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Collateral and its substitutes in emerging markets' lending

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Collateral and its Substitutes in Emerging Markets' Lending

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Abstract

Due to opaque information and weak enforcement in emerging loan markets, the need for collateral is high, whereas borrowers lack adequate assets to pledge as collateral. How is this puzzle solved? We find for a representative sample from Northeast Thailand that indeed most loans do not include any tangible assets as collateral. Instead, lenders enforce collateral-free loans through third-party guarantees and relationship lending, but also through modifying loan terms, such as reducing loan size. Guarantees are the relatively most important substitute, they reduce collateral requirements independently of relationship lending and they are more often used by formal financial institutions.

JEL-Code: G210, O160.

Keywords: lending, financial institutions, collateral, guarantees, relationship lending.

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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, theory suggests that the request for collateral is even higher in less developed markets (Bae and Goyal 2009, Behr et al. 2011, Hainz, 2003, Menkhoff et al., 2006). This high importance of collateral results into a problem for relatively poor borrowers in emerging markets: collateral requirements are expected to be particularly high 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 or entrepreneurs 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, are there substitutes to collateral? 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; one should note that these households also operate as small entrepreneurs and that loans are accordingly used for production and consumption purposes, respectively. The three provinces of our sample are

selected in order to differ in economic conditions. Moreover, Thailand's rural areas are served by a variety of 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, second, we analyze the determinants of collateral including considering substitutes to collateral, and, third, we examine the use of the most important collateral substitutes. 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 in cross-sections, such as household groups or borrowing purposes, the share of collateralized loans is consistently small throughout and does not exceed 25%. Moreover, the share of credit-constrained households is low at 11%, strongly indicating that lenders rely on substitutes to collateral in enforcing their interests.

This empirical research is the first, according to best of our knowledge, to systematically consider several substitutes to collateral in order to fully understand the role of collateral in lending to poor borrowers in emerging markets. 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. 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. 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.

As the data set unusually covers two important collateral substitutes, i.e. guarantees and relationship lending, we are able to examine their use in the same market. We find that guarantees are relatively more important, that both substitutes work independently of each other and tend to substitute each other, that guarantees are relatively more important at formal financial institutions and that the marginal effect of these substitutes is independent of loan size. These findings extend recent literature emphasizing the importance of *either* guarantees *or* relationship lending in less developed markets as means to overcome information and incentive problems.

We are not aware that there is an earlier study on emerging markets where all these determinants of the use of collateral – including substitutes to 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 the following determinants: guarantees, relationship, loan term and borrower 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 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 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 ex ante problems of adverse selection and ex post frictions such as moral hazard. Collateralization thus serves as a means to reduce credit rationing (review in Berger et al. 2011a, 2011b, 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

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).

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., 2009) predict that the use of collateral varies across loans according to 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, Egli et al., 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). Relationship lending dominates in economies where the likelihood of strategic default is high because of an underdeveloped financial system with low transparency and weak legal enforcement (Egli et al., 2006).

As exactly this applies to emerging markets, one expects that relationship lending with its preferred reliance on outside collateral is wide-spread. 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 default risk. Loan *duration* is a 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.

Restrictive covenants are a further 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). For a mature market it has been shown that small business loans with real estate collateral less frequently contain covenants, but that smaller and manager-controlled firms are less likely to have covenants in their loans (Niskanen and Niskanen 2004). Restrictive covenants are less useful for the smallest firms as these borrowers do not have audited financial statements or do not provide feasible financial information (Ortíz and Penas, 2008, Niskanen and Niskanen, 2004). In emerging markets with weak contract enforcement covenants are expected to be less efficient. This may explain why they are not present in our sample of loans to very small businesses in Thailand.

As *borrower characteristics* affecting the use of collateral most of the literature has discussed size, age and legal form of the firm. 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. Credit risk tends to be higher in corporations than in unincorporated firms, which makes outside collateral particularly necessary there. In our case, these firm characteristics are not relevant. As our dataset covers information about loans to households, which are mostly used for productive purposes, borrower risk may depend on demographic and socio-economic characteristics, such as age, gender, education and wealth of the household head or self-employed person. If, however, the production loans to households are interpreted as loans to unincorporated firms, the borrowing purpose may be relevant to explain the low incidence of collateral. Since in the case of self-employed persons, personal assets can be used for business as well as private purposes, the distinction between inside and outside collateral may not be useful here (Neuberger and R athke, 2009). In fact, personal assets of small business owners are often pledged as collateral. Additionally, the owners of small businesses may have their personal wealth at stake to repay loans, because they are organized as proprietorships and partnerships with unlimited liability (Berger and Udell, 1998). This is likely to apply to our case of self-employed Thai households.

Finally, the use of collateral may depend on the *type of loan* sought. Loans with nonspecific use such as credit lines or consumption loans are riskier and therefore may be more often secured by personal commitments and require more soft information than is the case of specific investments in machinery (Avery et al., 1998, Chakraborty and Hu, 2006). In countries with weak protection of property rights, lenders tend to prefer loans for specific purposes such as investments in physical assets (Bae and Goyal, 2009). This might explain why the production loans in our sample do not include lines of credit.

In summary, borrower-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 not fully developed markets.

2.2 Empirical literature

The empirical literature is largely in line with theoretical predictions (overview in Berger et al., 2011a, 2011b, Steijvers and Voordeckers, 2009, see also Degryse et al., 2009). Most studies find that observed borrower risk positively affects collateralization, and that the incidence and degree of collateral tends to be highest for young and small firms. These

findings support the risk reduction and monitoring role of collateral. Evidence in favor of the signaling role of collateral is less clear, because studies that find a negative relationship between borrower risk and collateral (Jiménez et al., 2006, Lehmann and Neuberger, 2001) do not isolate effects of ex ante private information from ex post incentive problems (Berger et al., 2011a, 2011b). Recent studies that differentiate between private and public information show that the use of credit scoring technology by lenders, reducing ex ante private information, reduces the incidence of collateral (Berger et al., 2011a), but that the ex ante private information theories seem to hold only for customers with relatively short relations to the lender (Berger et al. 2011b). 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 and less developed 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, Menkhoff et al. (2006) for Thai commercial banks and Allen et al. (2005) for private sector loans in China. As a side-aspect Thai banks' customers are likely to be locked-in as housebanks demand extra collateral. The high collateral requirements in China do not seem to restrain growth of the private sector, because firms use alternative financing mechanisms relying strongly on reputation and relationships (Allen et al. 2005). Lin (2011) finds a limited role of collateral in overcoming asymmetric information in China due to weakly protected creditor rights. Recently, Liberti and Mian (2010) show 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 most of 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 serve as guarantors (Bond and Rai, 2008). Guarantees do not only shield the lender but they may also impact the behavior of the borrower (Klonner and Rai, 2010). Only for commercial microlending in Mozambique, it has been shown that collateral is relevant and is a substitute to relationships: the microlenders pass on informational gains to the borrowers via lower collateral requirements for successive loans, from which the most opaque firms profit most (Behr et al. 2011).

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; in addition 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” (FOR 756), 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. Due to the

sampling process this survey is largely representative for rural households in Northeast Thailand. More details on sample selection of the survey are available on request.

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 in 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. It seems interesting to note that even low income households possess a remarkable stock of assets which may be important as a source for collateral. However, the numbers grossly overestimate the usefulness of these assets for the purpose of collateral: first, the average figures are higher than median, which is about one third lower. Second, about 70% of assets consist of land and buildings which are not easily marketable. Many landholding documents fall into the categories of so-called “Sor Por Kor” and “NS2” which cannot be sold to lenders. If land can be sold legally, it may be difficult to do so because the legal system works slowly and even if lenders gain land rights it may be

² A household is classified as low-income if the annual household income per adult equivalent unit falls below the Northeast poverty line, which is 15,792 Baht/person or equivalently 1,316 Baht/person per 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.

difficult to use them effectively as long as the borrowers are still in place. Third, marketability of durable goods is very low as these goods are typically used items. Overall, the existence of assets does not ensure a solid basis for useful collateral.

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 low income households pay a much higher interest rate as compared to the middle and high-income households. The incidences of credit 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 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 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 are

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

the largest banks in the country following a business model mainly serving larger customers, needing for example larger loans. Moreover, they tend to rely on advanced infrastructure, such as larger branches. According to this specialization they play a minor role in the more remote areas covered by our study. 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 *village funds (VF)* program. This was initiated in 2001 following 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. The loan application is decided by the village fund committee selected by village members. The fourth 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 the local community. The fifth is *policy loans (POLICY)* with a narrow focus and at subsidized lending conditions, mainly the “Student Loan Fund” and the “Poverty Eradication 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 sources 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 credit market in Northeast Thailand due to its relatively large loan size with a share of 38 percent. Next in importance are VF, CRED, ML and RELA. As may be expected, 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 remarkable. The formal financial institutions (CB and BAAC) provide larger loans whereas the more informal 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.

provide loans with smaller size. Among informal lenders, ML provides relatively larger loans than the others. CB, POLICY 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, whereas CB and ML charge comparatively high interest rates.

All 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.

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%, in a sample of loans to large private firms in China it was 83% (Allen et al., 2005), 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 firms in the UK with 16 employees as median number (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

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.

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 (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 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 households in Thailand than for loans to micro and small enterprises in mature markets. To find out possible explanations, we 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 or other loan terms. 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 are land, durable goods, savings, future crop, and gold. We classify the types of collateral into three groups: land, other assets 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 collateral⁷. 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 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 the hypothesis 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 have 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,

⁷ 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.

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 main categories: agricultural production, non-agricultural production and consumption. Almost 60% of the sample consists in production loans, which are used for specific purposes of investments in physical assets, in contrast to consumption loans. Panel A of [Table 6](#) also documents another split of all production loans in that we differentiate into conventional investment loans and loans for input expenses. However, investment loans dominate the sample and the loans for input expenses are only slightly different regarding their characteristics. Their volume is a bit smaller, duration shorter and the interest rate higher, as it might be expected *ex ante*. Due to these minor differences we refer in the following more on the distinction between agricultural and non-agricultural loans.

Panel B of [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 higher interest rate. Note that the relation of collateral with high interest rate is influenced by the fact that the policy induced low-interest rate loans of VF and POLICY are extended basically without demanding collateral (see Tables 2, 4). 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 for loans backed by land or asset substitutes. This may indicate that guarantees and close bank-borrower relationships are substitutes to collateral.

5 The use of collateral: regressions

5.1 Baseline results

In this section, we analyze which factors affect lenders' decisions to give loans without any tangible collateral. We use the probit model to explain the incidence of collateral.

In our baseline regressions, we exclude loans from 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 loans from 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 adult equivalence units), years of education of the household head, household annual 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 and the value of late repayments to total loans. 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 estimations are reported in Table 8. Column (1) of the table displays the results for the whole sample (CB, BAAC, CRED, ML, RELA); column (2) for the sample of loans from BAAC, CRED, ML and RELA; column (3) for the sample of loans from BAAC, CRED and ML; and column (4) for the sample from CB and ML.

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 Thai 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. 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 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 due to unlimited liability of self-employed households. 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 use 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; the coefficient is not significant for specification (4), possibly because relationship is better covered by the number of lenders in this subsample. 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., 2010, Behr et al., 2011).⁸ 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 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.

⁸ In contrast, no significant effect of relationship duration on collateral was found for business loans in Thailand (Menkhoff et al., 2006).

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)⁹, 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 those state banks which are included in CB. These policy loans usually require no land or asset substitutes as collateral.

5.2 The use of substitutes to collateral

The limited role of collateral in rural lending motivates to examine potential substitutes, i.e. in particular third party guarantees and relationship lending, in their relation to collateral in more detail. The following analyses are based on the probit regression results using all loans from CB, BAAC, CRED, ML, RELA (Column (1) of Table 8.)

First, we examine whether and to which degree both third-party guarantee and relationship lending, proxied by the incidence that the borrower is a previous customer of the lender, influence the requirement of collateral. [Table 9](#) shows that both, guarantees and relationship lending, significantly reduce collateral needs. Clearly, third-party guarantees play a more important role than relationship lending. Holding other variables at their sample means (average household with average loan contract), the use of third-party guarantees decreases the probability of requiring collateral by a factor of 0.54-0.57, while relationship lending decreases the probability by only 0.07-0.10. Moreover, [Table 9](#) shows that the effect of third-party guarantees on reducing the collateral incidence differs according to the presence of relationship lending, and vice versa. The effect of relationship lending on reducing the provision of collateral is higher when a third-party guarantee is not used. This is in line with our expectation that the effect of relationship lending will be even stronger when a third-party guarantee is not present and vice versa (they substitute each other; related see also Behr et al., 2010).

Next we examine the importance of third-party guarantees and the borrower-lender relationship for different lenders (see also [Table 9](#)). First we still find that all types of lenders put more weight on the presence of a third-party guarantee rather than relationship lending.

⁹ Evidence consistent with this theory has been found by Jiménez et al. (2009) for Spanish banks.

For all lenders, the use of a third-party guarantee reduces the probability of providing collateral by almost five times the effect of relationship lending. The exception is RELA, where the effect of a third-party guarantee is equally important as relationship lending. Second, the third-party guarantee has the strongest impact when loans are taken from the formal lenders, and the impact decreases with informal loans. For instance, the third-party guarantee reduces the probability of requiring collateral by a factor of 0.5 for loans from CB and BAAC, but only by 0.06 for loans from RELA. Third, with regard to the substitution effect between third-party guarantees and relationship lending, we find that the effect of relationship lending is stronger when a third-party guarantee is not present, except for BAAC. For BAAC, the substitution between third-party guarantees and relationship lending is weaker, possibly because both substitutes are already in intensive use at BAAC compared to the other lenders in our sample.

Lastly we show in [Figure 1](#) the marginal probability effects of third-party guarantee and relationship lending on the incidence of collateral by loan size. This shows whether the substitution effects differ according to other circumstances, where these other conditions are captured here by the size of the loan. We expect that the effect of relationship lending may decrease with loan size as a larger loan implies that the lender would bear more loss if the loan default occurs. For third-party guarantee, we expect that the effect would be constant as the risk to the lender is transferred to the guarantor. Somewhat contrary to these expectations, we find that the effects of relationship lending and third-party guarantees are both quite constant and do not depend on the size of the loan. Obviously, relationship lending reduces collateral requirement in general, independently of loan size, so that the particular risk of a larger loan size may be addressed by other measures. Alternatively, our imperfect proxy for relationship lending may be responsible for this finding.

Overall, we make the following contributions about the use of collateral substitutes:

- We find for our sample that a third-party guarantee is more important than relationship lending.
- Both substitutes help reducing the need for collateral independently of each other.
- The third-party guarantee plays a more important role for formal lenders and thus, implicitly, relationship lending is relatively more important for informal lenders.
- The marginal effects of the two considered substitutes on the probability of collateral provision do not depend on loan size.

5.3 Robustness tests

This section tackles several possible concerns with the baseline results. First, we experiment with a further disaggregation of collateral into land and other assets. The respective multinomial probit model explains the choice between land as collateral, the use of other assets as collateral and no collateral (Table 10).¹⁰ Results are qualitatively unchanged compared to the baseline regression shown in Table 8. In a similar vein, we have explored further variations in the set of determinants in our baseline regressions, including the consideration of additional variables such as number of children or ratio of loans to assets, without interesting changes (results available on request).

The second 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 the results when loan rate, loan size and duration are taken into and out of each regression. Results reported in Table 11 show that the parameter estimates do not differ significantly between these models, which suggest that endogeneity is not important¹¹.

As a related aspect of possibly distorted regressions, we pick up the concern that our sample may be distorted due to a selection bias as loan granting does not result from a random process. In order to account for this we apply a standard Heckman correction procedure, where the selection equation is a loan approval equation:

$$\text{prob}(y_i = 1) = ax1_i + bz1_i + e_i$$

where $y_i = 1$ if loan i is approved and 0 if loan i is rejected

$x1_i$ = loan i 's variables including amount of loan applied, purpose of borrowing, type of lender to which a loan application is submitted

$z1_i$ = household's characteristics

The main equation of interest is the incidence of collateral:

$$\text{prob}(w_j = 1) = ax2_j + bz2_j + e_j$$

¹⁰ Results are qualitatively unchanged if we use an ordered probit model, where we use "assets as collateral" as the medium category due to its lower degree of marketability compared to land as collateral (result available on request).

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.

where $w_j = 1$ if collateral is pledged for loan j

The selection equation provides some reasonable information about loan approval, such as a preference for production over consumption loans or a lower approval probability if late repayments have occurred (see [Appendix](#)). However, the main equation is virtually unaffected, indicating that the selection effect is not very important regarding the use of collateral.

Third, 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 12](#) reports the regression results for a sub-sample of all production loans (column 1) and consumption loans (column 4). 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.

In another effort to challenge the homogeneity of production loans we split this group of 971 loans into 790 “investments”, i.e. loans for business investments, agricultural investments or investments into housing or land, and into 181 “expenses”, i.e. loans for the purpose of buying other inputs for the production process. The rationale behind this split is the idea that loans for expenses may be closer to lines-of-credit loans where relationship lending may play a relatively larger role (Chakraborty and Hu, 2006). The result in columns (2) and (3) indicates that this hypothesis is not supported by our data, possibly because we do not really observe lines-of-credit loans. We note that the variable “loan duration” becomes insignificant for “expenses” loans, probably because by far most of these loans support agricultural expenses which are needed for one year with little variation.

Fourth, we test the robustness of results with regard to subgroups of borrowers, each defined by specific characteristics. In particular, we distinguish according to loan size and household income. Regarding loan size, we split the sample into small and large loans at a loan size of 50,000 Baht, i.e. the value of loan size at the 75th percentile. [Table 13](#) shows that the results for small loans are very similar to the results for the total sample (see [Table 8](#)), which is expected as small loans dominate the total sample. Results for large loans become somewhat weaker regarding the loan terms where the variables “loan size” and “loan interest rate” turn insignificant. This may be due to much less variation in variables among the group of large loans.

Regarding the household income, we rely on the classification of three income groups introduced above (see Table 5). Again, the rough structure of the three regressions presented in [Table 14](#) follows the baseline regression (see Table 8). Due to the smaller sample sizes, tentatively fewer coefficients are statistically significant, and in some cases “new” variables may turn significant. However, we never get contradictory results.

Our final robustness test concerns the consideration of 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 credit risk of a borrower using the variable `DEFAULT`, which takes the value of one if a borrower ever had defaulted on a loan, and zero otherwise. Results reported in [Table 15](#) 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 lending to relatively poor households in emerging countries, i.e. this research targets at a large fraction of world-wide population. Collateral is an important instrument for lending institutions. In general, collateral limits potential losses to the lenders in case of loan defaults and reduces borrowers’ incentives to default. Due to opaque information and weak enforcement, theory suggests that the incidence of collateral is 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 three main findings. First, in describing the use of collateral, we find that conventional collateral is indeed rarely used and that most loans to poor households do not include any tangible assets as collateral. Remarkably, the lack of assets (which could serve as collateral) 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, i.e. by

collateral substitutes. In principle, the substitution mechanisms may also work in advanced markets.

Our second main finding reveals determinants of the use of collateral: lenders can enforce collateral-free loans through third party guarantees and relationship lending. In particular, third-party guarantees and repeated borrowing from the same lender significantly reduce the pledging of collateral. Moreover, reducing loan size and duration and increasing the interest rate also substitute collateral. Our results do not show a significant impact of the borrower's wealth, savings and default risk on the use of collateral.

The dominant means of loan enforcement are reliance on guarantees and relationship lending which both substitute collateral in emerging markets' lending. In our sample, guarantees are relatively more important than relationship lending, both substitutes work independently of each other and thus tend to substitute each other. Moreover, third-party guarantees are relatively more important at formal financial institutions that lend at arm's length, and the marginal effect of these substitutes is independent of loan size.

These results show the benefits of collateral and its substitutes for more favorable loan terms and for an easier access to finance. Although our data stem from a particular emerging market, the substitution process at work may well apply to other markets too. For example, whenever the ownership of land is not easily transferable as is the case in rural Thailand, there emerges a lack of conventional collateral and substitutes become particularly urgent. From a policy perspective it seems important to support easier collateralization as well as its substitutes of guarantees and relationship lending. The analyses show that more available instruments to deal with risk in emerging markets' lending to poor households really help more.

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Table 1: Summary Statistics of Key Variables of Sample Households

	<i>Low income</i> (<i>n = 936</i>)		<i>Middle income</i> (<i>n = 587</i>)		<i>High income</i> (<i>n = 663</i>)		
	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	
Married household head	0.77	0.01	0.77	0.02	0.80	0.02	
Age of household head (years)	55.43	0.47	55.30	0.67	52.95	0.51	
Years of education of household head (years)	4.58	0.06	4.67	0.08	5.77	0.14	
Number of adult equivalence	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 of Household Head							
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 (hectre)	1.61	0.09	2.11	0.13	2.47	0.19	
Household annual income (Baht)	8,184	1,862	67,198	1,198	222,742	14,847	
Annual income per equivalence scale (Baht)	2,761	691	22,603	188	85,924	5,645	
Consumption expenditures (Baht)	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 (Baht)	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 per household	1.61	0.07	1.44	0.07	1.44	0.07	
Volume of loans per household (Baht)	43,811	3,032	39,231	3,493	71,458	6,353	
Average interest rate per household (%)	17.26	5.33	11.89	1.28	10.70	1.50	
Weighted average interest rate per household (%)	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	

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 (Calcagnini 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�athke, 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: Loan Types and Collateral by Borrowing Purpose**Panel A: Loan Types by Borrowing Purpose**

<i>Loan Characteristics</i>	<i>Type of Loan</i>					
	All	Agricultural	Production Non- agric.	Investment	Input expens.	Consump- tion All
No. of loans	1,924	1,387	537	1,595	329	1,374
Share of total loans	58.3%	42.1%	16.2%	48.3%	10.0%	41.7%
Mean loan size (in Baht)	34,502	27,856	51,635	35,757	28,412	26,421
Duration of loan (in years, mean)	1.5	1.4	1.8	1.6	1.3	1.4
Interest rate (in %)	9.8%	9.2%	11.5%	9.6%	10.8%	13.7%

Panel B: Collateral by Borrowing Purpose

<i>Collateral type</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 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 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: Probit Regression Results for the Incidence of Collateral

<i>Incidence of Collateral</i>	<i>Marginal Probability</i>			
	(1)	(2)	(3)	(4)
Loan terms				
Loan size	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)
Loan duration	0.037** (0.006)	0.039** (0.006)	0.048** (0.008)	0.020** (0.011)
Loan interest rate	-0.001** (0.001)	-0.001** (0.001)	-0.002** (0.001)	-0.001** (0.001)
Agricultural production loan	0.062* (0.032)	0.056* (0.033)	0.074** (0.037)	0.004 (0.028)
Non-agricultural production loan	0.154** (0.045)	0.152** (0.045)	0.191** (0.052)	0.119** (0.091)
Third party guarantee requirement	-0.551** (0.054)	-0.564** (0.055)	-0.575** (0.052)	-0.257** (0.101)
Household characteristics				
Female headed household	0.016 (0.035)	0.023 (0.036)	0.007 (0.044)	0.012 (0.029)
Age of household head	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)
Adult equivalence units	-0.012 (0.014)	-0.009 (0.014)	-0.010 (0.016)	-0.012 (0.015)
Years of education of household head	-0.013** (0.006)	-0.012* (0.006)	-0.019** (0.007)	-0.003 (0.006)
Income per adult equivalence	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Amount of savings in lending institution	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000** (0.000)
Default risk				
Ratio of loan default to total loans	0.007 (0.150)	0.014 (0.148)	-0.270 (0.169)	-0.131 (0.123)
Ratio of late repayments to total loans	0.097 (0.076)	0.075 (0.085)	0.086 (0.103)	0.022 (0.049)
Borrower-Lender relationship				
Membership	-0.073 (0.057)	-0.054 (0.057)	-0.063 (0.063)	-0.052 (0.065)
Ever borrowed	-0.094** (0.038)	-0.091** (0.039)	-0.120** (0.044)	-0.030 (0.027)
Number of lenders a household engaged with	0.022 (0.014)	0.019 (0.015)	0.016 (0.019)	0.025** (0.017)
Lender dummy, CB	-0.185** (0.034)			
Lender dummy, CRED	-0.219** (0.024)	-0.221** (0.024)	-0.256** (0.028)	
Lender dummy, ML	-0.240** (0.025)	-0.241** (0.026)	-0.284** (0.034)	-0.012 (0.032)
Lender dummy, RELA	-0.297** (0.023)	-0.302** (0.023)		
No. Obs	1,671	1,610	1,400	280.000
PseudoR ²	0.283	0.277	0.279	0.301
Likelihood ratio chi-square (df)	425.129(23)	419.910 (22)	314.532 (22)	76.043 (20)

Notes: (1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

(2) Column (1) includes loans from CB, BAAC, CRED, ML, RELA; Column (2) includes BAAC, CRED, ML, RELA; Column (3) includes BAAC, CRED, ML; Column (4) includes CB and ML.

(3) Province dummies are considered.

Table 9: Predicted Probability of Requiring Collateral in the Presence of Guarantee and Relationship Lending

Borrower-lender relationship	Predicted probability of requiring collateral		
	No third party guarantee	Third party guarantee	Difference
Total sample			
Never borrowed	0.78	0.21	-0.57
Ever borrowed	0.68	0.14	-0.54
Difference	-0.10	-0.07	
CB			
Never borrowed	0.62	0.10	-0.51
Ever borrowed	0.50	0.06	-0.44
Difference	-0.11	-0.04	
BAAC			
Never borrowed	0.88	0.35	-0.53
Ever borrowed	0.81	0.25	-0.56
Difference	-0.07	-0.10	
CRED			
Never borrowed	0.58	0.09	-0.49
Ever borrowed	0.47	0.05	-0.42
Difference	-0.11	-0.04	
ML			
Never borrowed	0.45	0.04	-0.40
Ever borrowed	0.34	0.02	-0.31
Difference	-0.11	-0.02	
RELA			
Never borrowed	0.06	0.00	-0.06
Ever borrowed	0.03	0.00	-0.03
Difference	-0.03	0.00	

Table 10: Multinomial Probit Regression Results for the Use of Different Collateral

<i>Use of different collateral</i>	<i>Marginal Probability</i>		
	<i>No collateral</i>	<i>Assets as collateral</i>	<i>Land as collateral</i>
Loan terms			
Loan size	-0.000** (0.000)	0.000 (0.000)	0.000** (0.000)
Loan duration	-0.036** (0.006)	0.001 (0.001)	0.035** (0.006)
Interest rate	0.002** (0.001)	-0.000 (0.000)	-0.002** (0.001)
Agricultural production loan	-0.063** (0.031)	-0.009* (0.005)	0.072** (0.031)
Non-agricultural production loan	-0.142** (0.043)	0.033** (0.014)	0.109** (0.042)
Third party guarantee requirement	0.495** (0.053)	-0.047** (0.017)	-0.447** (0.055)
Household characteristics			
Female headed household	-0.012 (0.034)	0.004 (0.005)	0.008 (0.034)
Age of household head	0.000 (0.001)	-0.000 (0.000)	-0.000 (0.001)
Equivalence scale	0.012 (0.013)	0.000 (0.002)	-0.012 (0.013)
Years of education of household head	0.012** (0.005)	-0.001 (0.001)	-0.011** (0.006)
Income per equivalence scale	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Amount of savings in lending institution	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Default risk			
Ratio of loan default to total loans	0.045 (0.120)	0.020 (0.027)	-0.065 (0.115)
Ratio of late repayments to total loans	-0.090 (0.071)	0.007 (0.011)	0.083 (0.068)
Borrower-Lender relationship			
Membership	0.069 (0.052)	-0.002 (0.010)	-0.067 (0.050)
Ever borrowed	0.086** (0.036)	-0.006** (0.005)	-0.080** (0.035)
Number of lenders	-0.020 (0.014)	0.003 (0.002)	0.017 (0.014)
Lender dummy, CB	0.168** (0.034)	0.006 (0.016)	-0.174** (0.029)
Lender dummy, CRED	0.231** (0.021)	0.004 (0.008)	-0.235** (0.020)
Lender dummy, ML	0.239** (0.027)	-0.002 (0.010)	-0.237** (0.024)
Lender dummy, RELA	0.328** (0.019)	-0.016** (0.006)	-0.312** (0.019)
No. Obs	1,196	51	424

Notes:

(1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.

Table 11: Probit Regression Results for the Incidence of Collateral - Modified

<i>Incidence of Collateral</i>	<i>Marginal Probability</i>			
	<i>(a)</i>	<i>(b)</i>	<i>(c)</i>	<i>(d)</i>
Loan terms				
Loan size		0.000** (0.000)	0.000** (0.000)	
Loan duration	0.047** (0.006)		0.037** (0.006)	
Interest rate	-0.001** (0.001)	-0.001** (0.001)		
Agricultural production loan	0.061* (0.032)	0.066** (0.032)	0.065** (0.032)	0.072** (0.032)
Non-agricultural production loan	0.181** (0.046)	0.160** (0.046)	0.155** (0.045)	0.211** (0.047)
Third party guarantee requirement	-0.551** (0.052)	-0.549** (0.053)	-0.546** (0.054)	-0.546** (0.050)
Household characteristics				
Female headed household	0.009 (0.034)	0.020 (0.036)	0.016 (0.035)	0.006 (0.035)
Age of household head	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)
Equivalence scale	-0.009 (0.014)	-0.010 (0.014)	-0.013 (0.013)	-0.006 (0.014)
Years of education of head	-0.010* (0.006)	-0.012** (0.006)	-0.013** (0.006)	-0.007 (0.006)
Income per equivalence scale	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)
Amount of savings	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Default risk				
Ratio of loan default to total loan	-0.016 (0.155)	0.015 (0.149)	0.010 (0.152)	-0.012 (0.158)
Ratio of late payment to total loan	0.088 (0.075)	0.119 (0.087)	0.096 (0.076)	0.107 (0.085)
Borrower-Lender relationship				
Membership	-0.075 (0.058)	-0.074 (0.056)	-0.071 (0.056)	-0.074 (0.058)
Ever borrowed	-0.092** (0.037)	-0.113** (0.038)	-0.090** (0.037)	-0.109** (0.037)
Number of lenders	0.024 (0.014)	0.021 (0.015)	0.023 (0.014)	0.025 (0.016)
Lender dummy, CB	-0.179** (0.039)	-0.182** (0.036)	-0.189** (0.033)	-0.175** (0.043)
Lender dummy, CRED	-0.222** (0.024)	-0.237** (0.023)	-0.217** (0.024)	-0.247** (0.024)
Lender dummy, ML	-0.246** (0.027)	-0.255** (0.025)	-0.247** (0.024)	-0.281** (0.025)
Lender dummy, RELA	-0.308** (0.023)	-0.312** (0.022)	-0.293** (0.023)	-0.331** (0.023)
No. Obs	1671	1671	1671	1671
PseudoR ²	0.269	0.260	0.279	0.227
Likelihood ratio chi-square (df)	436.679 (22)	397.465 (22)	411.028 (22)	393.711 (20)

Notes: (1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.

Table 12: Probit Regression Results for the Incidence of Collateral by Purpose of Loan

<i>Incidence of collateral</i>	<i>Marginal Probability</i>			
	<i>Production loan (1)</i>	<i>Investment (2)</i>	<i>Expenses (3)</i>	<i>Consumption loan (4)</i>
Loan terms				
Loan size	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)
Loan duration	0.040** (0.008)	0.045** (0.008)	0.011 (0.023)	0.037** (0.009)
Interest rate	-0.001 (0.001)	-0.002 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Third party guarantee requirement	-0.562** (0.059)	-0.561** (0.070)	-0.616** (0.135)	-0.533** (0.076)
Household characteristics				
Female headed household	0.009 (0.049)	0.045 (0.058)	-0.176** (0.069)	0.052 (0.044)
Age of household head	0.000 (0.002)	0.000 (0.002)	0.002 (0.003)	-0.001 (0.001)
Equivalence scale	-0.005 (0.017)	-0.015 (0.019)	0.017 (0.036)	-0.024 (0.018)
Years of education of household head	-0.013* (0.008)	-0.015* (0.008)	-0.013 (0.016)	-0.011 (0.009)
Income per equivalence scale	0.000* (0.000)	0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)
Amount of savings in lending institution	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)
Default risk				
Ratio of loan default to total loans	0.218 (0.236)	0.335 (0.263)	-0.548 (0.704)	-0.380 (0.258)
Ratio of late repayments to total loans	0.110 (0.132)	0.079 (0.140)	0.221 (0.426)	0.024 (0.087)
Borrower-Lender relationship				
Membership	-0.106 (0.083)	-0.122 (0.091)	-0.118 (0.201)	-0.028 (0.071)
Ever borrowed	-0.111** (0.051)	-0.140** (0.058)	-0.067 (0.109)	-0.069* (0.043)
Number of lenders	0.017 (0.018)	0.009 (0.021)	0.038 (0.042)	0.021 (0.019)
Lender dummy, CB	-0.182** (0.060)	-0.196** (0.064)	-0.144 (0.080)	-0.160** (0.032)
Lender dummy, CRED	-0.237** (0.032)	-0.243** (0.031)	-0.182** (0.070)	-0.177** (0.031)
Lender dummy, ML	-0.277** (0.032)	-0.285** (0.034)	-0.228** (0.061)	-0.179** (0.032)
Lender dummy, RELA	-0.339** (0.029)	-0.360** (0.031)	-0.249** (0.063)	-0.228** (0.028)
No. Obs	971	790	181	700
PseudoR ²	0.299	0.304	0.375	0.248
Likelihood ratio chi-square (df)	237.644 (21)	180.853 (21)	50.683 (21)	150.095 (21)

Notes:

(1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.

Table 13: Probit Regression Results for the Incidence of Collateral by Loan Size

<i>Incidence of Collateral</i>	<i>Marginal Probability</i>	
	Small loan	Large loan
Loan terms		
Loan size	0.000** (0.000)	0.000 (0.000)
Loan duration	0.033** (0.008)	0.041** (0.010)
Loan interest rate	-0.001* (0.001)	-0.001 (0.001)
Agricultural production loan	0.038 (0.043)	0.087 (0.069)
Non-agricultural production loan	0.083 (0.056)	0.247** (0.082)
Third party guarantee requirement	-0.512** (0.065)	-0.635** (0.062)
Household characteristics		
Female headed household	0.059 (0.044)	-0.071 (0.076)
Age of household head	0.000 (0.002)	0.000 (0.003)
Adult equivalence units	-0.015 (0.018)	-0.028 (0.030)
Years of education of household head	-0.001 (0.008)	-0.033** (0.011)
Income per adult equivalence	0.000 (0.000)	0.000 (0.000)
Amount of savings in lending institution	-0.000 (0.000)	-0.000* (0.000)
Default risk		
Ratio of loan default to total loans	0.058 (0.165)	1.915 (1.828)
Ratio of late repayments to total loans	0.100 (0.122)	0.130 (0.245)
Borrower-Lender relationship		
Membership	-0.073 (0.066)	-0.212 (0.141)
Ever borrowed	-0.123** (0.042)	-0.143* (0.083)
Number of lenders a household engaged with	0.010 (0.021)	0.047 (0.035)
Lender dummy, CB	-0.201* (0.060)	-0.292** (0.089)
Lender dummy, CRED	-0.172** (0.037)	-0.232** (0.070)
Lender dummy, ML	-0.226** (0.043)	-0.399** (0.067)
Lender dummy, RELA	-0.307** (0.031)	-0.528** (0.051)
No. Obs	1,183	488
PseudoR ²	0.228	0.347
Likelihood ratio chi-square (df)	257.911 (23)	142.121 (23)

Notes:

(1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.

(4) We use 50,000 baht as the cut-off point for large loan as this is the value of loan size at 75th percentile.

Table 14: Probit Regression Results for the Incidence of Collateral by Income Group

<i>Incidence of Collateral</i>	<i>Marginal Probability</i>		
	Low income	Middle income	High income
Loan terms			
Loan size	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)
Loan duration	0.041** (0.010)	0.020** (0.010)	0.054** (0.011)
Loan interest rate	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.000)
Agricultural production loan	0.022 (0.044)	0.141** (0.058)	0.014 (0.066)
Non-agricultural production loan	0.150** (0.067)	0.225** (0.087)	0.073 (0.071)
Third party guarantee requirement	-0.574** (0.080)	-0.554** (0.084)	-0.627** (0.077)
Household characteristics			
Female headed household	0.049 (0.051)	0.055 (0.059)	-0.076 (0.054)
Age of household head	0.000 (0.002)	-0.002 (0.002)	-0.003 (0.003)
Adult equivalence units	-0.028 (0.020)	-0.014 (0.025)	0.042* (0.023)
Years of education of household head	-0.017 (0.011)	-0.017 (0.017)	-0.019** (0.010)
Income per adult equivalence	-0.000 (0.000)	0.000 (0.000)	0.000** (0.000)
Amount of savings in lending institution	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Default risk			
Ratio of loan default to total loans	0.032 (0.266)	0.016 (0.189)	0.201 (0.342)
Ratio of late repayments to total loans	-0.041 (0.134)	0.108 (0.144)	0.247 (0.166)
Borrower-Lender relationship			
Membership	0.071 (0.073)	-0.196 (0.140)	-0.302** (0.120)
Ever borrowed	-0.127** (0.062)	-0.093 (0.062)	-0.070 (0.050)
Number of lenders a household engaged with	0.002 (0.019)	0.071** (0.028)	0.015 (0.028)
Lender dummy, CB	0.057 (0.117)	-0.169** (0.062)	-0.233** (0.036)
Lender dummy, CRED	-0.204** (0.034)	-0.189** (0.053)	-0.244** (0.042)
Lender dummy, ML	-0.224** (0.046)	-0.237** (0.061)	-0.256** (0.038)
Lender dummy, RELA	-0.286** (0.037)	-0.278** (0.064)	-0.299** (0.042)
No. obs	756	406	509
PseudoR ²	0.342	0.288	0.351
Likelihood ratio chi-square (df)	292.256 (23)	156.035 (23)	157.115 (23)

Notes:

(1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.

Table 15: Probit Results for the Incidence of Collateral – Adding Interaction Terms

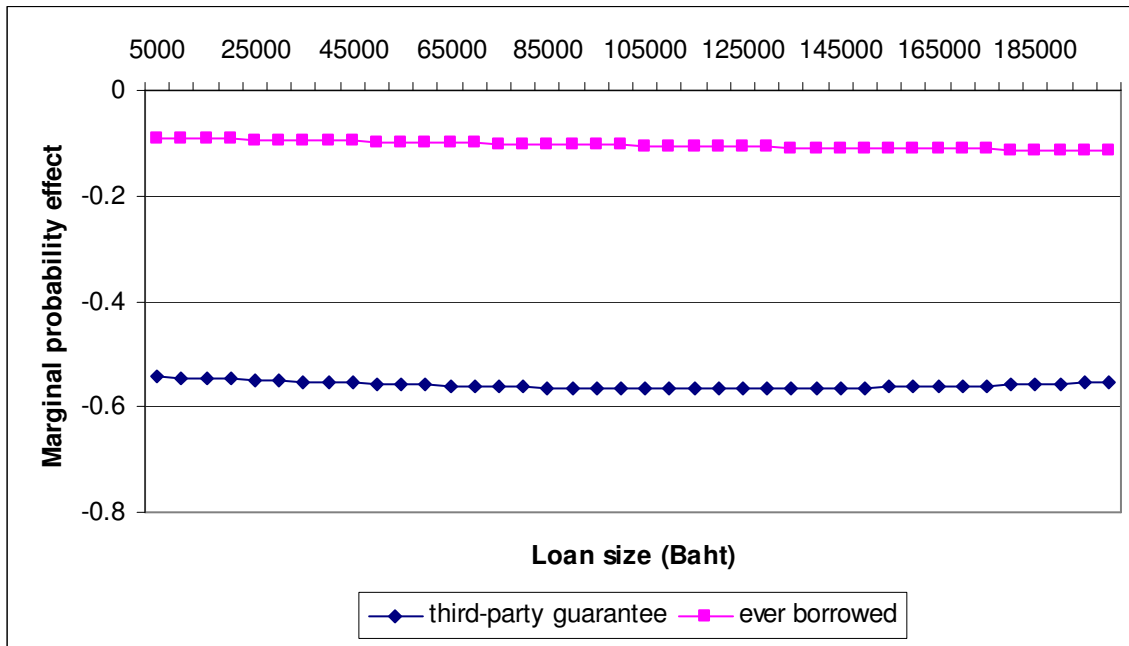
<i>Incidence of collateral</i>	<i>Marginal probability</i>
Loan terms	
Loan size	0.000** (0.000)
Loan duration	0.036** (0.006)
Interest rate	-0.001** (0.001)
Agricultural production loan	0.058* (0.032)
Non-agricultural production loan	0.154** (0.045)
Third party guarantee requirement	-0.542** (0.054)
Household characteristics	
Female headed household	0.014 (0.035)
Age of household head	-0.000 (0.001)
Equivalence scale	-0.010 (0.014)
Years of education of household head	-0.013** (0.006)
Income per equivalence scale	0.000 (0.000)
Amount of savings in lending institution	-0.000 (0.000)
Default risk	
Ratio of loan default to total loans	-0.039 (0.263)
Ratio of late repayments to total loans	0.099 (0.073)
Borrower-Lender relationship	
Membership	-0.088 (0.057)
Ever borrowed	-0.100** (0.039)
Number of lenders	0.022 (0.014)
Lender dummy, CB	-0.182** (0.034)
Lender dummy, CRED	-0.216** (0.023)
Lender dummy, ML	-0.240** (0.025)
Lender dummy, RELA	-0.296** (0.022)
Interaction terms with DEFAULT	
loan size*DEFAULT	-0.000 (0.000)
loan duration*DEFAULT	0.023 (0.024)
interest rate*DEFAULT	-0.001

	(0.003)
third party guarantee*DEFAULT	-0.235
	(0.045)
amount of savings*DEFAULT	0.000
	(0.000)
membership*DEFAULT	0.353
	(0.334)
ever borrowed*DEFAULT	0.181
	(0.169)
No. Obs	1671
PseudoR ²	0.289
Likelihood ratio chi-square (df)	466.820 (30)

Notes:

- (1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.
- (2) The sample reported in this table includes loans from CB, BAAC, CRED, ML, RELA.
- (3) Province dummies are considered.

Figure 1: Marginal Probability Effects of Third-party Guarantee and Relationship Lending on the Provision of Collateral by Loan Size



Appendix: Selection equation of a Heckman correction to the baseline regression (T.8)

<i>Selection equation: whether a loan application is approved</i>	<i>Coefficients</i>		
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>
Amount of loan applied	8.21e-08	-1.01e-07	-7.82e-07
	1.08e-06	1.05e-06	1.14e-06
Use of applied loan: agricultural production loan	.3491842**	.3521119**	.3182576*
	.1485795	.1496445	.1822981
Use of applied loan: non-agricultural production loan	.297182	.3716857*	.3946637*
	.1877722	.2025145	.2359604
Female headed household	.0394631	.036046	.1062159**
	.0300564	.0300667	.0427363
Age of household head	-.1117575	-.131802	.0000953
	.1379287	.1372739	.1622595
Adult equivalent units	.008478	.0126954	.0561658
	.0628577	.0641772	.0712426
Years of education of household head	-.0033481	-.0032742	.0007874
	.0046128	.0046657	.0058106
Income per adult equivalent unit	1.76e-06	2.12e-06	3.51e-06
	2.09e-06	2.16e-06	2.64e-06
Ratio of loan defaults to total loans	-.5245933	-.5323203	.1468006
	.4340373	.434817	.6089177
Ratio of late repayments to total loans	-.6238908**	-.6429599**	-.8437043**
	.2485567	.2510956	.2978337
Lender dummy, CB	-.0792683		
	.4411793		
Lender dummy, CRED	.1264045	.1252725	.0950518
	.1967072	.197092	.204941
Lender dummy, ML	-.9688113**	-.9683051**	-1.017661**
	.1501941	.1514195	.1540741
Lender dummy, RELA	-.6417676**	-.6435424**	
	.1619623	.162254	
No. Obs	1,746	1,684	1,455

Notes: (1) Standard errors of marginal probabilities in parentheses; * p<0.10; ** p<0.05.

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

(3) Province dummies are considered.