 0.009	0.267 *** 0.009	0.057 *** 0.008
Age	0.016*** 0.001	0.013 *** 0.001	0.005 *** 0.000	0.014 *** 0.001	0.002 *** 0.000
<i>Bank-borrower relationship</i>					
Years with bank	0.031*** 0.002	0.043 *** 0.002	-0.002 0.001	0.036 *** 0.002	0.001 *** 0.001
Number of prior loans	0.019*** 0.001	0.018 *** 0.002	0.004 *** 0.001	0.016 *** 0.001	0.002 *** 0.001
Number of bank products	-0.247*** 0.006	-0.241 *** 0.007	-0.044 *** 0.003	-0.244 *** 0.007	-0.027 ** 0.003
Other bank _D	-0.091*** 0.017	-0.079 *** 0.015	-0.023 ** 0.011	-0.064 *** 0.016	-0.016 *** 0.006
Local borrower _D	0.004 0.018	0.027 0.021	-0.010 0.007	0.015 0.020	0.001 ** 0.004

(continued)

<i>Economics conditions</i>					
Base rate	0.027*** 2.970	0.016 1.550	0.013 *** 2.570	0.014 1.560	0.005 1.500
<i>Control variables</i>					
<i>Loan characteristics</i>					
Loan duration	0.010*** 0.000	0.009 *** 0.000	0.003 *** 0.000	0.000 0.000	0.004 *** 0.000
Loan size	0.403*** 0.006	0.412 *** 0.010	0.183 *** 0.010	0.327 *** 0.007	0.042 *** 0.005
<i>Branch operation characteristics</i>					
Distance to head-quarter	0.000** 0.000	0.000 ** 0.000	0.000 0.000	0.000 0.000	0.000 0.000
Main branch _D	0.067*** 0.009	0.056 *** 0.009	0.017 *** 0.005	0.071 *** 0.009	0.001 *** 0.002
<i>Regional characteristics</i>					
Provincial legal index	0.120*** 0.008	0.111 *** 0.008	0.031 *** 0.004	0.079 *** 0.008	0.022 *** 0.003
Municipality _D	-0.152*** 0.017	-0.166 *** 0.024	-0.032 *** 0.007	-0.156 *** 0.024	-0.017 0.003
<i>Quarterly dummies</i>					
II-2007	0.030** 0.013	0.022 * 0.012	0.021 ** 0.008	0.023 * 0.012	0.002 0.003
III-2007	-0.014 0.010	-0.011 0.010	0.006 0.006	-0.010 0.010	-0.002 0.002
IV-2007	-0.021** 0.008	-0.015 * 0.008	0.007 0.005	-0.017 ** 0.008	-0.003 0.002
I-2008	-0.012 * 0.007	-0.013 * 0.007	0.014 *** 0.004	-0.013 * 0.007	-0.001 0.001
II-2008	0.007 0.007	-0.001 0.006	0.021 *** 0.004	0.003 0.006	0.001 0.001
III-2008	0.036** 0.013	0.023 ** 0.011	0.024 ** 0.008	0.024 ** 0.012	0.000 0.004
IV-2008	0.046*** 0.006	0.037 *** 0.005	0.026 *** 0.004	0.030 *** 0.005	***
I-2009	0.028*** 0.005	0.021 *** 0.005	0.021 *** 0.003	0.016 *** 0.005	0.009 0.002
II-2009	0.022*** 0.005	0.017 *** 0.005	0.017 *** 0.003	0.010 ** 0.005	***
III-2009	0.023*** 0.005	0.017 *** 0.005	0.017 *** 0.003	0.012 ** 0.004	0.008 *** 0.002
IV-2009	0.023*** 0.004	0.017 *** 0.004	0.016 *** 0.003	0.012 ** 0.004	0.007 * 0.002
I-2010	0.005 0.004	0.004 0.004	0.009 *** 0.002	0.001 0.004	0.002 ** 0.001
II-2010	0.002 0.003	0.001 0.003	0.008 *** 0.002	-0.002 0.003	0.001 0.001
III-2010	0.000 0.003	-0.001 0.003	0.007 *** 0.002	-0.003 0.003	0.001 0.001
IV-2010	0.003 0.003	0.000 0.003	0.008 *** 0.002	-0.001 0.003	0.001 0.001
I-2011	0.002 0.003	0.001 0.003	0.007 *** 0.002	-0.001 0.003	0.001 * 0.001
II-2011	0.001 0.003	-0.001 0.003	0.007 *** 0.002	-0.002 0.003	0.001 ** 0.001
III-2011	0.005* 0.003	0.003 0.003	0.007 *** 0.001	0.001 0.003	0.002 0.001
log likelihood	-8825.451	-5643.298	2807.7	-6085.6	-2115.1
pseudo R ²	60.98	59.71	52.18	56.78	61.46
number of observations	32655	21244	11411	21408	10717

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