

Menkhoff, Lukas; Neuberger, Doris; Rungruxsirivorn, Ornsiri

Conference Paper

Collateral and Lending to Rural Households in Emerging Markets

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Macroeconomic Problems of Asian Economies, No. G1-V1

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Menkhoff, Lukas; Neuberger, Doris; Rungruxsirivorn, Ornsiri (2010) : Collateral and Lending to Rural Households in Emerging Markets, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Macroeconomic Problems of Asian Economies, No. G1-V1, Verein für Socialpolitik, Frankfurt a. M.

This Version is available at:

<https://hdl.handle.net/10419/37313>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Collateral and Lending to Rural Households in Emerging Markets

by Lukas Menkhoff, Doris Neuberger and Ornsiri Rungruxsirivorn

Abstract

This paper examines the role of collateral in the rural credit market of an emerging country. The need for collateral is expected to be high but rural households usually lack adequate assets to pledge as collateral. How is this puzzle solved? Using data from Thailand, we find that indeed most loans are provided without any tangible assets as collateral. Lenders can enforce collateral-free loans through third party guarantees and borrower-lender relationships, but also through reducing loan size, reducing duration or increasing the interest rate. There is no significant impact of borrowers' wealth and default risk on the use of collateral.

JEL-Classification: G 21, O 16, O 17

Keywords: informal financial institutions, microfinance, relationship lending

February 12, 2010

We thank participants at several university seminars. Financial support by the German Research Foundation (DFG) is gratefully acknowledged.

Lukas Menkhoff, Ornsiri Rungruxsirivorn; Department of Economics, Leibniz Universitaet Hannover, Koenigsworther Platz 1, D-30167 Hannover, Germany; menkhoff@gf.uni-hannover.de, ornsiri@gf.uni-hannover.de; Doris Neuberger, Department of Economics, University of Rostock, Ulmenstr. 69, D-18057 Rostock, Germany, doris.neuberger@uni-rostock.de.

Collateral and Lending to Rural Households in Emerging Markets

1 Introduction

Collateral is a regular ingredient of risky lending. It serves to limit potential losses for lenders and serves as an incentive mechanism and commitment signal for borrowers. Because of these functions it plays an important role in loan markets. Accordingly collateral is part of many if not most (business) loan contracts in mature markets (Steijvers and Voordeckers, 2009). Due to opaque information and weak enforcement, the request for collateral is expected to be even higher in less developed markets (Hainz, 2003, Menkhoff et al., 2006). This high importance of collateral results into a problem for rural households in emerging markets as they are relatively poor: collateral requirements are expected to be particularly high for this group but their ability to provide collateral is comparatively low. How do borrowers and lenders get along with this problem?

In principle, there may be two possibilities: first, collateral requirements are similar to requirements in mature markets so that poor households who lack adequate assets to pledge as collateral will be credit-rationed; second, conventional collateral is not necessary and lenders can issue some credit without collateral. In the latter case, the follow-up question is then how can a lender enforce a collateral-free loan? Is it third party guarantees, pledged savings, other contractual features, close relationships or interpersonal trust that serve as collateral substitutes? As limited access to finance is constraining growth and welfare (Beck and Demirgüç-Kunt, 2008, 2008a) it seems important to learn about possible credit rationing induced by missing collateral and ways to overcome the threatening lack of collateral.

Despite the obvious relevance of lacking collateral for a very large share of the population in emerging countries, there is not much evidence available. Earlier studies documenting the use of collateral concentrate on mature markets. Studies on developing countries, however, are often narrow in their coverage, either with respect to target group, financial institutions or their information about borrowers and lending terms. In order to provide comprehensive evidence we have conducted a household survey in Northeastern Thailand in 2007. This survey covers 2,186 rural households from which we receive information about household, demographic and in particular financial details. The three provinces of our sample are selected in order to differ in economic conditions. Moreover,

Thailand's rural areas are served by various financial institutions (see Kaboski and Townsend, 2005, Siamwalla et al., 1990). All this provides welcome depth and diversity to our data set.

This data allows to empirically analyzing the above introduced “collateral puzzle” in emerging markets: first, we lay foundations by documenting the importance of collateral and, second, we analyze the determinants of collateral. Regarding the importance of collateral we find that only about 15% of the 1,671 loans in our sample are secured by various forms of collateral. Although there is some variation across household groups, this share is consistently small throughout. For example, “high” income households pledge collateral in 17.3% of cases, whereas low income households do this in 14.5% of cases. However, there are other marked differences as production loans are more often collateralized than consumption loans, with 15-25% versus 10%. Compared to the little reliance on collateral, the share of credit-constrained households is surprisingly low with 11%. This combined incidence of little use of collateral and small share of credit-constrained households indicates that lenders rely on other means of enforcing their interests beyond the reliance on collateral.

The consideration of these other means of enforcement is necessary for fully understanding the role of collateral and their consideration is possible due to the survey's construction. We do indeed find that collateral is significantly less often required if there is either a third party guarantee or a case of relationship lending. This finding seems to fit into recent literature emphasizing the importance of guarantees and relationship lending in less developed markets which are both means to overcome information and incentive problems. The use of collateral is also related to other loan terms where collateral obviously serves to reduce the lender's risk: more collateral is required for larger loans, for longer loan duration and for lower interest rates. This finding is also largely in line with earlier literature (see Section 2). As a third group of determinants we investigate household characteristics and possible default risk with little success. It is only better education that is related to less collateral requirements.

We are not aware that there is an earlier study on emerging markets where all these determinants of the use of collateral were considered within a unified approach. Closest in coverage is Ono and Uesugi (2009) for small firms in Japan where, however, collateral is very widely used and thus plays another role than in our case. Usually, studies rely on a subset of determinants, i.e. guarantees, relationship, loan term and household characteristics. Our study shows, however, that all of these groups of determinants are important in analyzing the use of collateral and thus should not be missed in empirical work.

The paper is organized in four more sections. Section 2 provides an overview of the theoretical and empirical literature which shapes expectations to be examined. Section 3 informs about the data used in this study and the characteristics of borrowers and lenders in the rural areas. In Section 4 we examine the use of collateral in the rural credit markets by descriptive statistics. The hypotheses on the determinants of collateral are tested by multivariate analyses in Section 5. Section 6 concludes.

2 Literature review

Our literature review aims for preparing expectations on the use of collateral in rural lending in emerging markets. We are thus selective in coverage. Section 2.1 addresses theoretical literature in order to derive hypotheses of interest, whereas Section 2.2 deals with respective empirical work in order to identify gaps in research.

2.1 Theoretical literature

The use of collateral has been mostly explained by theories of asymmetric information which show that collateralization reduces adverse selection and moral hazard. Collateralization thus serves as a means to reduce credit rationing (review in Coco, 2000). First, it induces a borrower to reveal his or her default risk, acting as a signaling device (Bester, 1985, Besanko and Thakor, 1987). Second, it provides the borrower with an incentive to exert effort and reveal truthfully the state of his project after having obtained the loan (Bester, 1987, 1994). Both arguments apply above all to outside collateral, where the lender has right of access to personal assets outside the firm.¹ The potential loss of personal assets makes a signal more credible and improves the incentive to repay the loan. By contrast, inside collateral, where assets inside the firm are pledged as collateral, serves to reduce conflicts of interest between multiple lenders by providing a priority of debt claims. If the borrower lacks inside and outside collateral, loans may be secured by third party guarantees. They help to reduce the lender's potential loss, but do not solve the moral hazard problem. If the third party is better able to monitor and control the borrower's actions than the lender is, the use of third party guarantees has some economic advantage. Accordingly, these so-called borrower-based theories (Jiménez et al., 2008) predict that the use of collateral varies across loans according to

¹ A personal guarantee represents a more general claim on personal wealth and places fewer restrictions on the guarantee's use of this wealth than the pledge of a specific personal asset (Avery et al. 1998, p.1026).

the characteristics of borrowers, loans, and bank-borrower relationships, which affect information asymmetries between both parties about the credit risk of the loan.

Further theories on the use of collateral reach beyond our objective. First, lender-based theories postulate that collateral serves to increase the lender's profit or expected return (Binswanger, 1982). Profits may increase due to a bank's market power (Hainz, 2003) or due to its information advantage over distant lenders in evaluating credit risk (Inderst and Mueller, 2007). As we do not observe local banking market structures, we do not directly test lender-based theories. Second, there are theories predicting the use of collateral due to legal variables and the efficiency of the legal system (La Porta et al., 1998). These theories require cross-country data and are thus also beyond our objective. Third, following the lazy bank hypothesis (Manove et al., 2001), high collateralization weakens the bank's incentive to evaluate the profitability of an investment project. Testing this theory requires time-series data which we do not have.

Collateral may be substituted by other mechanisms to reduce credit risk and informational asymmetry, such as strength of the lending relationship, loan maturity, loan size and covenants. The role of *relationship* strength in reducing problems of asymmetric information has been extensively discussed in the literature (for an overview see Boot, 2000). The more recent discussion focuses on differences between relationship lending and asset-based lending as two alternative lending technologies (Berger and Udell, 2006). Relationship lending relies on soft or private information about borrower risk obtained through a close bank-borrower relationship and involves the use of outside collateral. In contrast, asset-based lending, being more transactions oriented relies on hard or public information and uses the assets inside the firm as collateral (Brick and Palia, 2009).

As exactly such hard or public information is rare in rural areas of emerging markets, one expects that relationship lending with its preferred reliance on outside collateral is widespread. It follows that the discussion based on different consequences derived from the use of inside collateral (see Longhofer and Santos, 2000) versus outside collateral (see Boot and Thakor, 1994) is less relevant for our case. Potentially very relevant for the situation of an emerging country is, however, the proprietary information gained by the relationship lender. This information increases its *ex post* bargaining power to the detriment of the borrower (Sharpe, 1990, Rajan, 1992). Because the borrower is locked-in, collateral requirements may be positively related to the intensity of the lending relationship. Thus, collateral is the result of holdup. At the same time, it causes hold-up: since an asset can be pledged only once, and is costly to evaluate, switching to other banks would involve high costs.

Among loan terms, charging a higher *interest rate* is a standard measure to prepare against asymmetric information. Loan *duration* is another means to reduce asymmetric information problems. Shorter loan durations provide additional information and reduce the moral hazard problem. The shorter the loan duration the lower is the opportunity and incentive for the borrower to switch from low-risk to high-risk projects (so-called asset substitution problem). Short-term loans may also reduce the adverse selection problem by serving as signaling instruments. Thus, short-term loans and collateral are substitutes and loan duration is expected to be positively related to the use of collateral (Ortíz and Penas, 2008, Steijvers and Voordeckers, 2009).

Similarly, moral hazard can be reduced by reducing the loan *volume*, since a larger loan amount tends to increase the incentive for default. Larger loans tend to be riskier than smaller loans, since they increase firm leverage and thus default probability (Steijvers and Voordeckers, 2009). Moreover, the contracting costs of collateralization may be too high for small loans. Therefore, the use of collateral is expected to increase with loan size.

The literature has discussed further loan terms which, however, do not apply to our case of rural households. First, restrictive covenants are a contractual device to reduce moral hazard and adverse selection and may therefore be a substitute to collateral (for an overview see Steijvers and Voordeckers, 2009). However, they generally cannot be imposed on small businesses that do not have audited financial statements (Ortíz and Penas, 2008). Second, it has been argued that small and young firms tend to be more opaque than larger and older firms, because potential lenders have less information on their investment opportunities or managerial capabilities. Third, the legal form may affect the use of collateral, as for example credit risk tends to be higher in corporations than in unincorporated firms, which makes outside collateral particularly necessary there. Fourth, the use of collateral may depend on the type of loan sought. If there is a nonspecific credit use as in the case of a credit line, it may be more often secured by personal commitments than is the case of specific investments in machinery (Avery et al., 1998, Chakraborty and Hu, 2006). However, all these distinctions do not apply to our case of rural households.

In summary, lender-based theories on the use of collateral predict that borrower characteristics, loan terms and relationship will play a role. In the case of household loans, borrower characteristics affecting credit risk and information opacity are determined by demographic and socio-economic household variables. Loan terms should have the above derived effects. Regarding relationship or guarantees we expect some empirical relevance as

the costs of evaluating and utilizing inside collateral may be prohibitively high in the case of very small loans in underdeveloped markets.

2.2 Empirical literature

The empirical literature is largely in line with theoretical predictions (overview in Steijvers and Voordeckers, 2009, see also Degryse et al., 2009). Most studies find that borrower risk positively affects collateralization, with the incidence and degree of collateral tending to be highest for young and small firms. These findings support the risk reduction and monitoring role of collateral. Few studies also find evidence for the signaling role of collateral (Lehmann and Neuberger, 2001, Jiménez et al., 2006). The results about the relation between collateral and strength of the lending relationship are mixed; in the Japanese market for small firm lending, for example, collateral is used by related banks as an incentive for monitoring effort and thus is an alternative to guarantees (Ono and Uesugi, 2009). All studies that included loan duration found a positive influence on the use of collateral (Steijvers and Voordeckers, 2009).

The majority of studies focuses on mature US and European markets, while the evidence about the role of collateral in emerging markets is scarce. In transition countries, collateral plays a larger role than in developed ones, which might be explained by higher information asymmetries, a lower liquidation payoff, or lower banking market competition (Hainz, 2003). Interestingly, small firms in transition countries are less likely to pledge collateral than medium-sized firms. The important role for collateral is supported by La Porta et al. (2003) for Mexico and Menkhoff et al. (2006) for Thai commercial banks. As a side-aspect Thai banks' customers are likely to be locked-in as housebanks demand extra collateral. Recently, Liberti and Mian (2010) showed for a cross section of small business loans in 15 emerging countries that the cost of collateral in terms of the collateral amount and the specificity of assets pledged as collateral decline sharply with financial development. In more developed markets, firms may pledge a broader range of firm-specific assets as collateral (e.g. inventory instead of non-firm specific land), because better legal and creditor rights protection enables banks to seize and liquidate specialized forms of assets more efficiently.

All previously mentioned studies refer to business loans. Complementing this literature there are studies about microfinance institutions in developing countries, thus covering very small enterprises and households, i.e. an institutional environment close to our study (Conning and Udry, 2007, Hermes and Lensink, 2007). It is revealing that these studies do not focus on collateral but rather on other means, in particular guarantees, to make loans enforceable (e.g.

Besley and Coate, 1995, Fafchamps and Lund, 2003). Guarantees are embedded in the lending process in various forms, such as group lending where all group members serve as guarantors or cosigned lending where the specific cosigners serves as guarantors (Bond and Rai, 2008). Guarantees do not only shield the lender but they may even impact the behavior of the borrower (Klonner and Rai, 2010).

We learn from the empirical literature regarding the importance of collateral that there are two counterbalancing effects: collateral requirements are relatively higher in emerging than in mature markets but they may be very low for small firms and households because of an outright lack of useable collateral. Regarding collateral determinants, we learn that other means of enforcement (than collateral) are expected to be important and thus need to be considered; otherwise loan terms may play a role.

3 Data and description of borrowers and lenders

3.1 Data compilation

The data used in this analysis is based on a household survey conducted in 2007 in three provinces in the Northeast region of Thailand. The survey is part of the project “Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies” (FOR756), funded by the German Research Foundation (DFG). The Northeast region is particularly interesting for our study because it is often considered the poorest region with limited access to formal financial markets and with various types of informal lenders operating in this area.

A three stage sampling design was used to select the households. Within each of the three provinces, sub-districts were first randomly selected with probability proportional to population density. Then within each sub-district, two villages were chosen at random. Finally, within each village, 10 households are randomly selected. In total, the survey covers 2,186 households from 220 villages in 110 sub-districts of the three provinces. Details on sample selection of the survey are contained in Hardeweg et al. (2007).

The data set contains detailed information on household characteristics and their activities profile for the reference period May 2006 to April 2007. Our data set is particularly rich for financial data, including borrowing, savings, lending, credit denials, loan defaults and related credit contracts.

3.2 Description of borrowers

Table 1 presents the sample means and standard deviations for some of the selected variables for different income groups. Households are classified into three income groups: the low-income, the middle-income and the high-income².

There seems to be little difference between the income groups with respect to household demographic characteristics. The average family size is 3.98 persons or 2.83 in adult equivalent units³. The level of educational attainment for these households is low, as the average year of schooling for the head of household is only 5 years. However the proportion of households with more than secondary education is higher in the high-income group. The majority of households are farmers in all income groups. Nevertheless formal employment and non-farm self-employment are more important in the high-income group.

Households with different income levels tend to differ with regard to wealth variables. Whereas differences between the low-income and the middle-income group are in general not large, the high-income group, by contrast, differs significantly in income, consumption and assets. In particular, land ownership, consumption expenditures and assets are almost twice as much for this group as for the other two groups.

Regarding household borrowings, the data reveals that these households exhibit a high degree of borrowing, as more than 70 percent of the households have taken some loans during the reference period. Moreover having multiple loans contracted by one household is not uncommon, as the average number of loans per household is about 1.5 loans. Significant differences also occur between the income groups with respect to household borrowing. Whereas there are no big differences in the number of loans between the three groups, the amount of loans differs significantly. The high-income households borrow almost twice as much as the low and middle income households, suggesting that the high-income households can obtain loans with larger size than the low and middle-income households. When we consider loan amount relative to household income, we find that the low-income households have the largest loan-income ratio, and that the loan-income ratio tends to decrease with household income. As for the interest rate, the high income households pay a much lower interest rate as compared to the low and middle-income households. The incidences of credit

² A household is classified as low-income if household income per adult equivalent unit falls below the Northeast poverty line, which is 1,316 Baht/person/month. A household is classified as middle-income if income is above the poverty line but below twice the poverty line, and as high-income if income is above twice the poverty line.

³ We use the OECD adult equivalence scale which assigns the weight of 1.0 for the first adult member, 0.7 to each additional adult, and 0.5 to each child.

rationing⁴ and loan default are low for the three types of households and are not statistically different. However, poorer households are more likely to face credit denials.

In summary, we find that a large number of rural households have access to the credit markets and that the poor are not statistically different from the rich in terms of credit rationing. Both observations seem to be inconsistent with the expectation that the poor who lack adequate assets will be credit rationed. Later, we shall find that H3 is more consistent with the data; that is, the large quantity of loans is provided without land or any tangible assets as collateral, because there are substitutes.

3.3 Description of lenders

This section gives a brief overview of the financial institutions that operate in the rural area. The rural credit market in Thailand is characterized by a diverse set of lenders; some are formal, some are informal and some are considered in between. These lenders have characteristics that are distinct from one another. Instead of dividing these lenders into two major categories – the formal and informal sectors, we group these different lenders into seven categories which are described next. Ranked in descending order of formality, the first is *commercial banks and state owned banks (CB)*. Commercial banks and state owned banks have the largest asset size but play a minor role in the rural area. The second is the *Bank for Agriculture and Agricultural Cooperatives (BAAC)*. BAAC was established in 1966 as a government owned agricultural development bank. Most of the loans issued by BAAC are for agricultural production purposes. BAAC normally does not require collateral in the form of land ownership and tangible assets but rather in the form of guarantor and joint liability. Among all banks – public and private banks – BAAC has the largest number of branches. The third is the *million village funds (VF)*. This program was initiated in 2001 following in the spirit of other microfinance programs. It is also promoted as an attempt to improve access to credit for the poor. Under this program, a separate fund was established in every village and the government injected 1 million Baht into each fund. Loan application process is done by the village fund committee selected by village members. The forth is community-based organizations including cooperatives, rice banks, buffalo banks, savings and *credit groups (CRED)*. Typically these cooperatives and credit groups are organized and administered by local community. The fifth is some *policy loans (POLICY)* with a narrow focus and at subsidized lending conditions, mainly the “Student Loan Fund” and the “Poverty Eradication

⁴ Full rationing means that a loan is denied and partial rationing means that a smaller loan is supplied than requested.

Scheme”.⁵ The sixth is professional *money lenders (ML)*, including pawnshops and traders. Finally the seventh is *relatives and friends (RELA)*.

Table 2 describes the lending business of these lending institutions. It is clear that BAAC and VF are the most important source of credit in rural areas. Based on the survey data, 3,298 loans are made in 2006 - 2007, among which 43 percent are from VF and 23 percent are from BAAC. In terms of credit volume, BAAC dominates the rural credit markets due to its larger loan size while VF accounts for 23 percent of the total credit volume. Next in importance are CRED, ML and RELA. Interestingly, CB and POLICY play relatively smaller roles in the rural areas, both in terms of number of loans and credit volume.

The variation in loan characteristics across lenders is also remarkable. The formal financial institutions (CB and BAAC) provide larger loans whereas the more informal institutions provide loans with smaller size. Among informal lenders, ML provides relatively larger loans than the others. CB and BAAC tend to provide loans with longer duration than the others. There are great variations in interest rates within lending institutions and between lending institutions. Nevertheless some patterns can be derived. The groups of lending institutions that typically charge low interest rates are POLICY, RELA and VF. We note that while the average interest rate for RELA is higher than for VF, nearly 70 percent of these loans are given at zero interest. BAAC and CRED are also relatively “cheap” but more expensive than VF. Interestingly, the formal and the informal extremes, i.e. CB and ML, charge comparatively high interest rates.

These lending institutions seem to have their own market niche with respect to the purpose of borrowing. The more formal lending institutions lend disproportionately for production whereas the more informal ones lend more for consumption loans. Interestingly, ML and RELA seem to be used for shock-related borrowing⁶ more than other lending institutions.

⁵ The student loan fund and the poverty eradication scheme are treated as separate lending institution as these programs are quite distinct from other institutions in terms of the target groups, the usage of the loan, and the interest rate charged. The two programs provide 0-1% interest rate loans to households with income below 15,000 Baht/person/year (approximately US\$ 375/person/year). For the poverty eradication scheme, not all households and villages are eligible for the fund. Only low-income households (below 15,000 Baht/person/year) living in villages with the proportion of low-income households higher than 30% are eligible. With regard to the use of loan, the student loan fund provides loans for education only while the poverty eradication scheme gives loans for production purpose. They are managed by government offices which also assess eligibility, approve and monitor the loan.

⁶ Shock-related borrowings are loans that are taken to absorb income shocks caused by e.g. unplanned higher household expenditures, retirement, bad year for household’s business, higher input prices or investment costs, lower crop prices, bad weather, or illness.

The lending institutions are also likely to differ with respect to their lending technologies. We expect that the more formal lending institutions use more asset-based lending with hard information, while the informal ones, being closer to their customers, rely on relationship lending with soft information. Whether this can be seen in different collateral requirements will be examined below.

4 The use of collateral: descriptive statistics

4.1 The incidence and degree of collateral: aggregated view

In our sample, the incidence of collateral is surprisingly low, while the degree of collateral is high. Only 15% of loans are secured by collateral, but the mean collateral value is clearly above 100% of the loan volume. The degree of collateralization is much higher than that observed for business loans in previous studies (for an overview see Menkhoff et al., 2006). In a sample of loans to small, medium and large firms in Thailand the mean collateral value as percentage of loan volume was 53%, and in a sample of loans to SMEs in 15 emerging economies it was 54% (Liberti and Mian, 2010). However, collateral values much above 100% of the loan volume have been reported also by small firms⁷ in the UK (Cowling, 1999). Thus, the high collateral volume in our sample may be explained by the small size of the borrowing household-enterprises rather than by the environment of an emerging market. However, a comparison of reported collateral values may be biased because some samples are based on bank-internal data (e.g. Liberti and Mian, 2010, Menkhoff et al., 2006), while others (e.g. Cowling, 1999 and the present sample) are based on a survey of borrowers. The liquidation value of collateral is usually lower for the bank than for the borrower.

In the present sample, the dominating form of securing loans is third-party personal guarantees, which are pledged in 71% of the loan cases. Thus, although loans to rural households in Thailand are rarely collateralized by tangible assets, they are unsecured in only 14% of the cases. To examine whether this differs from the incidence of collateral and guarantees observed in other countries, we need data about collateral and guarantees for comparable loans to households or microenterprises. However, these are largely missing. To our knowledge, the only publicly available dataset that indicates whether and how each small business loan is secured by collateral or guarantees is the US National Survey of Small Business Finance (NSSBF). It is not well suited for our purpose, because it includes only nonagricultural firms with fewer than 500 employees and tends to underrepresent smaller and unincorporated firms (Avery et al., 1998). However, the US Survey of Consumer Finances

⁷ median number of employees: 16

(SCF), which includes information on businesses owned by households and underrepresents larger firms cannot be used for comparison with our data, because information on collateralized loans is provided only for the firm or household as a whole and not for individual loans. Therefore, we use information from previous studies based on the NSSBF survey and other surveys about the incidence of collateral and guarantees at loans to unincorporated firms, microenterprises, small firms and consumers. [Table 3](#) represents the results compared with those of the present sample. We find that the incidence of collateral is lower, but the probability of pledging personal guarantees is clearly higher for rural households in Thailand than for micro or small enterprises in mature markets. This seems to be due to a lack of collateral assets or lower costs of using personal guarantees instead.

All in all, we do not find support for the hypothesis that the incidence and degree of collateral is higher for loans to rural households in Thailand than for loans to micro and small enterprises in mature markets. To find out possible explanations, we have to take a disaggregated view.

4.2 The use of collateral: disaggregated views

The use of collateral may depend on the source of loan, household wealth, borrowing purpose and interest rate. We describe the use of collateral by different lending institutions, income groups, borrowing purposes and terms of credit contracts in order to draw some inferences about their relationships.

(a) Collateral by lending institution

The types of assets that are commonly accepted as collateral in the rural credit markets are land, durable goods, savings, future crop, and gold. We classify the types of collateral into three groups: land, asset substitutes and no collateral. [Table 4](#) shows the types of collateral accepted by different lending institutions. We see that all types of lending institutions issue some loans without any tangible assets as collateral. Even for the formal lending institutions such as CB and BAAC, nearly 65 percent of their loans is given without collateral⁸. The corresponding figures for the informal lenders are between 60 - 98 percent. Not all loans are collateral-free; in general formal lending institutions rely more on land collateral (about 35 percent of the loans from CB and BAAC) compared with the informal ones. Also, a

⁸ State owned banks engage in two types of lending. The first is the typical lending to persons who are required to provide land collateral or a third party guarantee, usually guarantee from a government official. The second involves special policy loans which are disbursed via the state owned banks. In the latter case, collateral requirements may be waived or substituted by a third party guarantee.

considerable number of loans from CRED (15 percent) and ML (47 percent) are backed by land or asset substitutes. The exception is RELA which typically requires no collateral. As informal lenders tend to have stronger relationships with their borrowers, these observations are consistent with hypothesis H3.4 that collateral is negatively related to the strength of the lending relationship.

Finally we find that the ratio of the value of collateral to loan size is very high overall. On average, the value of collateral is more than twice the value of loan. The proportion of more than fully collateralized loans is in the range of 50 percent to 100 percent. The high collateral ratio may be resulted from the low marketability of collateral, the difference between the lender and the borrower valuation of collateral, the restrictive collateral requirements by lenders, and the indivisibility in collateral.

(b) Collateral by income of household

Table 5 describes the types of collateral for different income groups. Collateral requirements overall show a small variation across income groups, much less than they did across lending institutions. There are no dramatic differences between the income groups with respect to the types of collateral and the collateral to loan ratio. This is partly due to the fact that many households have multiple loans from multiple sources at the same time. In our data, we find that several high-income households borrow from the informal lenders like CRED, ML and RELA. Nevertheless we note that the proportion of loans without any collateral is slightly higher for the low and the middle-income households compared with the high-income households. This is quite consistent with the finding that the poor pay higher interest rates than the rich. In other words, the poor do not have adequate assets to pledge as collateral; having no collateral security, the lender charges high rates on these loans to increase his interest income as a buffer against defaults.

(c) Collateral by borrowing purpose

We classify borrowing purposes into three categories: agricultural production, non-agricultural production and consumption. Table 6 shows the collateral requirements for different borrowing purposes. We first note that an equal number of loans are given for agricultural production and consumption whereas non-agricultural production loans account for 16 percent of total loans. Across all borrowing purposes, we see that a large share of loans is provided without tangible collateral. We also find that production loans are more likely to require land collateral, while consumption loans are less likely to require any collateral. This

may be because production loans are larger and have a longer duration than consumption loans, so that the expected benefits cover the costs of pledging collateral. However the collateral to loan amount ratio is, on average, higher for consumption loans than production loans. This is in line with our expectation that loans with non-specific purposes have to be secured with more collateral because they are riskier. Other patterns are observed for shock-related borrowings and normal borrowings; shock-related borrowings are more likely to require any collateral, especially in the form of other assets, probably because borrowers who urgently need a loan represent more risky borrowers. Interestingly we find that the ratio of collateral to loan values is slightly lower for shock-related borrowings. A possible explanation is that collateral is substituted by or complemented with personal guarantees.

(d) Collateral and loan terms

Table 7 shows the average term of credit contracts secured by different types of collateral. There seems to be a relationship between the types of collateral and loan terms. We find that conventional collateral is related to larger loan size, longer duration, and lower interest rate. With the exception of collateral-free loans, we find an inverse relationship between the marketability of collateral and interest rates. According to Table 7, the interest rates are lower on loans secured by land, the most marketable collateral, and higher on loans secured by asset substitutes. We also look at loan requirements, in particular, whether the borrower is a member of the lending institution and whether a third party guarantee is required to get a loan. We find that the proportion of members and third party guarantees are higher for collateral-free loans than loans backed by land or asset substitutes. This may indicate that guarantees and close bank-borrower relationships are substitutes to collateral (H.3.3 and H3.5).

5 The use of collateral: regressions

5.1 Baseline results

In this section, we analyze how lenders enforce collateral-free contracts and what factors affect lenders' decisions to give loans without any tangible collateral. We use the probit model to explain the choice between with and without collateral, and the ordered probit model to explain the choice between land collateral, asset substitutes and no collateral.

In our baseline regression, we exclude the lending institutions VF and POLICY from our analysis because the collateral policies of these institutions are institutionally fixed, i.e. loans are secured by third party guarantees. Alternatively we also exclude two more lending

institutions: CB, since the share of CB in rural credit is very small, and RELA, since relatives may provide loans based on altruism or trust but not based on economic lending criteria.

The analysis is performed at the loan level because we observe several households borrowing multiple loans with varying loan terms from different sources. We account for the sampling design in our analysis to get the precise estimates. Thus we incorporate the effect of stratification, clustering and sampling weights when computing the variance, standard error, and confidence intervals.

In all regressions, we control for loan term variables, household characteristics, default risk and borrower-lender relationship. Loan term variables comprise loan size, duration, interest rate, borrowing purpose, and whether a third party guarantee is required to obtain a loan.

Household characteristics include the gender of the household head, the age of the household head, number of household members (measured in terms of equivalence scale), number of children, years of education of the household head, household income (measured per number of adult equivalence), and the amount of savings in the corresponding lending institution.

Default risk is proxied by the value of loan defaults to total outstanding loans, the value of late repayments to total loans and the value of loans to assets. We proxy the borrower-lender relationship by three variables: whether the borrower is a member of the lending institution ('membership status'), whether the borrower has previously borrowed from the lender, and the number of lenders a borrower engages with to capture the exclusivity of the relationship. Finally a set of lender dummies is also included.

Results for the probit and ordered probit estimations are reported in [Table 8](#) and [Table 9](#) respectively. Column (1) of the table displays the results for the whole sample (CB, BAAC, CRED, ML, RELA); column (2) for excluding CB; and column (3) for excluding CB and RELA. Since the results are qualitatively the same, we do not discuss them separately.

Our regressions display interesting results with respect to the terms of credit contracts. Loan size and loan duration are positively related to both the incidence and the degree of collateral. This finding is consistent with previous studies (e.g. Degryse and Van Cayseele, 2000, Voordeckers and Steijvers, 2006). Thus, the use of collateral in loans to rural households may be low, because the loans are of small size and short duration.

We find that the provision of collateral is negatively related to the interest rate, that is conventional collateral is required for a loan with a low interest rate. This finding is consistent with the function of collateral in increasing the lender's expected return (Binswanger, 1982).

Most of the previous studies do not include the loan rate as independent variable in estimations of collateral, because it is assumed to be endogenous (for an overview see Lehmann et al., 2004, Table 2). Studies that take into account the jointness of interest rate and collateral decisions by simultaneous equation models find that collateral has a significant positive effect on the interest rate, but that the interest rate does not have any significant effect on the probability of collateral (Brick and Palia, 2007, Steijvers and Voordeckers, 2009).

Production loans are more likely to require collateral than consumption loans, which cannot only be explained by larger size or duration. Other explanations are that production loans involve higher uncertainty of repayment, or that the assets used as collateral are inputs in the production process, serving as inside collateral to provide priority of debt claims.

Our main interest is in the coefficient of the third party guarantee. The effect is significantly negative at the 1 percent level, suggesting that a loan guarantee acts as a collateral substitute and allows a lender in the rural credit market to enforce collateral-free loans.

We do not find a significant effect of savings on the use of collateral. Thus, savings do not act as a collateral substitute. A possible explanation is that some lending institutions do not accept savings (only ML, RELA and POLICY).

In general, the borrower-lender relationship appears to be negatively related to the incidence and degree of collateral. A very important element seems to be whether a borrower has ever borrowed from a lender. Having previously borrowed from a lender reduces the informational opaqueness and therefore the likelihood of pledging collateral. This result is consistent with most previous studies (e.g. Berger and Udell, 1995, Degryse and Van Cayseele, 2000, Chakraborty and Hu, 2006, Jiménez et al., 2006, Brick and Palia, 2007, Steijvers et al., 2008).⁹ Both membership status and number of lenders have expected signs but are not significant.

Regarding the effect of default risk, we do not find a significant effect of borrower's default risk on the use and the degree of collateral. Household wealth and other household characteristics appear to play no role for the provision of collateral, except the years of education of the household head, which shows a negative influence. The lack of wealth effect is not completely surprising. One may argue that household wealth should be positively related to the provision of collateral as wealthier households have enough assets to pledge as collateral. However household wealth may indicate lower default risk; thus poorer households

⁹ In contrast, no significant effect of relationship duration on collateral was found for business loans in Thailand (Menkhoff et al., 2006).

may be required to pledge more collateral. The two effects may outweigh each other. Another possible explanation is related to the role of informal lenders. The informal lenders serve to solve this problem for the poor by giving loans without any collateral requirement but using informational advantages, social enforcement and collateral substitutes. Thus for the informal lenders, wealth plays no role in the provision of collateral. Given the prevalence of the informal lenders in the Thai rural credit markets, the effect of wealth on the provision of collateral would become less important.

We find considerable differences between lenders with respect to their collateral requirements. As expected, CRED, ML and RELA are more likely to give loans without any collateral than BAAC. This is inconsistent with the lender-based theory of collateral (Inderst and Mueller, 2007)¹⁰, but in line with the hypothesis that the informal lenders have informational advantages over the formal lenders by closer relationships and therefore do not need collateral as a substitute. Testing for equality of coefficients on these dummies, we find that RELA is most likely to offer collateral-free loans, followed by ML, CRED and CB. Surprisingly our results show that CB requires less collateral than BAAC. This result is possibly driven by some special policy loans which are disbursed via the state banks. These policy loans usually require no land or asset substitutes as collateral.

5.2 Robustness tests

This section tackles several possible concerns with the baseline results. The first robustness test concerns the possible endogeneity problem. There may be an endogeneity problem as collateral pledging, interest rate charged on a loan, loan size and maturity may be jointly and endogenously determined, which may bias our results. To take into account the possible endogeneity of several loan contract features, one needs to use the simultaneous equation approach with well-identified instrumental variables. However it is difficult to find such instruments that would not be related to collateral pledging. Alternatively we check the robustness of our results by estimating the reduced form equations and comparing that the results when loan rate, loan size and duration are moved into and out of each regression. Results reported in [Table 10](#) show that the parameter estimates do not differ significantly between these models, which suggest that endogeneity is not important¹¹.

¹⁰ Evidence consistent with this theory has been found by Jiménez et al. (2008) for Spanish banks.

¹¹ Table 10-12 only report the robustness test using all loans from CB, BAAC, CRED, ML and RELA. Similar robustness tests are undertaken when excluding loans from CB and RELA and when estimating by ordered probit model but are not reported here. In summary, parameter estimates do not differ significantly when dropping the possible endogenous variables from the regressions.

Second, we evaluate the robustness of our results with respect to the types of loans. Results from the baseline regression show that production loans are more likely to require collateral than consumption loans. We are interested in testing whether the effects of other variables remain unchanged when we split the sample into production and consumption loans, or whether the main results are largely driven by a particular type of loan. [Table 11](#) reports the regression results for a sub-sample of production loans (column 1) and consumption loans (column 2). The estimation results for both sub-samples are in line with the findings when we use the pooled sample. Most coefficient estimates have the same signs and significance. The null hypotheses of equal coefficients are rejected at 5 percent level, suggesting that the effects of other variables do not differ between production and consumption loans.

Our third robustness test concerns the exclusion of the possible interaction effects between the different tools that may be used as collateral substitutes and the creditworthiness of the borrower. Inconsistency in empirical results on collateral may be originated from not incorporating these interaction effects into the estimation (Steijvers and Voordeckers, 2009). For example, relationship duration may reduce the likelihood of collateral pledging for low credit quality borrowers but have no significant impact for higher credit quality borrowers. To test the robustness of our main findings, we add the interaction terms between the different collateral substitutes and the creditworthiness of the borrower. We proxy for the creditworthiness of a borrower using the variable `DEFAULT`, which takes the value of one if a borrower did not have a loan default or a late repayment, and zero otherwise. Results reported in [Table 12](#) indicate that the interaction terms are not significant and that the effects of the critical variables do not change after incorporating the interaction terms.

6 Conclusions

This paper examines the use of collateral in the rural credit markets of emerging countries, i.e. this research targets at a large fraction of world-wide population. Collateral is an important instrument for formal lending institutions. In general, collateral serves to limit potential losses to the lenders in case of loan defaults and reduces borrowers' incentives to default. Due to opaque information and weak enforcement, the incidence of collateral is expected to be even higher in developing markets. This high importance of collateral results into a problem for poor households in developing countries: collateral requirements are expected to be particularly high for this group but their ability to provide collateral is comparatively low. How do borrowers and lenders deal with this collateral puzzle?

Our empirical examination yields two main findings. First, in describing the use of collateral, we find that conventional collateral is indeed rarely used in the rural credit markets and that most loans are provided without any tangible assets as collateral. Remarkably, the lack of assets does not seem to exclude the poor from credit access, because they do not have a higher probability of credit rationing than the rich. Thus, the puzzle is “solved” by creating other means of credit enforcement than by relying on collateral.

Our second main finding reveals determinants of the use of collateral: lenders in the rural credit markets can enforce collateral-free loans through third party guarantees and the borrower-lender relationship. In particular, we find that borrowers who are previous customers of the lenders are less likely to pledge any assets as collateral. Third party guarantees and relationships with informal lenders significantly reduce the pledging of collateral. Moreover, collateral is also substituted by reducing loan size and duration and increasing the interest rate. Our results do not show a significant impact of the borrower’s wealth, savings and default risk on the use of collateral. Thus, the use of collateral can be substituted by appropriate loan terms, whereas borrower characteristics are less important. The dominant means of loan enforcement, however, is reliance on guarantees and relationship which both seem to replace collateral in lending to rural households in emerging markets.

References

- Avery, R.B., Bostic, R. and K. Samolyk (1998), The Role of Personal Wealth in Small Business Finance, *Journal of Banking and Finance*, 22, 1019-1061.
- Beck, T. and A. Demirgüç-Kunt (2008), Access to Finance: An Unfinished Agenda, *World Bank Economic Review*, 22:3, 383-396.
- Beck, T. and A. Demirgüç-Kunt (2008a), Small and Medium-size Enterprises: Access to Finance as a Growth Constraint, *Journal of Banking and Finance*, 30, 2931-2943.
- Berger, A.N., Espinosa-Vega, M.A., Frame, W.S. and N.H. Miller (2007), Why Do Borrowers Pledge Collateral? New Empirical Evidence on the Role of Asymmetric Information, Federal Reserve Bank of Atlanta, Working Paper 2006-29a.
- Berger, A.N. and G.F. Udell (1990), Collateral, Loan Quality, and Bank Risk, *Journal of Monetary Economics*, 25, 21-42.
- Berger, A.N. and G.F. Udell (1995), Relationship Lending and Lines of Credit in Small Firm Finance, *Journal of Business*, 68, 351-381.
- Berger, A.N. and G.F. Udell (2006), A More Complete Conceptual Framework for SME Finance, *Journal of Banking and Finance*, 30, 2945-2968.
- Besley, Timothy and Stephen Coate (1995), Group Lending, Repayment Incentives and Social Collateral, *Journal of Development Economics*, 46, 1-18.
- Besanko, D. and A. V. Thakor (1987), Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets, *International Economic Review*, 28, 671-690.
- Bester, H. (1985), Screening vs. Rationing in Credit Markets with Imperfect Information, *American Economic Review*, 75, 850-855.
- Bester, H. (1987), The Role of Collateral in Credit Markets with Imperfect Information, *European Economic Review*, 31, 887-899.
- Bester, H. (1994), The Role of Collateral in a Model of Debt Renegotiation, *Journal of Money, Credit, and Banking*, 26, 72-86.
- Binswanger, H. P. (1982), Risk Aversion, Collateral Requirements and the Markets for Credit and Insurance in Rural Areas, in: P. Hazell, C. Pomarecla and A. Valdes (eds.), *Crop Insurance for Agricultural Development: Issues and Experiences*, Baltimore, MD: Johns Hopkins University Press.
- Bond, P. and A.S. Rai (2008), Cosigned or Group Loans, *Journal of Development Economics*, 85, 58-80.

- Boot, A.W.A. (2000), Relationship Banking: What Do We Know?, *Journal of Financial Intermediation*, 9, 7-25.
- Boot, A.W.A. and A.V. Thakor (1994), Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game, *International Economic Review*, 35, 899-920.
- Brick, I.E. and D. Palia (2007), Evidence of Jointness in the Terms of Relationship Lending, *Journal of Financial Intermediation*, 16, 452-476.
- Calgagnini, G., Farabullini, F. and G. Giombini (2009), Loans, Interest Rates and Guarantees: Is There a Link?, Università degli Studi di Urbino, WP-EMS # 2009/04.
- Chakraborty, A. and C.X. Hu (2006), Lending Relationships in Line-of-credit and Non-line of-credit Loans: Evidence from Collateral Use in Small Business, *Journal of Financial Intermediation*, 15, 86-107.
- Coco, G. (2000), On the Use of Collateral, *Journal of Economic Surveys*, 14, 191-214.
- Conning, J. and C. Udry (2007), Rural Financial Markets in Developing Countries, in: Robert E. Evenson and Prabhu Pingali (eds.), *The Handbook of Agricultural Economics*, Vol.3, 2857-2910.
- Cowling, M. (1999), The Incidence of Loan Collateralization in Small Business Lending Contracts: Evidence from the UK, *Applied Economics Letters*, 6, 291-293.
- Degryse, H., Kim, M. and S. Ongena (2009), *Microeconometrics of Banking*, Oxford et al.: Oxford University Press.
- Degryse, H. and P. Van Cayseele, (2000), Relationship Lending within a Bank-based System: Evidence from European Small Business Data, *Journal of Financial Intermediation*, 9, 90-109.
- Elsas, R. and J.P. Krahnen (2000), Collateral, Default Risk, and Relationship Lending: An Empirical Study on Financial Contracting, CFS Working Paper No. 1999/13, Center for Financial Studies, University of Frankfurt, revised version, November 25, 2000.
- Fafchamps, M. and S. Lund (2003), Risk-Sharing Networks in Rural Philippines, *Journal of Development Economics*, 71, 261-287.
- Hainz, C. (2003), Bank Competition and Credit Markets in Transition Economies, *Journal of Comparative Economics*, 31, 223-245.
- Hardeweg, B., Praneetvatakulb, S., Phung Duc, T. and H. Waibel (2007), Sampling for Vulnerability to Poverty: Cost Effectiveness versus Precision, Conference on International Agricultural Research for Development.
- Hermes, N. and R. Lensink (2007), The Empirics of Microfinance: What Do We Know?, *Economic Journal*, 117, F1-F10.

- Inderst, R. and H. M. Mueller (2007), A Lender-based Theory of Collateral, *Journal of Financial Economics*, 84, 826-859.
- Jiménez, G., Salas-Fumás, V. and J. Saurina (2008), Organizational Distance and Use of Collateral for Business Loans, Documentos de Trabajo No. 0816, Banca de España,
- Jiménez, G., Salas, V. and J. Saurina (2006), Determinants of Collateral, *Journal of Financial Economics*, 81, 255–282.
- Kaboski, J.P. and R.M. Townsend (2005), Policies and Impact: An Analysis of Village-Level Microfinance Institutions, *Journal of the European Economic Association*, 3:1, 1-50.
- KfW (2007), Unternehmensbefragung 2007, KfW Bankengruppe, Frankfurt/Main, available at:
http://www.kfw.de/DE_Home/Kreditverbriefung/Deutscher_Verbriefungsmarkt/Mittelstand52/Pdf_Dokumente_Mittelstands_Clos/Ubef2007_lang-D.pdf.
- Klonner, S. and A.S. Rai (2010), Cosigners as Collateral, *Journal of Development Economics*, forthcoming.
- La Porta, R., López-de-Silanes, F., Shleifer, A. and R.W. Vishny (1998), Law and Finance, *Journal of Political Economy*, 106, 1113-1155.
- La Porta, R., López-de-Silanes, F. and G. Zamarripa (2003), Related Lending, *Quarterly Journal of Economics*, 118, 231-268.
- Lehmann, E. and D. Neuberger (2001), Do Lending Relationships Matter? Evidence from Bank Survey Data in Germany, *Journal of Economic Behavior and Organization*, 45, 339-359.
- Lehmann, E., Neuberger, D. and S. Rähke (2004), Lending to Small and Medium-sized Firms: Is there an East-West Gap in Germany?, *Small Business Economics*, 23, 23-39.
- Liberti, J. and A. Mian (2010), Collateral Spread and Financial Development, *Journal of Finance*, 65, 147-177.
- Longhofer, D. and J.A.C. Santos (2000), The Importance of Bank Seniority for Relationship Lending, *Journal of Financial Intermediation*, 9, 57-89.
- Manove, M., Padilla, A.J. and M. Pagano (2001), Collateral versus Project Screening: A Model of Lazy Banks, *Rand Journal of Economics*, 32, 726-744.
- Menkhoff, L., Neuberger, D. and C. Suwanaporn (2006), Collateral-based Lending in Emerging Markets: Evidence from Thailand, *Journal of Banking and Finance*, 30, 1-21.
- Neuberger, D. and S. Rähke (2009), Microenterprises and Multiple Bank Relationships: The Case of Professionals, *Small Business Economics*, 32:2, 207-229.

- Ono, A. and I. Uesugi (2009), The Role of Collateral and Personal Guarantees in Relationship Lending: Evidence from Japan's SME Loan market, *Journal of Money, Credit and Banking*, 41, 935-960.
- Ortiz-Molina, H. and M. Penas (2008), Lending to Small Businesses: The Role of Loan Maturity in Addressing Information Problems, *Small Business Economics*, 30, 36-383.
- Pal, S. (2002), Household Sectoral Choice and Effective Demand for Rural Credit in India, *Applied Economics*, 34, 1743-1755.
- Pozzolo, A. F. (2004), The Role of Guarantees in Bank Lending, Banca d'Italia, Temi di Discussione Number 528.
- Rajan, R.G. (1992), Insiders and Outsiders: The Choice Between Informed and Arm's-length Debt, *Journal of Finance*, 47, 1367-1400.
- Sharpe, S.A. (1990), Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships, *Journal of Finance*, 45, 1069-1087.
- Siamwalla, Ammar, Chirmsak Pinthong, Nipon Poapongsakorn, Ploenpit Satsanguan, Prayong Nettayarak, Wanrak Mingmaneeakin and Yuavares Tubpun (1990), The Thai Rural Credit System: Public Subsidies, Private Information, and Segmented Markets, *World Bank Economic Review*, 4:3, 271-295.
- Steijvers, T. and W. Voordeckers (2009), Collateral and Credit Rationing: A Review of Recent Empirical Studies as a Guide for Future Research, *Journal of Economic Surveys*, forthcoming.
- Steijvers, T., Voordeckers, W. and K. Vanhoof (2008), Collateral, Relationship Lending and Family Firms, *Small Business Economics*, forthcoming.
- Voordeckers, W. and T. Steijvers (2006), Business Collateral and Personal Commitments in SME Lending, *Journal of Banking and Finance*, 30, 3067-3086.

Table 1: Summary Statistics of Key Variables of Sample Households

	<i>Low income</i> (<i>n</i> = 936)		<i>Middle income</i> (<i>n</i> = 587)		<i>High income</i> (<i>n</i> = 663)	
	Mean or fraction	Std. dev.	Mean or fraction	Std. dev.	Mean or fraction	Std. dev.
Demographics						
Female headed household	0.28	0.01	0.28	0.02	0.23	0.02
Dummy for marital status, married	0.77	0.01	0.77	0.02	0.80	0.02
Age of household head	55.43	0.47	55.30	0.67	52.95	0.51
Years of education of head	4.58	0.06	4.67	0.08	5.77	0.14
Equivalence scale	2.81	0.03	2.97	0.05	2.73	0.04
Household size	3.98	0.06	4.21	0.07	3.77	0.07
Number of children	1.43	0.04	1.38	0.05	1.05	0.04
Occupation						
Farmer	0.66	0.02	0.62	0.02	0.55	0.02
Informal worker	0.08	0.01	0.10	0.01	0.08	0.01
Formal worker	0.02	0.00	0.03	0.01	0.06	0.01
Government official	0.01	0.00	0.03	0.01	0.09	0.01
Business owner	0.05	0.01	0.06	0.01	0.13	0.01
Economically inactive	0.18	0.01	0.17	0.02	0.09	0.01
Wealth						
Area of owned land	1.61	0.09	2.11	0.13	2.47	0.19
Income	8,184	1,862	67,198	1,198	222,742	14,847
Income per equivalence scale	2,761	691	22,603	188	85,924	5,645
Consumption expenditures	64,930	2,393	68,709	2,281	106,742	5,460
Food	25,441	883	26,794	1,041	35,204	1,589
Non-food	39,489	1,794	41,915	1,653	71,538	4,666
Total assets	666,307	31,473	893,108	66,895	1,611,767	107,132
Savings	9,836	1,394	12,209	1,221	43,592	5,534
Livestock and stored crops	23,988	1,192	29,846	1,687	46,221	4,063
Household durable goods	160,117	13,124	158,755	8,146	301,382	18,458
Land and buildings	472,366	21,513	692,297	66,165	1,220,573	95,454
Borrowing						
Dummy for borrowing	0.75	0.02	0.72	0.02	0.70	0.02
Number of loans	1.61	0.07	1.44	0.07	1.44	0.07
Volume of loans	43,811	3,032	39,231	3,493	71,458	6,353
Interest rate	17.26	5.33	11.89	1.28	10.70	1.50
Weighted average interest rate	9.97	2.45	8.26	1.10	7.24	1.49
Credit Access						
Dummy for credit rationing	0.11	0.01	0.09	0.01	0.08	0.01
Full rationing	0.07	0.01	0.05	0.01	0.04	0.01
Partial rationing	0.05	0.01	0.04	0.01	0.04	0.01
Dummy for loan default	0.03	0.01	0.03	0.01	0.03	0.01
Dummy for late repayment	0.12	0.01	0.11	0.01	0.08	0.01
Value of loan defaults: total loans	0.02	0.00	0.02	0.00	0.02	0.00
Value of late repayments: total loans	0.07	0.01	0.06	0.01	0.04	0.01

Note:

1) Land area is measured in hectare.

2) All other currency variables are in Thai Baht.

Table 2: Loan Characteristics by Lending Institution

<i>Loan characteristics</i>		<i>CB</i>	<i>BAAC</i>	<i>VF</i>	<i>CRED</i>	<i>POLICY</i>	<i>ML</i>	<i>RELA</i>
No. borrowing households		57	569	1,076	336	147	194	192
% of all borrowing households		3.6%	35.8%	67.8%	21.2%	9.3%	12.2%	12.1%
No. loan items		61	757	1,427	436	165	227	225
% of total loans items		1.8%	23.0%	43.3%	13.2%	5.0%	6.9%	6.8%
Total credit value (mil Baht)		6.4	38.6	23.3	16.6	1.8	9.3	6.6
% of total credit volume		6.2%	37.6%	22.7%	16.2%	1.7%	9.1%	6.4%
Loan size (Baht)								
	Mean	104,705	51,043	16,345	38,114	10,823	41,135	29,303
	Std. dev	136,776.7	58,356.0	9,366.6	91,127.6	32,849.6	75,704.7	58,063.7
Loan duration (years)								
	Mean	3.8	2.1	1.0	1.4	2.2	1.3	1.2
	Std. dev	5.4	2.8	0.4	1.4	3.2	1.4	1.6
Interest rate (%)								
	Mean	22.9%	9.5%	6.3%	11.1%	3.1%	55.0%	10.6%
	Std. dev	27.03%	12.45%	7.49%	14.56%	6.62%	75.16%	29.80%
Weighted ave interest rate (%)								
	Mean	21.4%	9.6%	6.1%	11.3%	3.9%	48.2%	9.0%
	Std. dev	23.7%	11.2%	6.8%	11.4%	6.2%	66.0%	26.8%
Percentage of interest-free loans								
	% of loan items	0.0%	1.1%	0.4%	6.2%	53.3%	2.6%	67.6%
	% of credit volume	0.0%	0.7%	0.2%	1.1%	41.2%	1.5%	54.4%
Borrowing purpose (%)								
	Farm production	21.3%	51.9%	44.9%	38.3%	37.6%	24.7%	24.4%
	Non-farm production	37.7%	18.4%	15.5%	13.1%	10.9%	15.0%	20.0%
	Consumption	39.3%	28.5%	38.5%	47.2%	50.9%	59.0%	55.1%
Shock related borrowing (%)		9.8%	6.9%	6.5%	7.1%	6.7%	14.1%	23.6%

Table 3: The Incidence of Collateral and Guarantees in Small Business and Consumer loans

<i>Sample</i>	<i>Loan type</i>	<i>Percentage of loans secured by collateral and guarantees</i>			<i>Percentage of unsecured loans</i>
		Business and personal collateral	Personal guarantee	Total	
US NSSBF 1993: 4,637 small firms (< 500 empl.) (Avery et al., 1998)	Total loans	without guarantee: 49.5 with guarantee: 30.0	without collateral: 10.9 with collateral: 30.0	90.4	9.6
	Loans to unincorporated firms:				
	- Lines of credit	without guarantee: 10.3 with guarantee: 7.4	without collateral: 31.7 with collateral: 7.4	49.4	50.6
	- Mortgages	without guarantee: 34.6 with guarantee: 23.2	without collateral: 15.9 with collateral: 23.2	73.7	26.3
	- Equipment loans	-	without collateral: 31.4	-	-
Italy 2005: 300,000 firms, sole proprietorships, consumer households (Calgagnini et al., 2009)	Loans to all customers	42.7	15.7	58.4	41.6
	Loans to firms	32.2	23.6	55.8	44.2
	Loans to sole proprietorships	45.4	28.0	73.4	26.6
	Loans to consumer households (mostly mortgage loans)	72.6	5.4	78.0	22.0
Germany 2002: 230 professionals (Neuberger and R��thke, 2009)	Investment loans	Real estate: 63.0 Other assets: 20.0	20.0	84.0	16.0
Belgium: 248 small firms (mean number of empl.: 40) (Voordeckers and Steijvers, 2006)	Total loans	Business collateral: 57.26	Personal collateral and guarantees: 30.34	87.6	12.4
Thailand 2006-2007: 2,186 rural households (present study)	Total loans	15.0	71.0	86.0	14.0
	Agricultural production loans	Land: 14.7 Other assets: 0.7			
	Non-agricultural production loans	Land: 19.8 Other assets: 4.9			
	Consumption loans	Land: 8.2 Other assets: 2.2			

Table 4: Collateral by Lending Institution

<i>Type of collateral</i>	<i>CB</i>	<i>BAAC</i>	<i>VF</i>	<i>CRED</i>	<i>POLICY</i>	<i>ML</i>	<i>RELA</i>
Percentage of loans							
Land	27.9%	36.7%	0.4%	12.8%	0.6%	27.7%	5.8%
Other assets	6.6%	1.1%	1.0%	3.4%	0.6%	9.4%	1.3%
None	65.6%	62.3%	98.6%	83.7%	98.8%	62.9%	92.8%
Mean value of collateral to loan size							
Land	2.89	4.32	2.01	5.57	1.12	4.56	5.32
Other assets	27.19	1.03	1.02	1.06	6.58	2.09	1.00
None	0	0	0	0	0	0	0
Median value of collateral to loan size							
Land	1.75	2.65	1.94	3.17	1.12	3.00	4.90
Other assets	3.50	1.07	0.05	0.50	6.58	1.18	1.00
None	0	0	0	0	0	0	0
Percentage of more than fully collateralized loans							
Land	76.5%	84.8%	66.7%	96.4%	100.0%	85.5%	92.3%
Other assets	100.0%	50.0%	21.4%	26.7%	100.0%	57.1%	0.0%
None	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 5: Collateral by Income Group

<i>Type of collateral</i>	<i>Low income</i>	<i>Middle income</i>	<i>High income</i>
Percentage of loans			
Land	12.6%	11.8%	15.0%
Other assets	1.9%	1.9%	2.3%
None	85.4%	86.3%	82.7%
Mean value of collateral to loan size			
Land	4.22	4.94	4.42
Other assets	1.35	8.19	3.85
None	0	0	0
Median value of collateral to loan size			
Land	2.50	3.00	3.07
Other assets	0.70	1.58	1.00
None	0	0	0
Percentage of more than fully collateralized loans			
Land	83.7%	83.8%	90.8%
Other assets	34.5%	62.5%	40.9%
None	0.0%	0.0%	0.0%

Table 6: Collateral by Borrowing Purpose

<i>Type of Collateral</i>	<i>Borrowing purpose</i>			<i>Shock-related borrowing</i>	
	Agricultural production	Non-agricultural production	Consumption	No	Yes
Percentage of loans					
Land	14.7%	19.8%	8.2%	13.0%	13.7%
Other assets	0.7%	4.9%	2.2%	1.9%	3.2%
None	84.6%	75.4%	89.6%	85.0%	83.1%
Mean value of collateral to loan size					
Land	4.58	3.91	4.96	4.52	3.71
Other assets	0.87	1.75	6.68	4.09	1.95
None	0	0	0	0	0
Median value of collateral to loan size					
Land	3.00	2.50	3.08	2.86	2.63
Other assets	0.97	1.08	1.00	1.00	1.50
None	0	0	0	0	0
Percentage of more than fully collateralized loans					
Land	88.2%	85.8%	81.7%	86.8%	78.9%
Other assets	30.0%	50.0%	43.3%	37.9%	77.8%
None	0.0%	0.0%	0.0%	0.0%	0.0%

Table 7: Loan Terms by Type of Collateral

<i>Type of collateral</i>	<i>Loan size</i>	<i>Loan duration</i>	<i>Interest rate</i>	<i>consumption loans</i>	<i>required membership</i>	<i>third party guarantee</i>	<i>ever borrowed</i>
Land	77,563	2.98	13.08	25.29%	70.30%	54.76%	65.89%
Other assets	44,522	1.71	24.30	44.78%	43.28%	25.37%	55.22%
None	23,604	1.21	10.78	42.83%	80.32%	85.37%	80.57%

Table 8: Determinants of the Use of Collateral – Probit Model

	(1)	(2)	(3)
Loan terms			
Loan size	2.74e-06** (4.29)	2.63e-06** (3.76)	2.94e-06** (3.52)
Loan duration	0.1183** (6.24)	0.1239** (5.99)	0.1369** (5.83)
Interest rate	-0.0039** (-2.19)	-0.0037** (-2.15)	-0.0046** (-2.35)
Agricultural production loan	0.1966* (1.90)	0.1703 (1.60)	0.2085* (1.89)
Non-agricultural production loan	0.4573** (3.67)	0.4429** (3.57)	0.5132** (3.81)
Third party guarantee requirement	-1.5629** (-9.24)	-1.6000** (-9.08)	-1.5997** (-9.00)
Household characteristics			
Female headed household	0.0543 (0.49)	0.0779 (0.71)	0.0213 (0.17)
Age of household head	-0.0013 (-0.32)	-0.0017 (-0.42)	-0.0020 (-0.47)
Equivalence scale	-0.0276 (-0.43)	-0.0194 (-0.30)	-0.0307 (-0.44)
Number of children	-0.0140 (-0.27)	-0.0149 (-0.28)	-0.0003 (-0.01)
Years of education of household head	-0.0415** (-2.18)	-0.0390* (-1.88)	-0.0558** (-2.50)
Income per equivalence scale	4.42e-07 (0.45)	4.79e-07 (0.44)	1.33e-07 (0.12)
Amount of savings in lending institution	-2.33e-06 (-0.55)	-9.76e-07 (-0.22)	-1.04e-06 (-0.23)
Default risk			
Ratio of loan default to total loans	0.0292 (0.06)	0.0564 (0.12)	-0.7706 (-1.57)
Ratio of late repayments to total loans	0.3212 (1.27)	0.2464 (0.90)	0.2485 (0.83)
Ratio of loans to assets	0.0662 (0.41)	-0.1213 (-0.51)	-0.0720 (-0.27)
Borrower-Lender relationship			
Membership	-0.2251 (-1.31)	-0.1731 (-1.00)	-0.1809 (-1.04)
Ever borrowed	-0.2926** (-2.50)	-0.2758** (-2.29)	-0.3298** (-2.66)
Number of lenders	0.0662 (1.35)	0.0683 (1.36)	0.0517 (0.91)
Lender dummy, CB	-0.9016** (-3.53)		
Lender dummy, CRED	-0.9725** (-8.93)	-0.9673** (-8.87)	-0.9556** (-8.79)
Lender dummy, ML	-1.3151** (-5.99)	-1.2898** (-5.80)	-1.2555** (-5.59)
Lender dummy, RELA	-2.7284** (-10.78)	-2.6901** (-10.71)	
Province dummy, Buriram	0.1601 (1.22)	0.1884 (1.36)	0.1299 (0.85)
Province dummy, Ubon	-0.2118* (-1.75)	-0.1754 (-1.45)	-0.2026 (-1.65)

	(-1.76)	(-1.39)	(-1.42)
Constant	1.2461**	1.2008**	1.3973**
	(3.99)	(3.68)	(4.05)
Pseudo R-squared	0.283	0.277	0.279
No. Obs	1671	1610	1400

Note:

(1) t-statistics in parentheses, * $p < 0.10$, ** $p < 0.05$.

(2) Column (1) includes loans from CB, BAAC, CRED, ML, RELA; Column (2) excludes loans from CB; Column (3) excludes loans from CB and VF.

Table 9: Determinants of the Use of Collateral – Ordered Probit Model

	(1)	(2)	(3)
Loan terms			
Loan size	2.63e-06** (4.18)	2.45e-06** (3.63)	2.69e-06** (3.40)
Loan duration	0.1212** (6.47)	0.1351** (6.51)	0.1500** (6.44)
Interest rate	-0.0044** (-2.48)	-0.0042** (-2.35)	-0.0053** (-2.75)
Agricultural production loan	0.2221** (2.14)	0.1938* (1.82)	0.2380** (2.17)
Non-agricultural production loan	0.4006** (3.44)	0.3925** (3.37)	0.4645** (3.73)
Third party guarantee requirement	-1.4449** (-9.48)	-1.4939** (-9.37)	-1.4910** (-9.24)
Household characteristics			
Female headed household	0.0323 (0.30)	0.0598 (0.54)	0.0067 (0.06)
Age of household head	-0.0015 (-0.38)	-0.0023 (-0.58)	-0.0026 (-0.61)
Equivalence scale	-0.0234 (-0.37)	-0.0112 (-0.17)	-0.0220 (-0.32)
Number of children	-0.0206 (-0.40)	-0.0262 (-0.49)	-0.0110 (-0.19)
Years of education of household head	-0.0388** (-2.05)	-0.0360* (-1.71)	-0.0524** (-2.30)
Income per equivalence scale	5.17e-07 (0.53)	5.66e-07 (0.53)	2.44e-07 (0.22)
Amount of savings in lending institution	-2.52e-06 (-0.59)	-1.36e-06 (-0.29)	-1.44e-06 (-0.31)
Default risk			
Ratio of loan default to total loans	0.0065 (0.02)	0.0512 (0.12)	-0.6521 (-1.35)
Ratio of late repayments to total loans	0.2468 (1.10)	0.2086 (0.77)	0.2088 (0.71)
Ratio of loans to assets	0.1318 (0.84)	-0.0898 (-0.39)	-0.0417 (-0.16)
Borrower-Lender relationship			
Membership	-0.2360 (-1.45)	-0.1850 (-1.13)	-0.1921 (-1.17)
Ever borrowed	-0.2802** (-2.45)	-0.2572** (-2.21)	-0.3050** (-2.55)
Number of lenders	0.0535 (1.16)	0.0621 (1.26)	0.0433 (0.77)
Lender dummy, CB	-1.0123** (-4.04)		
Lender dummy, CRED	-0.9840** (-9.30)	-0.9794** (-9.22)	-0.9644** (-9.12)
Lender dummy, ML	-1.3064** (-6.49)	-1.2883** (-6.31)	-1.2463** (-6.11)
Lender dummy, RELA	-2.6351** (-10.83)	-2.6059** (-10.93)	
Province dummy, Buriram	0.2832** (2.05)	0.3239** (2.25)	0.2813* (1.76)
Province dummy, Ubon	-0.1141	-0.0704	-0.0845

	(-0.92)	(-0.54)	(-0.57)
Constant 1	-1.0872**	-1.0309**	-1.2018**
	(-3.54)	(-3.25)	(-3.60)
Constant 2	-0.9578**	-0.9072**	-1.0751**
	(-3.10)	(-2.85)	(-3.19)
Pseudo R-squared	0.243	0.242	0.241
No. Obs	1671	1610	1400

Note:

(1) t-statistics in parentheses, * $p < 0.10$, ** $p < 0.05$.

(2) Column (1) includes loans from CB, BAAC, CRED, ML, RELA; Column (2) excludes loans from CB; Column (3) excludes loans from CB and VF.

Table 10: Robustness Test - Determinants of the Use of Collateral When Dropping Possible Endogenous Loan Contract Features (Probit Model)

	<i>Baseline model (1)</i>	<i>(a)</i>	<i>(b)</i>	<i>(c)</i>	<i>(d)</i>
Loan terms					
Loan size	2.74e-06** (4.29)		3.85e-06** (5.47)	2.75e-06** (4.30)	
Loan duration	0.1183** (6.24)	0.1458** (7.18)		0.1202** (6.32)	
Interest rate	-0.0039** (-2.19)	-0.0039** (-2.22)	-0.0042** (-2.38)		
Agricultural production loan	0.1966* (1.90)	0.1931* (1.89)	0.2021** (1.99)	0.2097** (2.04)	0.2163** (2.19)
Non-agricultural production loan	0.4573** (3.67)	0.5239** (4.27)	0.4630** (3.66)	0.4635** (3.73)	0.5863** (4.71)
Third party guarantee requirement	-1.5629** (-9.24)	-1.5486** (-9.45)	-1.5428** (-9.29)	-1.5499** (-9.14)	-1.5137** (-9.51)
Household characteristics					
Female headed household	0.0543 (0.49)	0.0362 (0.34)	0.0654 (0.59)	0.0557 (0.50)	0.0317 (0.30)
Age of household head	-0.0013 (-0.32)	0.0002 (0.06)	-0.0018 (-0.46)	-0.0011 (-0.29)	0.0005 (0.13)
Equivalence scale	-0.0276 (-0.43)	-0.0030 (-0.05)	-0.0142 (-0.22)	-0.0313 (-0.49)	0.0207 (0.33)
Number of children	-0.0140 (-0.27)	-0.0280 (-0.56)	-0.0252 (-0.46)	-0.0132 (-0.25)	-0.0491 (-0.94)
Years of education of head	-0.0415** (-2.18)	-0.0310* (-1.72)	-0.0371** (-2.04)	-0.0403** (-2.12)	-0.0196 (-1.16)
Income per equivalence scale	4.42e-07 (0.45)	1.34e-06 (1.49)	3.44e-07 (0.35)	4.87e-07 (0.49)	1.56e-06* (1.92)
Amount of savings	-2.33e-06 (-0.55)	-2.37e-06 (-0.58)	-1.77e-06 (-0.43)	-2.20e-06 (-0.52)	-1.15e-06 (-0.29)
Default risk					
Ratio of loan default to total loan	0.0292 (0.06)	-0.0370 (-0.08)	0.0610 (0.13)	0.0404 (0.08)	-0.0128 (-0.03)
Ratio of late payment to total loan	0.3212 (1.27)	0.2900 (1.17)	0.3842 (1.38)	0.3169 (1.25)	0.3441 (1.27)
Ratio of loans to assets	0.0662 (0.41)	0.3104* (1.90)	0.0173 (0.11)	0.0684 (0.42)	0.3786** (2.25)
Borrower-Lender relationship					
Membership	-0.2251 (-1.31)	-0.2152 (-1.25)	-0.2253 (-1.35)	-0.2205 (-1.29)	-0.2027 (-1.22)
Ever borrowed	-0.2926** (-2.50)	-0.2891** (-2.55)	-0.3404** (-2.97)	-0.2818** (-2.42)	-0.3324** (-3.09)
Number of lenders	0.0662 (1.35)	0.0518 (1.07)	0.0653 (1.32)	0.0705 (1.42)	0.0465 (0.95)
Lender dummy, CB	-0.9016** (-3.53)	-0.8569** (-3.40)	-0.8102** (-3.36)	-0.9504** (-3.62)	-0.7743** (-3.33)
Lender dummy, CRED	-0.9725** (-8.93)	-0.9406** (-8.84)	-1.0377** (-9.72)	-0.9722** (-8.91)	-1.0180** (-9.73)
Lender dummy, ML	-1.3151** (-5.99)	-1.2743** (-5.94)	-1.3795** (-6.28)	-1.4469** (-6.64)	-1.5011** (-7.09)
Lender dummy, RELA	-2.7284** (-10.78)	-2.7088** (-10.85)	-2.8127** (-11.45)	-2.7110** (-10.78)	-2.7909** (-12.00)
Province dummy, Buriram	0.1601	0.1779	0.0407	0.1562	0.0342

	(1.22)	(1.34)	(0.31)	(1.17)	(0.26)
Province dummy, Ubon	-0.2118*	-0.1744	-0.3273**	-0.2338*	-0.3267**
	(-1.76)	(-1.44)	(-2.68)	(-1.92)	(-2.69)
Constant	1.2461**	1.0450**	1.5475**	1.1691**	1.2736**
	(3.99)	(3.42)	(5.05)	(3.74)	(4.29)
Pseudo R-squared	0.283	0.271	0.260	0.279	0.229
No. Obs	1671	1671	1671	1671	1400

Note:

(1) t-statistics in parentheses, * $p < 0.10$, ** $p < 0.05$.

(2) The sample reported in this table includes loans from CB, BAAC, CRED, ML, RELA.

Table 11: Robustness Test - Determinants of the Use of Collateral by Type of Loan (Probit)

	<i>Baseline model (1)</i>	<i>Production loan</i>	<i>Consumption loan</i>
Loan terms			
Loan size	2.74e-06** (4.29)	3.49e-06** (3.29)	2.13e-06** (2.42)
Loan duration	0.1183** (6.24)	0.1219** (5.15)	0.1450** (4.18)
Interest rate	-0.0039** (-2.19)	-0.0040 (-1.52)	-0.0035 (-1.46)
Agricultural production loan	0.1966* (1.90)		
Non-agricultural production loan	0.4573** (3.67)		
Third party guarantee requirement	-1.5629** (-9.24)	-1.5741** (-8.15)	-1.5604** (-6.60)
Household characteristics			
Female headed household	0.0543 (0.49)	0.0238 (0.16)	0.1395 (0.87)
Age of household head	-0.0013 (-0.32)	0.0007 (0.13)	-0.0048 (-0.83)
Equivalence scale	-0.0276 (-0.43)	-0.0154 (-0.20)	-0.0424 (-0.40)
Number of children	-0.0140 (-0.27)	-0.0031 (-0.04)	0.0025 (0.03)
Years of education of household head	-0.0415** (-2.18)	-0.0399* (-1.68)	-0.0501 (-1.43)
Income per equivalence scale	4.42e-07 (0.45)	1.85e-06 (1.61)	-6.20e-07 (-0.39)
Amount of savings in lending institution	-2.33e-06 (-0.55)	-2.23e-06 (-0.45)	-0.0000109* (-1.86)
Default risk			
Ratio of loan default to total loans	0.0292 (0.06)	0.6630 (0.93)	-1.3482 (-1.53)
Ratio of late repayments to total loans	0.3212 (1.27)	0.3281 (0.81)	0.1405 (0.39)
Ratio of loans to assets	0.0662 (0.41)	-0.1289 (-0.64)	0.3583 (1.06)
Borrower-Lender relationship			
Membership	-0.2251 (-1.31)	-0.3169 (-1.36)	-0.2061 (-0.79)
Ever borrowed	-0.2926** (-2.50)	-0.3189** (-2.14)	-0.2657* (-1.82)
Number of lenders	0.0662 (1.35)	0.0626 (1.05)	0.0168 (0.22)
Lender dummy, CB	-0.9016** (-3.53)	-0.7132* (-1.95)	-0.9508** (-3.03)
Lender dummy, CRED	-0.9725** (-8.93)	-0.9651** (-6.88)	-1.0080** (-5.26)
Lender dummy, ML	-1.3151** (-5.99)	-1.4814** (-5.12)	-1.2251** (-3.53)
Lender dummy, RELA	-2.7284** (-10.78)	-3.0804** (-8.86)	-2.4870** (-6.71)
Province dummy, Buriram	0.1601 (1.22)	0.4377** (2.29)	-0.2533 (-1.33)

Province dummy, Ubon	-0.2118*	-0.0090	-0.4350**
	(-1.76)	(-0.05)	(-2.19)
Constant	1.2461**	1.2273**	1.7385**
	(3.99)	(2.96)	(3.21)
Pseudo R-squared	0.283	0.299	0.242
No. Obs	1671	971	680

Note:

(1) t-statistics in parentheses, * $p < 0.10$, ** $p < 0.05$.

(2) The sample reported in this table includes loans from CB, BAAC, CRED, ML, RELA.

Table 12: Robustness Test - Determinants of the Use of Collateral When Adding Interaction Effects (Probit Model)

	<i>Baseline model (1)</i>	<i>Interaction effects</i>
Loan terms		
Loan size	2.74e-06** (4.29)	0.0000** (3.83)
Loan duration	0.1183** (6.24)	0.1246** (5.99)
Interest rate	-0.0039** (-2.19)	-0.0035** (-2.01)
Agricultural production loan	0.1966* (1.90)	0.1971* (1.92)
Non-agricultural production loan	0.4573** (3.67)	0.4697** (3.79)
Third party guarantee requirement	-1.5629** (-9.24)	-1.5171** (-8.13)
Household characteristics		
Female headed household	0.0543 (0.49)	0.0487 (0.44)
Age of household head	-0.0013 (-0.32)	-0.0010 (-0.26)
Equivalence scale	-0.0276 (-0.43)	-0.0283 (-0.45)
Number of children	-0.0140 (-0.27)	-0.0147 (-0.28)
Years of education of household head	-0.0415** (-2.18)	-0.0398** (-2.08)
Income per equivalence scale	4.42e-07 (0.45)	0.0000 (0.47)
Amount of savings in lending institution	-2.33e-06 (-0.55)	-0.0000 (-0.44)
Default risk		
Ratio of loan default to total loans	0.0292 (0.06)	0.2323 (0.47)
Ratio of late repayments to total loans	0.3212 (1.27)	0.5011 (1.46)
Ratio of loans to assets	0.0662 (0.41)	0.0310 (0.19)
Borrower-Lender relationship		
Membership	-0.2251 (-1.31)	-0.2549 (-1.42)
Ever borrowed	-0.2926** (-2.50)	-0.2820** (-2.22)
Number of lenders	0.0662 (1.35)	0.0716 (1.46)
Lender dummy, CB	-0.9016** (-3.53)	-0.8926** (-3.45)
Lender dummy, CRED	-0.9725** (-8.93)	-0.9678** (-8.90)
Lender dummy, ML	-1.3151** (-5.99)	-1.3031** (-5.92)
Lender dummy, RELA	-2.7284** (-10.78)	-2.7323** (-10.79)
Province dummy, Buriram	0.1601	0.1499

	(1.22)	(1.11)
Province dummy, Ubon	-0.2118*	-0.2194*
	(-1.76)	(-1.79)
loan size*DEFAULT		0.0000
		(1.33)
loan duration*DEFAULT		-0.0314
		(-0.76)
interest rate*DEFAULT		-0.0029
		(-0.69)
third party guarantee*DEFAULT		-0.3363
		(-0.90)
amount of savings*DEFAULT		-0.0000
		(-0.44)
membership*DEFAULT		0.1900
		(0.55)
ever borrowed*DEFAULT		-0.0304
		(-0.12)
Constant	1.2461**	1.2073**
	(3.99)	(3.89)
Pseudo R-squared	0.283	0.285
No. Obs	1671	1671

Note:

(1) t-statistics in parentheses, * p<0.10, ** p<0.05.

(2) The sample reported in this table includes loans from CB, BAAC, CRED, ML, RELA.