A Friend in Need is a Friend Indeed: Theory and Evidence on the (Dis)Advantages of Family Loans*

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— Incomplete, do not quote, comments welcome —

Abstract

We develop a model to study the choice between formal and informal sources of credit in a setting with strategic default due to limited enforcement. Informal loans (e.g., from friends or relatives) are enforced by the threat of both parties losing the friendship relation. In contrast, formal loans (e.g., from banks) can only be enforced via collateral requirement. We show that the optimal informal loan contract features zero interest rate and zero physical collateral requirement. In contrast, formal loans generically charge positive interest and always require collateral. Holding other things equal, borrowers are more likely to choose informal loans for small investment needs, and for relatively low-risk loans (those with low values of the loan size to borrower's wealth ratio). Riskier loans (those with higher values of the loan-to-wealth ratio), up to a limit, are optimally taken from formal sources since physical collateral, unlike social collateral is divisible, and default with a bank is thus less costly than default with a friend. Very risky loans can only be financed by informal sources again, due to insufficient collateral. Empirical results from a cross section of 2880 Thai households are consistent with the predicted pattern of formal versus informal credit.

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1 Introduction

Informal credit is the prevalent form of credit in developing countries, and a large fraction of that credit originates from family or friends (e.g., Paulson and Townsend, 2004 for Thailand; Banerjee and Duflo, 2007 for India).[2] One standard explanation for the dominant prevalence of informal credit in developing economies are market imperfections due to asymmetric information (e.g., Stiglitz and Weiss, 1981; Townsend, 1995) or imperfect enforcement (e.g., Ligon et al., 2002). The widespread inability of poor people to provide the physical collateral required by formal lenders in the presence of information and enforcement problems and the fact that formal lenders face high transaction costs relative to the loan size (e.g. due to lack of credit histories, lack of titles, inefficient courts, etc.) leads to many poor borrowers being rationed out of the formal credit market.[3] This often leaves informal credit as the only option for many of them.[4]

The above explanation seems to presume that formal (market-based) credit, e.g., from commercial banks, is somehow superior to informal (non-market) credit from friends or relatives. We pose the question why this is the case. Put it differently – why is formal credit so prevalent in developed countries? While turning to friends and relatives seems to be a viable option a priori, we do not observe many inter-personal loans in developed countries.[5] Most people go to the bank if they need to borrow money. The question is why? On a first thought, one could imagine banks having a comparative advantage in lending money (e.g., expertise, risk diversification, etc.). But on second thought, this does not seem plausible for smaller sums of money. Turning to friends and relatives seems to be a much better option in many circumstances: relatives and friends have comparative advantage in monitoring and enforcement capacity; being better informed about personal circumstance of borrower, they do not have to incur overhead/fixed cost of monitoring. This is the *peer monitoring* argument [Stiglitz (1990)]. For smaller sums of money, issues like risk aversion or liquidity constraints seem less of a problem. Relatives and friends can do everything a bank can do (in other words use the same contracts, charge interest, specify collateral) but have in addition the friendship as a means of enforcing contractual compliance. As is well known, relationships characterized by moral hazard can achieve more if they are of a long term nature. In addition, the friendship/credit relationship can be viewed as an interlinked relationship which can improve on efficiency compared to a stand-alone credit relationship in the presence of credit market imperfections (Braverman and Stiglitz, 1982, among others).

[2] Paulson and Townsend (2004) report that about 30% of households in their 1997 sample have debts to other households while only 3% (9% for business owners) have loans from commercial banks. Banerjee and Duflo (2007) report that in Udaipur, India about 2/3 of poor households have a loan of which 23% from a relative, 37% from a shopkeeper and only 6% from formal sources. The latter number also applies to 12 other developing countries on which they report.

[3] See Ghosh et al. (2000) for a review of the theory on credit rationing in developing countries.

[4] The spread of microfinance in recent years has provided another source of credit to poor households without collateral drawing on the "social collateral" feature of informal credit we highlight here.

[5] Detailed data on informal loans is hard to find (e.g., in the US there are tax implications if too low interest is charged) but the US National Association of Realtors reports that 9% of home buyers in 2011 received an intra-family loan to help with the downpayment. Basu and Parker (2001) review family finance for business startups in the UK and US. During the financial crisis in 2008, peer-to-peer lending sites such as Virgin Money have experienced a significant increase in loan volume. For a fee, these sites allow friends and family to formalize the loans they make to each other by providing formal loan agreements and the documents to secure the loan.

We analyze the optimal choice between formal and informal credit from the borrower's perspective in an environment with imperfect enforcement. We will use the term"informal" credit as a catchall for different arrangements, whose main characteristic is to rely on informal, personal relationships or *social sanctions* as a means for contract enforcement. The primary example we have in mind are loans from family, relatives, neighbours, and friends, although other institutions such as credit cooperatives, rotating savings and credit associations, some agricultural credit associations may also fit that description. The term "formal credit", in contrast, will be used to describe formal, market-based credit arrangements, where personal relationships are absent. The main idea is as follows. Informal credit from relatives or friends uses "social collateral" measured in terms of the value of friendship/relatedness. This social collateral can serve as a substitute for the physical collateral required by formal lenders. Using social collateral is feasible and, on the surface, cheap (e.g., in terms of the interest rate) for poor people who lack collateralizable assets, especially if all they need is a small loan. However, using the social collateral comes at a cost – unlike physical capital, it is indivisible. If a borrower defaults on an informal loan, the social relationship is severed and the social collateral embedded in the value of friendship is lost completely. There is also a second important difference between social collateral and physical collateral. Physical collateral can be seized or kept by the lender, thus he recovers something in case of default. In contrast, with informal loans both parties suffer from the loss of the social relationship.

This implies that informal credit can be in fact more 'expensive' than formal credit despite its low interest rate – friends are 'too costly' to lose. For borrowers, the utility from a friendship relationship with creditors is an advantage in the sense that it allows them to commit not to behave opportunistically. But at the same time, this utility from the ongoing friendship is also at stake if the project fails. As long as this probability is not zero, i.e., as long as default can occur in equilibrium, the associated loss in utility when the friendship is terminated upon represents a strictly positive personal cost to the entrepreneur, which has to be taken into account when evaluating the the choice between borrowing from a friend vs. bank ex ante.

We show that even if relatives and friends have access to the same contractual means as a banks (e.g., collateral, positive interest rate), they may refrain from using these in equilibrium, and rely solely on the lasting nature of their relationship as a means to enforce compliance. Indeed, we prove that the optimal informal loan contract features zero collateral requirement and charges no interest. In contrast, the optimal bank loan (when used) features positive interest rate and positive collateral requirement. Second, even though banks are at a comparative disadvantage in terms of direct monetary cost of borrowing (they need to be compensated for a cost of liquidating the collateral), entrepreneurs will choose to borrow money from banks for a large range of parameter values corresponding to riskier loans, i.e., those with relatively high loan size to borrower wealth ratio.

We derive two empirically testable predictions of our theoretical model. First the model implies that the probability of observing formal loans should on average increase in loan size, holding other variables constant. The second testable prediction of our model concerns the loan-to-wealth ratio (LTW). For low values of this ratio, the model unambiguously predicts informal credit. As the LTW ratio grows, borrowers switch to formal credit, notwithstanding less favourable contractual terms, since the friendship value lost under default is larger than the collateral that has to be paid to the

bank. As the LTW ratio grows further, it is possible that informal credit is used again, as formal credit becomes unavailable since the formal collateral needed to secure a bank loan is too high relative to the borrower's wealth. In the final part of the paper, we show that data taken from a 1997 survey to Thai households (the Townsend project) are consistent with these predictions. In particular, we document that the loan size has a strong negative effect on the likelihood of observing an informal (personal) loan. At the same time, the relation between choice of loan source and borrowers' loan-to-wealth is non-monotonic: low loan-to-wealth ratios imply a high incidence of informal credit, which decreases as the loan-to-wealth ratio grows, controlling for loan size. Note that this finding is quite surprising, and at first glance, counterintuitive as it implies that loans with higher risks are taken with banks, rather than friends and relatives. Our theory can account for this puzzle, however: the indivisibility of social capital makes those loans too expensive – if a borrower knows that he will default with positive probability, it's cheaper to default with a bank, as the physical capital lost in case of a default (the physical collateral) can be freely adjusted to fit the loan size. The social capital lost in case of a default on a personal loan, in contrast, can not be adjusted. Only at very high loan-to-wealth ratios, where the bank ceases to extend credit, will a borrower resort to friend loans again. In the data, this happens at the top 20 percent of loan-to-wealth ratios. These findings are shown to be robust to selection bias and a possible endogeneity of loan size.

Related literature

Our paper relates to several strands of the literature on the interdependencies between economic development and the development of (financial) institutions. First, our study contributes to a small literature on the co-existence of formal and informal credit. Gine (2011) develops a model of limited enforcement and fixed transaction costs of accessing formal credit to formalize the trade-off between informal and formal credit. After structurally estimating the model using data from Thailand, Gine concludes that the limited ability of banks to enforce contracts, and not the fixed cost, leads to the observed diversity of lenders. Guirkinger (2008) examines why farm households seek informal loans in Piura, a commercial agriculture region in Peru, where formal lenders offer loans at a lower interest rate. A panel data econometric analysis reveals that the informal sector serves various types of clients: households excluded from the formal sector but also households that prefer informal loans because of lower transaction costs or lower risk. Jain (1999) proposes a model in which the formal sector's superior ability in deposit mobilization (economies of scale and scope, security of deposit insurance) is traded off against the informational advantage that lenders in informal sector enjoy about their borrowers. Barslund and Tarp (2008) analyze empirically the determinants of formal vs. informal borrowing by households in rural Vietnam. They find that formal demand is driven by factors such as total land and to a lesser extent by land tenure. Informal credit is negatively associated with age and education and positively dependent on a bad credit history and on the number of dependents, reflecting household need to smooth consumption and address external shocks. When households have assets, they are better able to manage these needs without relying on informal credit.[6]

[6]Related to the 'social capital' basis of informal lending, Calum et al. (2010) study lending relationships involving trust using survey data from farm households in China. They find a relationship between trust and informal lending, and mistrust and formal lending. Informal borrowing amongst farm household friends and relatives in rural areas is incredibly strong and culturally directed. An estimated 2001 and 2750 billion Yuan was involved in informal financing

A different perspective on formal versus informal credit arrangements can be found in Anderson and Francois (2008), who study the degree of formalism that rotating savings and credit associations (ROSCAs) use to help govern their relations in Kiberia, a Keynian slum. Interestingly, and somewhat counter-intuitively, they present evidence that groups with stronger kinship (ethical) ties rely more on formal rules, while groups with weaker inter-individual connections are more likely to use informal decision making and proceudres. The authors attribute this pattern to the fact that groups of homogenous ethnicity find it most difficult to commit to punishment of recalcitrant group members; hence, the need for formal governance protocols. As the authors show, the theoretical model they develop to formalize this idea provides a convincing explanation for the observed pattern of group behavior, both across formalized and unformalized groups, and across homogeneous and mixed ethnicity groups. Our paper draws on their contribution since, similar to Anderson and Francois, we emphasize that the social collateral destroyed if default occurs and a member of the group is excluded represents a loss not only to the borrower but also to the other members of the group (the friends and family in our case).

Finally, the present paper contributes to the literature on informal group formation and social capital. The theoretical foundations of sustaining cooperative outcomes in informal settings relate are twofold. Repeated interactions among members of the same social network improve enforcement [Hoff and Stiglitz (1994), Besley and Coate (1995)]. Second, informal lenders' greater access to local information allows them to write contracts that are more state-contingent than formal contracts, and as such, reduce risk (Bond and Townsend, 1996; Kochar, 1997; Guirkinger, 2008; Bose, 1997). Similar insights underlay attempts to improve lending to the poor by exploiting their information sharing in setting up joint-liability lending (for example, Ghatak (1999) and Morduch (1999)). Our focus is instead on the effects that such ties have on the desirability of informal loans based on social ties, when the environment is sufficiently volatile that default can occur with positive probability in equilibrium.

The paper proceeds as follows. Section 2 develops the model and derives optimal credit arrangements with friends and relatives (Section 2.1) and Banks (Section 2.2.). The two options are compared, and the equilibrium choice of credit is analyzed in Section 3. The model is taken to the data in Section 4. A final Section 5 concludes.

2 The Environment

The economy is populated by two types of agents: lenders (or investors) L, and borrowers (or entrepreneurs) B. The borrowers are endowed with one investment project each. The projects vary in size which is denoted by θ where $\theta \in (0, \bar{\theta}]$. A project requiring θ units of investment at $t = 0$ generates a stochastic return $y(\theta)$ at $t = 1$. The return $y(\theta)$ can have two possible values: $R\theta$ ('project success') with probability p, and 0 ('project failure') with probability $1 - p$, where $p \in (0, 1)$. Borrowers hold illiquid wealth (or assets) w at $t = 0$, where w may differ across agents. We assume that wealth is divisible and collateralizable, but subject to risk. In particular, at time $t = 1$, only a fraction α of the

in Chinese agriculture, most of it between friends and relatives. The case made in this paper is that trust combined with social preferences on the use of debt is a powerful economic force in rural China that can explain farm households' different uses of formal and informal credit.

value of an agent's wealth is collateralizable, where α is a random variable with continuous cdf $G(\alpha)$, support $[\alpha_{\min}, 1]$ with $0 < \alpha_{\min} < 1$, and with expectation $E(\alpha) \in (\alpha_{\min}, 1)$. The parameter α has two possible interpretations. It can be either thought of as expenses that have to be incurred acquiring or storing the collateral, for repossession or liquidizing the asset value at time $t = 1$. Alternatively, one can think of α as a direct loss in value of the asset - a bad harvest reducing the value of the crop, an accident lowering the resale value of a car, or a property market collapse destroying house values. Importantly, the realization of α is unknown to both borrowers and lenders at $t = 0$ when the loan is taken but αw is fully observable at $t = 1$ when loan repayment is due.

Both types of agents are risk-neutral and, for simplicity, do not discount the future. We assume an environment of limited enforcement – the return y is non-verifiable, giving rise to strategic default. Loan terms must therefore be such that borrowers have an incentive to pay the loan back. In addition, we assume that borrowers are subject to limited liability: if a project fails ($y = 0$), borrowers – involuntarily – default in which case the lender cannot punish the borrower beyond seizing the collateral (if applicable). The lenders have access to a riskless storage technology, which converts one unit of investment good at $t = 0$ into one unit of consumption good at $t = 1$. The borrowers' outside option (if they do not invest in their project) is assumed equal to zero.

In what follows, we will distinguish between informal credit and formal credit. Informal creditor are relatives, friends, neighbours, members of the same ethnic group etc, and, more generally, have a (personal) relationship to the borrower characterized by *social capital*, a "friendship", whose value $\gamma > 0$ can be used as an alternative to a collateral. For ease of exposition, we will refer to such loan creditors as "friends", using the subscript F, in what follows. A friend (F lender) has a maximum amount of $\bar{\theta} > 0$ funds to lend. Formal credit occurs when the lender is a stranger, and no personal relationship exists. In the remainder, we refer to all such creditors as"banks", denoted by the subscript B.

The timing of the model is as follows. First, borrowers decide on their loan source. They can either borrow θ from a 'friend' (F) or 'bank' (B) type creditor. Next, the terms of the corresponding contracts $\{r_i, c_i\}$, $i = B, F$ are determined, where the variable r refers to the required gross payment – principal plus interest, if there the borrower does not default (announces that the project was a success) and c denotes the value of the required collateral, in terms of physical assets, which will be seized if the borrower defaults. Throughout, we assume that interest rates cannot be negative, i.e., $r_i \geq \theta$, and that a forced (formal) liquidation of assets is costly in the sense that, due to transaction cost, a \$1 of assets in the hands of the borrower is worth only \$ $\lambda \in (0, 1)$ in the hands of the creditor. Third, nature determines the value of α and whether the investment project has succeeded or failed. The former is observed by both parties. The latter is observed only by the borrower. Forth, the contract terms are executed, and in case of informal credit, lender and borrower play a friendship game to re-affirm their relationship. Finally, payoffs realized.

Let $\phi \equiv \frac{1}{p+\lambda(1-p)} > 1$. In order for our exercise to be meaningful, we impose the following assumption on the parameter values,

Assumption 1.

$$\textit{(i) } pR > \phi \textit{ and (ii) } p > 1/2 \tag{A1}$$

The first part of A1 ensures that all investment projects are worth undertaking and that borrowers would be always willing to take a bank loan in equilibrium (see below for the details). The second part of assumption A1, that the probability of success is sufficiently high, allows us to simplify the analysis and eliminate some cases.

We also assume that the friendship value is sufficiently high so that entrepreneurs who borrow from friends have incentive to repay their loans. To this end, we impose[7]

Assumption 2.

$$\gamma > \frac{p(R-1)}{1-p}\bar{\theta} \qquad \left(> \bar{\theta}\right). \tag{A2}$$

2.1 Informal Credit

2.1.1 The contracting problem

Informal credit allows the borrower and lender to use the threat of terminating their social relationship and the associated (utility) loss of $\gamma \geq 0$ *for each party* as means to ensure compliance and repayment beyond what can be achieved by physical collateral. Rather modelling "friendship" as a infinite-horizon model of repeated interactions, we use a simple coordination (handshake) game in which the parties either 'confirm' or 'reject' the friendship and which takes place at $t = 1$ after the project return has been realized and the contractually specified payment (r_F^1, r_F^0) have, or have not, been made.

B \ L	confirm	reject
confirm	γ, γ	-1,0
reject	0,-1	0,0

In what follows, we assume that the Nash equilibrium (confirm, confirm) is played whenever the required loan repayment is made and the Nash equilibrium (reject, reject) is played otherwise. We will also assume that the same game is played when a borrower is asking a friend for a loan. Consequently, there is an equilibrium where, if a friend refuses to give a loan, they also lose the friendship value γ. In general, the amount of repayment required in a friendship contract is not pinned down by any natural restriction, and would depend on the outcome of bargaining between friends. To simplify the analysis, we assume that borrowers enjoy all the bargaining power, so initial contracts (r_F, c_F) are chosen to maximize the borrowers expected utility.

Before stating the formal maximization program, note first that for γ sufficiently large, the borrower will always avoid the loss of a friendship. This implies that even if the project return is zero, and he therefore cannot pay the lender directly, he will not default *even if the formal collateral is zero.* Instead, he will pay back r_F by liquidizing his assets αw. When contracting with a friend, a borrower thus will *only* default he is *unable* to pay the lender back, i.e., if $y = 0$ and $r_F \leq \alpha w$ or $\alpha \geq \frac{r_F}{w}$, which happens with probability $(1-p)G(\frac{r_F^0}{w})$. Note that an additional formal collateral is of no use

[7] As will become clear below, Assumption 2 ensures that the value of social capital γ is strong enough to ensure repayment of informal loans. See below.

to secure repayment here. Indeed, we will see shortly that we must have $c_F = 0$ in equilibrium. For the moment, however, suppose the contract also specified a formal collateral. In case the borrower does not repay the loan ($\alpha \geq \frac{r_F}{w}$), a value of c_F in assets is seized provided $c_F \leq \alpha w$. Otherwise, all the borrower's assets are liquidated and the actual transfer from borrower to creditor is thus equal to $\min\{\alpha w, c_F\}$, which is worth $\lambda \min\{\alpha w, c_F\}$ to the lender.[8]

Given the continuation strategies described above, the $t = 0$ contracting problem between an F-lender and her borrower friend with project size $\theta \leq \bar{\theta}$, friendship value γ, and initial wealth w can accordingly be written as follows:

$$\max_{r_F, c_F} \quad p(R\theta - r_F) - (1-p)\left[\left(1 - G\left(\frac{r_F}{w}\right)\right) r_F + G\left(\frac{r_F}{w}\right)\gamma + \int_{\alpha_{\min}}^{1} \min\{c_F, \alpha w\} dG(\alpha)\right] \quad (\text{OBJ}_B)$$

$$\text{s.t.} \quad \left[p + (1-p)\left((1 - G(\frac{r_F}{w})\right)\right] r_F - G\left(\frac{r_F}{w}\right)\gamma + \lambda \int_{\alpha_{\min}}^{1} \min\{c_F, \alpha w\} dG(\alpha) - \theta \geq -\gamma \quad (\text{PC}_L)$$

$$p(R\theta - r_F) - (1-p)\left[\left(1 - G\left(\frac{r_F}{w}\right)\right) r_F + G\left(\frac{r_F}{w}\right)\gamma + \int_{\alpha_{\min}}^{1} \min\{c_F, \alpha w\} dG(\alpha)\right] \geq 0 \quad (\text{PC}_B)$$

$$r_F \leq \gamma + c_F \quad (\text{IC}_B)$$

$$r_F \geq \theta \quad (\text{NN})$$

The first constraint (PC_L) is the lender's participation constraint: if the lender makes the loan, she receives r_F in case the project succeeds (which occurs with probability p) or, as argued above, if the project fails but the borrower can repay by liquidizing assets, (which occurs with probability $1-p$ times $1 - G(\frac{r_F}{w})$. Otherwise, she loses γ and will receive a collateral value $\lambda \min\{\alpha w, c_F\}$. The opportunity cost of lending θ is θ itself. The right hand side reflects the fact that if an F lender refuses to make the loan she also loses the friendship value γ. The constraint (PC_B) is the borrower's participation constraint stating that the borrower's expected utility of taking a loan with terms (r_F, c_F) must exceed her outside option of zero obtained if the loan is not taken. The third constraint (IC_B) is the incentive constraint for the borrower to pay back the loan if she has the money, as opposed to reneging and losing γ. We assume that the friendship value γ is high enough so this constraint never binds at the optimum (exact conditions are provided below). The final constraint (NN) reflects our assumption of non-negative interest rates. If it binds, theinterest rate equals to zero. Naturally, a subset of all constraints may bind at the optimal contract.

[8] Note that we assume no cost of liquidation if the borrower himself liquidizes the assets voluntarily in order to be able to repay the creditor. This assumption can easily be relaxed. What is important here is the reasonable assumption that transaction cost are if the bank that seizes the assets. It seems reasonable to presume that forced bank liquidation is associated with higher transaction cost than voluntary private liquidation for a variety of reasons.

2.1.2 The optimal informal loan contract

Taking the borrower's initial wealth $w > 0$ as given, and recalling our assumption that γ is large enough to guarantee (IC_B) holds, we start with the following observation.

Lemma 1. *The lender's participation constraint in an F-loan is not binding; it is satisfied for any r_F^0, r_F^1 which satisfy constraints (IC_B) and (NN)*

Next, observe that it is optimal to set r_F and c_F as low as possible as long as (NN) and (PC_L) are satisfied. But we already know from Lemma 1 that lender participation is of no concern, and Assumption 2 ensures $\gamma \geq \overline{\theta}$. Hence:

Lemma 2. *In any optimal informal credit arrangement, we must have $r_F = \theta$ and $c_F = 0$.*

We expand on this latter point below. What remains to be checked is the borrower's participation constraint (PC_B). Given $r_F^1 = \theta$ and $c_F = 0$, (PC_B) is equivalent to

$$(pR-1)\frac{\theta}{w} + (1-p)G(\frac{\theta}{w})(\frac{\theta}{w} - \frac{\gamma}{w}) \geq 0 \tag{1}$$

There are three possible cases depending on the value of the loan/project size to wealth ratio, $\frac{\theta}{w}$.

1. **Case F1 (low loan-size-to-wealth ratio):** $\frac{\theta}{w} \leq \alpha_{\min}$. In this case we have $G(\theta/w) = 0$ and (1) is satisfied for any such project size since $pR > 1$ by Assumption A1. No default ever occurs for such loans, which are small relative to the borrower's wealth and no social capital is lost (friendships broken) in equilibrium. This case holds for loan size $\theta \leq \min\{\bar{\theta}, \alpha_{\min} w\}$.

2. **Case F2 (high loan-size-to-wealth ratio):** $\frac{\theta}{w} \geq 1$. Then $G(\theta/w) = 1$ and (1) and hence (PC_B) is violated for any feasible loan size $\theta \in [0, \bar{\theta}]$ given that $\gamma > \frac{p(R-1)\bar{\theta}}{1-p}$ by Assumption A2. Thus, no F-loans are taken for such values of the ratio $\frac{\theta}{w}$. These are either very poor borrowers (low w) or, more generally, agents with large investment needs relative to their collateralizable wealth. Note also that it is the borrowers, not the lenders, who refuse such loans.

3.**Case F3 (intermediate loan-size-to-wealth ratio):** $\alpha_{\min} < \frac{\theta}{w} < 1$. From cases F1 and F2 we know that, for given w the borrower's participation constraint (PC_B) is always satisfied when $\frac{\theta}{w}$ is sufficiently low and always violated for $\frac{\theta}{w}$ sufficiently high. Let $\hat{\alpha}_F(w) \in (\alpha_{\min}, 1)$ be the value of the ratio $\frac{\theta}{w}$ for which (1) holds with equality.[9] We thus have that F-loans are taken for loan-to-wealth rations satisfying $\alpha_{\min} < \frac{\theta}{w} \leq \min\{\hat{\alpha}_F(\theta), \frac{\bar{\theta}}{w}\}$. Note that it is possible for the borrower to be unable repay $r_F = \theta$ in equilibrium in Case F3, depending on the realization of α. Thus, some friendships are broken with positive probability.

The above analysis is summarized in

[9]Note that, by continuity such value always exists since at $\frac{\theta}{w} = \alpha_{\min}$ (Case F1) the LHS of (1) is strictly positive, while at $\frac{\theta}{w} = 1$ (Case F2) it is negative. See Lemma A1 in the Appendix for sufficient condition for uniqueness of $\hat{\alpha}_F(w)$.

Proposition 1 (Informal Credit)**.** *Suppose Assumptions A1 and A2 hold. Optimal informal credit arrangements are as follows:*

(i) no informal credit occurs for 'not-too-large' and 'high default risk' projects – those with $\theta \leq \bar{\theta}$ *and* $\frac{\theta}{w} > \hat{\alpha}_F(w) \in (\alpha_{\min}, 1)$*;*

(ii) informal credit emerges for 'not-too-large' and 'low default risk' projects – those with $\theta \leq \bar{\theta}$ *and* $\frac{\theta}{w} \leq \hat{\alpha}_F(w)$*. All such loans have no collateral and zero interest i.e.,* $r_F = 0$ *and* $c_F = 0$*. If* $\frac{\theta}{w} > \alpha_{\min}$ *the friendship is rescind (default occurs) with positive probability;*

(iii) no informal credit is available for 'very large' projects – those with $\theta > \bar{\theta}$*.*

Intuitively, very small loans or loans where the loan size is not too large relative to the borrower's wealth, namely those with $\frac{\theta}{w} \leq \alpha_{\min}$), are both available and mutually beneficial, since there is no risk of default – the borrower has sufficient assets to repay even in the worst state of the world. For higher loan-to-wealth ratios, $\frac{\theta}{w} > \alpha_{\min}$, default will occur and the social capital γ will be lost with positive probability in equilibrium. In this case, the borrower must weight the risk of default against the expected utility gain from undertaking the project. The latter outweighs the former provided that $\frac{\theta}{w} < \hat{\alpha}(w)$). Proposition 1 also shows that informal credit is always characterized by no physical collateral and zero interest rate (this will be confirmed in the data, as we will see below). Note that this is a result and not an assumption – we only ruled out negative interest rates.[10]

Finally, for values $\frac{\theta}{w} \geq \hat{\alpha}(w)$, informal credit is *feasible but undesirable.* Even though informal credit is available in principle, and as before would involve zero interest and collateral, it is not optimal to ask one's friends for an informal loan: the risk of losing the friendship due to 'unusual circumstances' where the project fails *and* the borrower cannot possibly repay the money out of his private wealth even if he wanted to, dominates.

2.1.3 Comparative statics

We next analyze how the loan-to-wealth ratio threshold $\hat{\alpha}_F(w)$ from Proposition 1 depends on the model parameters p, R, w and γ. Remember, this threshold is important since it determines the extent of informal credit in equilibrium. Using the definition of $\hat{\alpha}_F(w)$, evaluating *(1)* at $\hat{\alpha} = \hat{\alpha}_F(w)$ yields

$$(pR - 1)\hat{\alpha} + (1 - p)G(\hat{\alpha})(\hat{\alpha} - \frac{\gamma}{w}) = 0 \tag{2}$$

By Assumption A1, for this equality to hold it must be that $\hat{\alpha} < \frac{\gamma}{w}$ so we can write (2) as:

$$G(\hat{\alpha}) = \frac{(pR - 1)\hat{\alpha}}{(1 - p)(\frac{\gamma}{w} - \hat{\alpha})} \tag{3}$$

Both sides of (3) can be viewed as functions of α on the interval $[\alpha_{\min}, 1]$ with equality obtaining when evaluated at $\alpha = \hat{\alpha}$. Note first that both sides are strictly increasing in α. The left hand size equals 0 at $\alpha = \alpha_{\min}$ and equals 1 at $\alpha = 1$. The right hand side is positive at $\alpha = \alpha_{\min}$ and less

[10] Of course, what is important for this result is that the bargaining power of the lender is not too large.

than 1 at $\alpha = 1$. Hence, assuming a unique crossing $\hat{\alpha}$ (see Lemma A1 in the Appendix for sufficient conditions), the right hand side of (3) must cross the left hand side from above at $\hat{\alpha}$. We have the following comparative statics:

1. An increase in the friendship value γ shifts the graph of the right hand side of (3) down, thus the threshold $\hat{\alpha}$ decreases in γ ceteris paribus – less F-loans are given. The intuition is that F-loans become more costly to both parties.

2. An increase in the borrower's initial assets w shifts the graph of the right hand side of (3) up, thus the threshold $\hat{\alpha}$ increases ceteris paribus. Intuitively, a larger wealth can support a wider range of loan sizes.

3. An increase in the project's marginal return upon success R shifts the graph of the right hand side of (3) up, thus the threshold $\hat{\alpha}$ increases ceteris paribus. Intuitively, a higher project return can support a wider range of loans.

4. An increase in the probability of success p shifts the graph of the right hand side of (3) up thus the threshold $\hat{\alpha}$ increases ceteris paribus. The intuition is that a higher probability of success supports more loans.

The effects from varying w, R and p are intuitive – better 'quality' borrowers have access to a wider range of possible loan sizes. The effect of varying the friendship value γ is perhaps less obvious ex-ante as it implies that 'stronger' friends are less likely to lend to each other ceteris paribus (the feasible range of projects θ is smaller). The reason is, of course, that conditional on taking a loan the loss of social collateral γ when default is possible in equilibrium. However, note that pairs with low γ would be unable to support any informal loans (here this is ruled out by Assumption A2 but easily obtains as an equilibrium result if we relax this assumption).

2.2 Contracting with Banks

2.2.1 The contracting problem

There are two main differences between formal and informal credit, or borrowing from a bank versus borrowing from a friend. First, we assume that banks have unlimited funds: there is no cap on the maximal size of the loan (the upper bound $\bar{\theta}$ for banks can be thought of as infinite). Second, there is no social capital or friendship value γ. Consequently, bank loans need to be secured by posting physical collateral – otherwise borrowers cannot commit not to always claim project failure $y = 0$ and pocket the return from the project.

Treating loan sources symmetrically, we maintain the assumption that borrowers have the entire bargaining power. In other words, banks are perfectly competitive and the optimal loan contract maximizes borrower's utility subject to participation and incentive compatibility. Limited liability also still applies – if the borrower does not pay back r_B, the bank cannot do anything beyond seizing the posted collateral c_B. In case the project fails and $y = 0$, the borrower has no cash flow and

can replay the specified amount c_B only if $c_B \leq \alpha w$. Otherwise, the equilibrium, the borrower's assets need to be sold off and the repayment is αw. The actual transfer from borrower to creditor is thus equal to $\min\{c_B, \alpha w\}$, which is worth $\lambda \min\{c_B, \alpha w, \}$ to the bank. If the project succeeds, the borrower pays back r_B. The constraint $c_B \geq r_B$ ensures that no strategic default occurs - the borrower weakly prefers to pay back r_B rather than default and pay c_B.[11] Using analogous notation as in the previous section, the borrower's maximization problem reads

$$\max_{r_B, c_B} \quad p\left[R\theta - r_B\right] - (1-p) \int_{\alpha_{\min}}^{1} \min\{c_B, \alpha w\} dG(\alpha) \tag{OBJ$_B$}$$

$$\text{s.t.} \quad p r_B + (1-p)\lambda \int_{\alpha_{\min}}^{1} \min\{c_B, \alpha w\} dG(\alpha) \geq \theta \tag{PC$_L$}$$

$$p[R\theta - r_B] - (1-p) \int_{\alpha_{\min}}^{1} \min\{c_B, \alpha w\} dG(\alpha) \geq 0 \tag{PC$_B$}$$

$$c_B \geq r_B \tag{IC$_B$}$$

$$r_B \geq \theta \tag{NN}$$

The optimal formal credit contract maximizers the borrower's expected utility (OBJ$_B$) subject to the following constraints. The first constraint (PC$_L$) ensures that the bank breaks even. The expected value of giving the loan and collecting the respective repayments under success or failure (the left hand side) must be larger than the opportunity cost of lending θ (the right hand side). The (PC$_B$) is the borrower's participation constraint, stating that his expected utility of taking the loan with given terms (r_B, c_B) must exceed her outside option of zero. The (IC$_B$) constraint ensure that the borrower will not want to strategically default, i.e., r_B is indeed paid whenever the project succeeded. Due to Assumption 1, the revenue from the project will be sufficient to cover the repayment r_B in full. The final constraint (NN) reflects the assumed non-negativity of interest rates.

[11] If $c_B > \alpha w$, one may wonder whether it may not be possible for the borrower to default strategically, paying back αw rather than c_B. The implicit assumption here is that if the borrower claims default although the project has indeed succeeded ($y = 1$), and also claims that the remaining assets are not sufficient to pay back c_B, an audit would reveal the cash flow generated by the successful project. Thus, a total of r_B would still be seized. None of the collateral, and none of the illiquid assets of the borrower would have to be touched, and no transaction cost λ would apply. The analysis remains qualitatively unaffected if one alters this assumption, assuming for example that if $r_B > \alpha w$, the borrower could strategically default, hide the proceeds from the projects, and instead have his assets αw liquidized.

2.2.2 The optimal formal loan contract

Note first that, by inspection, it is again optimal to set r_B and c_B as low as possible, while satisfying all the constraints.[12] The incentive constraint (IC_B) then implies $c_B = r_B > 0$: the bank will require a positive collateral. Next, evaluating the expected payoff of the bank [the left-hand side of (PC_L)] at zero interest rates $r_B = c_B = \theta$, we obtain

$$(p + (1-p)\lambda) \int_{\alpha_{\min}}^{1} \min\{\theta, \alpha w\} dG(\alpha) \quad \leq (p + (1-p)\lambda)\theta \qquad < \theta$$

Thus, the optimal interest rate, r_B charged by banks has to be positive to break even. Note that $\lambda < 1$ is not the only reason for this; the possibility of default reflected in the integral can cause the above inequality to be strict too.

From the above discussion, it follows that the optimal bank loan contract is a repayment amount r_B and a collateral c_B with $c_B = r_B \equiv r_B^* > \theta$ such that the lender's participation constraint (PC_L) is satisfied with equality

$$(p + (1-p)\lambda) \int_{\alpha_{\min}}^{1} \min\{r_B^*, \alpha w\} dG(\alpha) = \theta \tag{4}$$

Recall $\phi = \frac{1}{p+\lambda(1-p)} > 1$. As in the case of informal credit, there are three possible cases in terms of the loan size to wealth ratio. We will also verify that the borrower's participation constraint (PC_B) is satisfied whenever a bank loan is feasible.

1. **Case B1 (low loan-size-to-wealth ratio):** $\frac{\theta}{w} \leq \frac{\alpha_{\min}}{\phi}$. The borrower always has sufficient funds to repay the loan. In case of failure the money comes from liquidating (part of) his $t = 1$ assets, αw while in case of success the repayment comes from the project return $R\theta$.[13] There is no involuntary default. $\frac{\theta}{w} \leq \frac{\alpha_{\min}}{\phi}$. This is the case for which r_B^* solving (4) satisfies $r_B^* \leq \alpha_{\min} w$ i.e., $r_B^* \leq \alpha w$ for all α and so, from (4) we have that $r_B^* = \phi\theta > \theta$. For this to hold need $\phi\theta \leq \alpha_{\min} w$ i.e., $\frac{\theta}{w} \leq \frac{\alpha_{\min}}{\phi}$ as assumed. Note also that the threshold value, $\frac{\alpha_{\min}}{\phi}$ for the loan to wealth ratio $\frac{\theta}{w}$ is lower than in the respective informal credit case (case F1) – only relatively smaller loans are riskless for the bank.

2. **Case B2 (high loan-to-wealth ratio):** $\frac{\theta}{w} > \frac{E(\alpha)}{\phi}$. No B-loans are taken. When $\frac{\theta}{w} > \frac{E(\alpha)}{\phi}$ we have $\theta > wE(\alpha)\frac{1}{\phi} \geq (p + (1-p)\lambda) \int_{\alpha_{\min}}^{1} \min\{r_B^*, \alpha w\} dG(\alpha)$. The second inequality holds since $\alpha w \geq \min\{r_B^*, \alpha w\}$ for all α and hence $wE(\alpha) = \int_{\alpha_{\min}}^{1} \alpha w dG(\alpha) \geq \int_{\alpha_{\min}}^{1} \min\{r_B^*, \alpha w\} dG(\alpha))$. Thus,

[12] Formally, the function

$$\pi(r) \equiv \int_{\alpha_{\min}}^{1} \min\{r, \alpha w\} dG(\alpha) = (1 - G(\frac{r}{w}))r + w \int_{\alpha_{\min}}^{r/w} \alpha g(\alpha) d\alpha$$

is increasing in r with $\pi'(r) = 1 - G - \frac{G'}{w} r + \frac{1}{w} w \frac{r}{w} G' = 1 - G > 0$.

[13] Note that by Assumption A1, $R > 1/p > \phi$.

(PC_L) cannot be satisfied in this case. Note also that the $\frac{\theta}{w}$ threshold above which no bank loans are possible, $\frac{E(\alpha)}{\phi}$, is smaller than 1 – the corresponding threshold under informal lending (see case F2). This means that "riskier" loans will be given by friends, not banks. The intuition is that the threat of losing the indivisible friendship value can support such loans while the physical collateral cannot.

3. **Case B3 (intermediate loan-to-wealth ratio):** $\frac{\alpha_{\min}}{\phi} < \frac{\theta}{w} \leq \frac{E(\alpha)}{\phi}$. In this case, similarly to in Case F3, there will be some threshold value $\hat{\alpha}_B \in [\alpha_{\min}, 1]$ such that $r_B^* > \alpha w$ for $\alpha < \hat{\alpha}_B$ and vice versa, $r_B^* < \alpha w$ for $\alpha > \hat{\alpha}_B$. Using (4), the values of r_B^* and $\hat{\alpha}_B$ must satisfy:

$$(1 - G(\hat{\alpha}_B))r_B^* + w \int_{\alpha_{\min}}^{\hat{\alpha}_B} \alpha dG(\alpha) = \phi\theta$$

Since we also must have $r_B^* = \hat{\alpha}_B w$ by the definition of $\hat{\alpha}_B$, the optimal gross interest rate $r_B^*(w, \theta)$ is implicitly given by:

$$(1 - G(\frac{r_B^*}{w}))r_B^* + w \int_{\alpha_{\min}}^{r_B^*/w} \alpha dG(\alpha) = \phi\theta \tag{5}$$

Given the parametric assumptions, the r_B^* solving (5) will satisfy $w \geq r_B^* > \phi\theta$. Finally, we need to verify the borrower's participation constraint (PC_B). Borrower's expected utility evaluated at the optimal contract in both cases B1 and B3 equals $\theta(pR - \phi)$ which is non-negative by Assumption A1. To summarize,

Proposition 2 (Formal Credit)**.** *Suppose Assumptions A1 and A2 hold. Optimal formal credit arrangement are characterized as follows:*

(i) no formal credit is extended for 'high default risk' projects – those with $\frac{\theta}{w} > \frac{E(\alpha)}{\phi}$.

(ii) positive-interest, positive-collateral bank loans, with $r_B = c_B = r_B^* = \phi\theta$ *are given for 'low default risk' projects – those with* $\frac{\theta}{w} \leq \frac{\alpha_{\min}}{\phi}$. *The bank always receives* $\phi\theta$ *from the borrower either from the project return or by seizing the borrower's collateral.*

(iii) positive-interest bank loans, with $r_B = c_B = r_B^* \in (\phi\theta, w]$ *where* r_B^* *solves (5) emerge for 'intermediate default risk' projects – those with* $\frac{\alpha_{\min}}{\phi} < \frac{\theta}{w} \leq \frac{E(\alpha)}{\phi}$. *There is involuntary default, i.e., the bank sometimes receives* αw *from the borrower, which is less than* r_B^* *depending on the realization of* α.

These results are quite intuitive. The key is to recall that since the optimal loan contract involves a collateral equal to the loan value, the bank faces only one type of true risk, namely that the actual value of the borrower's assets ex post falls short of the posted collateral value. Project failure by itself, in contrast, is largely irrelevant to the bank. Thus, projects with very high default risk are ineligible for bank loans since the bank cannot break even as the expected payout in case of a default is too small. When bank loans are issued, the interest rate charged is increasing in the default risk (the loan size to borrower's wealth ratio). Low-risk projects, those with loan-to-wealth ratio less than $\frac{\alpha_{\min}}{\phi}$ are charged constant and lower gross interest rate (equal to $\phi\theta$) relative to higher risk projects.

3 Formal versus Informal Credit

We are now in a position to compare formal and informal credit arrangements, and their respective pros and cons from the borrower's perspective. The advantage of using informal arrangements is twofold. First, because of the social capital that can be pledged to secure the loan, informal credit can be extended to borrowers with low income and few assets. This, obviously, is the main premise of microcredit institutions that extend small loans to impoverished borrowers who typically lack collateral, steady employment and a verifiable credit history on the basis that group lending is be able to harness social collateral. Banks, in contrast, require a formal collateral to ensure compliance and repayment. Second, because of said social capital, informal loans are also quite cheap. Friends and relatives do not generally expect the borrower to pay the loan back with interest. The reason is that they do not need to be compensated for additional risk of default - even if the project fails, they know that the borrower will want to pay them back. And if the actual default risk, and thus the risk of losing the social collateral, is to great, both borrower and lender would not want to enter the agreement in the first place.

Borrowing from friends and relatives, however, also comes with a cost, although this cost may be less obvious. In particular, two characteristics of informal credit arrangements put them at a disadvantage relative to formal credit. First, there is an upper limit $\bar{\theta}$ on how much can be borrowed: friends and relatives generally do not have unlimited funds available. Second, and most importantly, the capital that is posted as a collateral to secure the loan – the friendship value – is *indivisible*, implying the entire amount γ is pledged to support repayment, even though for smaller loans, say, a much lower social collateral would suffice. The latter point is one of the primary insights of this paper, and one of the driving forces behind any formal credit that emerges in equilibrium.

To investigate this question in more detail, we next study the optimal choice of the loan source, given the parameters w, p, R, γ. To begin, recall that $\hat{\alpha}_F \in (\alpha_{\min}, 1)$ is the upper bound on the loan-to-wealth ratio θ/w for which informal credit is desirable, implicitly defined by (1) holding with equality. Loans beyond that threshold will be too costly in terms of risk of loosing the friendship. For formal credit, the corresponding upper bound is $E(\alpha)/\phi$. For larger LTW ratios, formal credit becomes unavailable as the borrower does not have enough collateral (in expectation) to secure repayment to the bank. Thus, only borrowers with $\frac{\theta}{w} \leq \min\{\hat{\alpha}_F, \frac{E(\alpha)}{\phi}\}$ can borrow from both banks and friends in principle. To characterize the optimal loan choice, in addition to the previous assumptions we assume that

Assumption 3.

$$\frac{E(\alpha)}{\phi} > \alpha_{\min} \tag{A3}$$

This assumption guarantees that bank loans will be used in equilibrium not only when the required loan exceeds the friend loan maximum $\bar{\theta}$. See below for the details. We next answer the question: if an entrepreneur is able to borrow from both sources (see Proposition 3), which one does she prefer? Assume $\theta < \bar{\theta}$, u.e., informal credit is *a priori* feasible. There are three possible cases.

Proposition 3 (Low-Risk Loans)**.** *Suppose* $\frac{\theta}{w} \leq \alpha_{\min}$*. Borrowers will make exclusive use of informal*

credit with no interest and no collateral. No default occurs in equilibrium.

Proof. Suppose $\theta \leq \bar{\theta}$, Propositions 1 and 2 imply $r_B^* = \phi\theta$ and $r_F^* = \theta$, i.e., informal credit is both feasible and cheaper. Also, in this range of loan-to-wealth ratios, the actual default risk is zero, i.e., we have $G(\frac{\theta}{w}) = 0$. Thus, the borrower's expected utility from an informal loan is equal to $U_F = (pR-1)\theta$. In contrast, his expected utility if he goes to the bank for a loan is $U_F = p[R\theta - \phi\theta] - (1-p)\phi\theta = \theta(pR - \phi)$. Due to $\phi > 1$, friend-loans are strictly preferred, whenever they are feasible. Bank loans will therefore only be used for $\theta > \bar{\theta}$ in this case. □

Proposition 4 (Intermediate-Risk Loans)**.** *Suppose* $\alpha_{\min} < \frac{\theta}{w} \leq \min\{\alpha_F, \frac{E(\alpha)}{\phi}\}$*. Borrowers will then use informal credit for lower values of the loan-to-wealth ratio and formal credit otherwise. Default occurs with positive probability in equilibrium.*

Proof. By Proposition 2 r_B^* solves (5) while we still have $r_F^* = \theta$ from Proposition 1. For such $\frac{\theta}{w}$ we have $G(\frac{\theta}{w}) \in (0,1)$ and $\gamma > \theta$. The borrower's expected utility from using informal credit is

$$U_F = (pR-1)\theta - (1-p)G(\frac{\theta}{w})(\gamma - \theta)$$

which he will compare to his expected utility from formal credit, which continues to be $U_B = \theta(pR-\phi)$. The optimal loan type chosen now depends on the parameter values. Recall that $U_F > U_B$ at $\theta/w = \alpha_{\min}$; $U_F = 0$ at $\theta/w = \hat{\alpha}_F$; and $U_B > 0$ always. Thus, friend loans will be optimal for low θ/w ratios, while bank loans will be optimal for higher $\frac{\theta}{w}$ ratios in the assumed range. □

Proposition 5 (High-Risk Loans)**.** *Suppose* $\min\{\alpha_F, \frac{E(\alpha)}{\phi}\} < \frac{\theta}{w} \leq \max\{\alpha_F, \frac{E(\alpha)}{\phi}\}$*. Borrowers will use informal credit if* $\alpha_F > \frac{E(\alpha)}{\phi}$*, as formal credit is not available. Otherwise, they will use formal credit. Default occurs with positive probability in equilibrium. Borrowers with* $\frac{\theta}{w} > \max\{\hat{\alpha}_F, \frac{E(\alpha)}{\phi}\}$ *can (will) not borrow from any source – either the cost of social collateral is too high or the lender cannot break even.*

Proof. Proposition 3 follows directly from Propositions 1 and 2 (Case ii) above. □

Empirical Implications

The model in the above section has a number of implications, some of which are worth investigating empirically. Naturally, not all parameters and variables will be present in the data below. For example, finding a proxy for the crucial parameter α, describing how borrowers' wealth is subject to risk, has been proven difficult. To derive comparative statics properties of the model that can be linked to the dataset on household finances in Thailand that we employ, we will therefore concentrate on the variables that we can find corresponding data for, namely loan size θ, collateral c, interest rate r/θ and the loan-to-wealth ratio θ/w.

The first conclusion that emerges is that the probability of formal loans should, on average, increase in loan size θ, holding other variables constant. Assuming bank loans are feasible, θ/w not too large, this result is a straightforward implication of the fact that friends and family do not have unlimited funds,

i.e., that informal loans above $\bar{\theta}$ cannot be extended. Of course, one could imagine that borrowers can tap into multiple informal sources if their credit requirements exceed $\bar{\theta}$. But adding loans will increase the risk of equilibrium default, which in turn implies a costly loss in social capital. The crucial point to take home from the previous section is that if borrowers default, they much rather default with the bank than with their friends and family.

The second implication of the above analysis concerns the loan-to-wealth ratio $\frac{\theta}{w}$. For low values, the model unambiguously predicts informal credit. As the LT ratio grows, borrower start switching to formal credit *although the latter has less favourable contractual terms (high interest, positive collateral)* since the friendship value lost in case of a default is much higher than the collateral that has to be paid to the bank in the same circumstances. Again, defaulting with banks is strictly preferable to defaulting with friends because the physical collateral is divisible while the social capital is not. As the LTW ratio grows further, we see from Proposition 5 hat one of two situations can occur. Either, formal credit is still available, and thus preferred for the reason just mentioned. Or formal credit becomes unavailable. In this latter case, informal credit becomes attractive again, as the formal collateral to ensure those is too high for bank loans to be extended over this range.

4 Empirical Findings

4.1 Data Description

This section will test the empirical predictions of the theory above with data from rural households in Thailand. The source is a socioeconomic survey of 2880 households in Thailand, conducted in 1997 by the Townsend Thai Project[14] to gather information on the existence and use of informal and formal financial mechanisms and institutions. The sample deliberately focuses on two two distinct regions, the more highly developed Central Region located near Bangkok, and the pooper semi-arid Northeast region. The dataset provides a wealth of pre-financial crisis socioeconomic and financial data, including data on current and retrospective information on wealth, occupational history, household demographics, entrepreneurial activities and education. Most importantly for our present purpose, the data also provide detailed and unique information on access and use of a wide variety of formal and informal financial institutions such as commercial banks, agricultural banks, village lending institutions, money- lenders, as well as friends, family and business associates.

Households were asked detailed questions about their borrowing and lending behaviour such as the total number of outstanding loans, the value of each loan, the date the loan was taken, the length of the loan period, why the money was borrowed and whom it was borrowed from. The latter category contained a range of possible answers: Neighbors, Relatives, the BAAC, a Commerical Bank, Agricultural cooperative, Village Fund, moneylender, a store owner or other business, a landlord, or other. Table 1 breaks the loan sources down into the respective categories. We see that borrowing from friends and family comprises about 25 % of all loans. Borrowing from commercial banks, in contrast, is

[14]The survey was fielded in May, prior to the economic/financial crisis which began with the devaluation of the Thai baht in July 1997. For further details, including sample selection and administration of the survey for each of the various instruments, see the Townsend Thai Project website http://cier.uchicago.edu/about/.

Table 1: Loan Source

Source	Freq.	Percent
neighbor	272	7.94
relative	552	16.11
BAAC	1,185	34.58
Commercial Bank	106	3.09
Agricultural Cooperative	347	10.13
Village Fund	32	0.93
moneylender	338	9.86
store owner	141	4.11
other	454	13.25
Total	3,427	100.00

[a] **Note:** Category "Other" includes the following possible answers: Rice Bank, Landlord, Purchaser of Output, Supplier of Input, as well as the answer "other" (the latter has 344 observations).

relatively rare, reflecting the fact that a large fraction of the population does not have direct access to a commercial bank. Instead, people often resort to moneylenders or, more importantly, the Bank for Agriculture and Agricultural Cooperatives (BAAC). The BAAC is a State owned enterprise created to provide loans primarily for "agricultural infrastructure" (Minitry of Finance, Thailand, 2008). While most loans are to individual farmers, those are usually organized in borrowing groups under the clause of joint liability. Interest rates are usually about 1% to 2 % lower than those of commercial banks. Since the BAAC is a hybrid - charging interest and requiring collateral but using informal relations to secure repayment – we will largely exclude those loans from the analysis below, focusing on commercial bank loans and moneylender credit versus loans from relatives and neighbours.

Summary statistics of the data are provided in Table 2. The categorical variable 'salary' indicates whether the household read draws a regular monthly or weekly income, or works for the government. The variable 'tenure' equals one that the household has resided in the village for more than six years. Finally, the variable 'bank' is an indicator variable that is set to one if households are a customer or member of a commercial bank. All other variables are self-explanatory. For comparison, note that the average annual income in Thailand in 1996 was 105,125 baht, or roughly US $4200 [Paulson and Townsend (2004)].

The empirical work to follow investigates the relationship between the source of the loan and two main explanatory variables: household wealth, and loan size. Before doing so, however, it is instructive to look at two other important loan characteristics: collateral requirements and interests rates. Although we the survey did not directly ask for the interest rate of the loan, we easily can infer the figure from our data using length of loan period, repayment value, and initial loan size. Figure 1 shows the imputed interest rates as well as the ratio of collateral to loan size (collateral ratio) for for different sources, Commercial banks, Moneylenders, Neighbours, and Relatives. Consistent with the implication of the

Table 2: Summary Statistics

Variable	Obs.	Median	Mean	St. Dev	Min	Max	Units
yearly HH income	1,441.	60.50	158.84	579.24	0.00	15,710.00	1,000 baht
wealth (assets)	1,444	488.55	1,027.78	1,810.86	9.00	21,166.30	1,000 baht
loan-to-wealth ratio (LTW)	1,444	0.04	0.08	0.16	0.00	3.54	
number of outstanding loans	1303	1	1.54	0.94	0.00	6	indicator variable
value of outstanding loans	1451	30	72.07	179.21	0.27	3,220	1,000 baht
age	1426	47	48.95	12.72	19	101	years
education	1426	3	3.44	1.81	1	11	categorical variable
gender (1=female)	1426	0	.15	.35	0	1	indicator variable
marital status (1=married)	1441	1	.48	.37	0	1	
collateral (1=yes)	1,449	1.00	0.63	0.48	0.00	1.00	indicatorl variable
interest	1,274	0.10	0.28	1.76	0.00	48.32	percent/100
salary (1=yes)	1,319	0.00	0.18	0.38	0.00	1.00	indicator variable
tenure (1 = yes)	1,437	1.00	0.95	0.22	0.00	1.00	indicator variable
bank access (1=yes)	1,450	0.00	0.27	0.44	0.00	1.00	indicator variable

[a] **Note:** Observational Units are households. Any personal demographics refer to the household head.

model, we see that informal credit can be significantly cheaper than formal credit: the median interest rate for loans from relatives is zero, and significantly lower than the median bank interest rate (8%). Similarly, the majority of neighbours and relatives require no explicit collateral, presumably using the social capital from personal ties in its place.

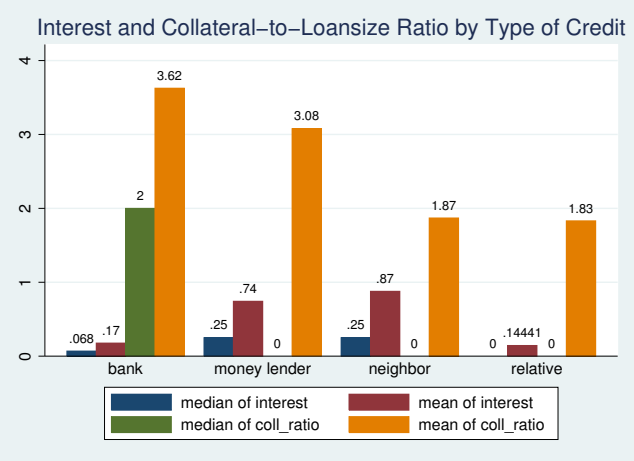

Figure 1: Interest Rates by Loan Source

The fact that going to your relative is considerably cheaper than borrowing from the bank does not mean, however, that formal credit is non-existent. As Figure 2 shows, while friends & family can be found for the entire wealth scale. Moneylender credit is also widespread, but only wealthy households make use of commercial banks. The most likely explanation for this observation is that access to formal banks is limited in poor remote villages, and that commercial banks will require a more collateral than moneylenders, which poses a serious constraint for poorer households. Again, however, the question remains why we observe formal credit at all. One important effect is certainly that the funds available from friends and relatives are more limited *a priori* than funds available through a commercial bank. But as Figure 2 shows, there are some very large informal loans from relatively wealthy households. Moreover, the relation between the source of the loan (formal or informal) and the main indicator of how secure the loan is, namely the loan-to-wealth ratio (LTW), is non-monotone, as Figure 3 shows. For smaller LTW's households primarily resort to informal credit, as loan size rises relative to household wealth, formal credit becomes more prominent. For very high LTW ratios, however, this negative relationship is reversed again - more informal credit occurs. Note that this observations is supportive of our theory. As Proposition 3 shows, such a U-shaped relationship will emerge, provided γ is not too large (otherwise, the potential loss of the social collateral would make those loans too risky). As we will see, this basic correlation is preserved once we control for other important observables.

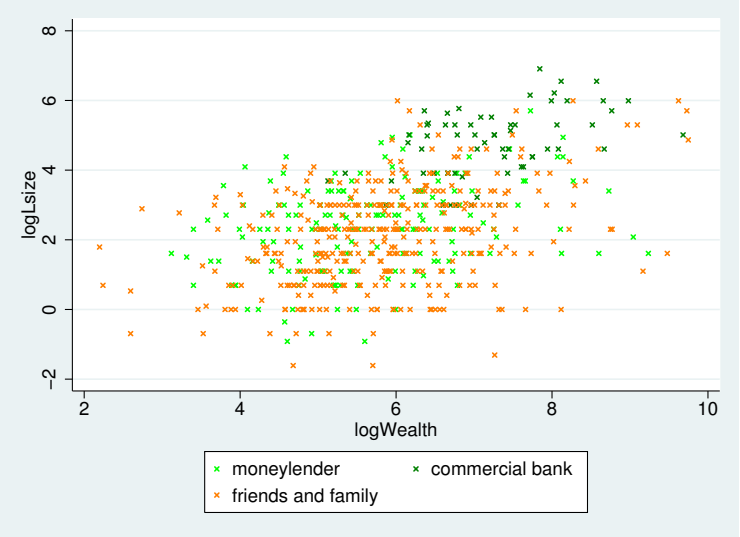

Figure 2: Size of Loan and Wealth by type of credit

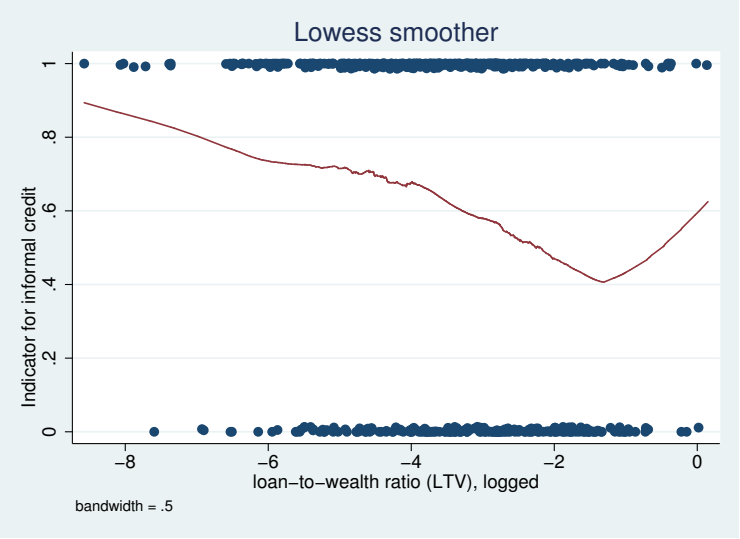

Figure 3: LTW ratio and type of credit

4.2 Results

This section investigate the link between the choice of loan source (formal versus informal), loan characteristics, and household characteristics. In doing so, we will largely assume that the size of loan

is exogenously determined by the needs of the household.[15] In our baseline regression, the dependent variable is the choice of loan source, and the regressor of interest is loan size and the loan-to-wealth ratio,

$$y_{kij} = \delta_j + \gamma Lsize_{ki} + \sigma LTW_{ki} + \beta X_i + u_{kij},$$

where the subscript i refers to the household, j to the region, and k to the loan; the dependent variable $y \in \{0, 1\}$ is a categorical variable that equals 1 if the creditor was a friend or a relative, and zero if the creditor was a commercial bank or a money lender. While the latter is arguably an 'informal' institution, what matters for our theory is whether or not personal ties are employed to secure the loan. In that sense, we have coded moneylender along with commercial banks. For reasons explained above, BAAC loans are excluded from the analysis. Together, formal credit then constitutes 36 percent of the sample that is relevant for our regressions. [16] The variables of interest are the size of the (logged) loan $Lsize$ and the (logged) loan-to-wealth ratio LTW. The vector X_i is a list of observable household characteristics, and δ_j are regional fixed effects. Estimation is by Probit, the results of which are reported in Table 2.

In our baseline regression (1) is the most parsimonious specification. It only includes basic demographic characteristics of the household head, such as gender, education, marital status, and age. All regression include dummy variables for four macro-regions. The estimates reveal that the incidence of friendship loans is significantly lower, the larger the loan size, *ceteris paribus*. At the same time, significantly fewer informal loans are also taken out as the loan-to-wealth ratio increases, controlling for loan size. Column (2) adds three more indicator variables as regressors, namely whether or not the household head is a business owner, has lived in the village longer than 6 years, and draws a regular salary. All three variables are potentially important in determining the extend of inter-personal credit, and could be correlated with loans size and wealth, thereby biasing the estimated coefficient. We see, however, that none of the three regressors adds much explanatory value; indeed the coefficient estimates of all other variables remain largely unchanged. In column (3), we add to further important variables. One is a dummy variable indicating whether or not a member of the household is a customer of a commercial bank. The second is household income. Both are highly correlated with wealth and clearly matter for the selection of the type of credit. As before, the coefficients on both loan size and loan-to-wealth ratio remain largely unaffected and statistically significant. The magnitude of the effects is significant as well: comparing the smallest loan in our sample with the larges loan, we estimate that the latter is over 70 percent less likely from a friend, evaluating other regressors at their average values. Similarly, comparing a household with the smallest LTV ratio to one with the largest LTV ratio in our sample, the estimated coefficient suggests that the latter is over 25 percent less likely to borrow from a friend and relative. We also see that direct access to a commercial bank increases the probability of formal loans, as expected. For households with access to a commercial bank, the estimated effect

[15] This is obviously a strong assumption, but maybe justified if most loans are taken our for a specific purpose, which the data seem to indicate. Another issue is that households may borrow from several sources to finance one investment project [Kaboski and Townsend, 2000] . In the data, we observe the calendar dates at which each household took out the loan, as well as rough categories regarding the purpose of the loan. If we generously count loans that are made for the same purpose within an year of each other as potentially being part of a 'larger' loan that was split up (e.g., due to cash constraints on the lenders' side or due to the required collateral), we arrive at a fraction of roughly 17% of all informal credit and only 0.2 % of formal credit. We will deal with the exogeneity issue in the Robustness analysis below.

[16] See Section 4.2 on robustness checks with regard to coding the dependent variable.

translates into a reduced likelihood of observing informal credit of 5 percentage points. Somewhat less obvious is the observed strong positive relation between household income and informal credit. There are two possible explanations. First, households with higher incomes are likely to socialize with people of the same income-class, implying that the upper bound on the available funds from friends and family ($\bar{\theta}$) increases in income. Alternatively, one could also imagine that income serves as an insurance to default, which is more important for informal loans for reasons explained above. In this view, the desirability (rather than the feasibility) of friends and family loans increases in a household's income, as the chance of not being able to repay the loan decreases. Again, the effect is quantitatively significant: increasing income from the smallest to the largest value in the dataset would increase the likelihood of a personal loan by roughly 40 percent, evaluating other controls at their mean value.

Finally, the last column (4) allows for a non-linear effect of the LTW ratio. This specification splits the LTW ratio into five quintiles and allows for a different slope co-efficient for each interval. The results are illuminating, and replicate the pattern in the raw data that we already identified in Figure 3. For small and medium sized LTW's, the incidence of friend loans declines with the loan-to-wealth ratio and becomes weaker in magnitude, although the estimates are not statistically significant. At the highest LTW, the estimated effect turns positive for loans that are very large relative to the household's assets, consistent with the idea that for such loans, no formal credit is available (while informal credit is). The pattern of coefficients suggests a U-shaped relationship between the LTW ratio and the incidence of informal credit, which is consistent with our Theory [see Proposition 3]: As loans become more risky, households *prefer formal credit whenever it is available because physical capital, as opposed to social capital, is divisible and can be adjusted to meet the loan requirement.* Only if formal loans are no longer available, because banks do no longer break even in expectation, do household revert to friends & family loans. Also note that the estimated relationship with respect to loan size is not affected when we allow nonlinear effects of the LTW.

4.3 Robustness

One important issue in our identification strategy that we have neglected so far is that we don't observe loan-characteristics of households who decide not to take out a loan. It is easy to imagine that those households who owe a loan have higher credit needs and are more trustworthy than those who do not owe a loan (otherwise, they would have take out one). If the propensity to take out a loan is correlated with unobserved characteristics that are also important in determining the type of credit selected, the estimated coefficients will tend to be biased since the selection into the sample is correlated with error term. To correct for this potential bias, we use a Heckman Sample Selection Correction (for probit models). Heckman's insight was that sample selection can be viewed as a form of omitted-variables bias, that can be corrected for with a simple two stage procedure.[17] In the first stage, we estimate a selection equation as a probit regression of the form

$$s_{ij} = \delta_j + \alpha Z_i + e_{ij}, D_{ij} = 1 \Leftrightarrow s_{ij} \geq \bar{s}$$

[17]Heckman J (1979), Sample selection bias as a specification error, Econometrica, 47, pp. 153-61. In what follows we use special application of Heckmans sample selection model, where the second stage equation is also probit. The corresponding STATA command is 'heckprob'.

where s_{ij}^* is the propensity to be included in the sample, $D_{ij} = 1$ if the household took out a loan and zero otherwise, Z_i is a vector of observable household characteristics, and e_{ij} is the error term. In the second stage, we can then correct for self-selection by incorporating a transformation of the predicted individual probabilities as an additional explanatory variable in the equation The estimated model is

$$Pr\{y_{kij} = 1 | D_{ij} = 1\} = \delta_j + \gamma Lsize_{ki} + \sigma LTW_{ki} + \beta X_i + \beta_\lambda \lambda(\alpha Z_i + \delta_j) + u_{kij}.$$

where $\lambda(\cdot)$ is the inverse Mills ratio, evaluated at $\alpha Z_i + \delta_j$.

The results, reported in Table 4, are encouraging in that none of the estimated coefficients seems to be significantly affected. Indeed, the ρ estimate indicates that the correlation between error terms is week, and the corresponding Wald test is not statistically significant, suggesting that sample selection bias does not pose a significant problem for the validity of our estimates.

Next, we examine the sensitivity of our results to alternate categorizations of formal versus informal loans. As mentioned above, for example, we have so far excluded BAAC (Bank for Agriculture and Agricultural Cooperatives) loans on the grounds that the BAAC loans are often secured through a joint liability agreement with a group of farmers who all belong to a BAAC group. Such loans are very common and make up almost 35 percent of all observed credit. Obviously, if the bulk of the BAAC loans is in form of group-liability loans, we do not want to include them into our sample, as they would be based on social (rather than physical) capital and as such bear more resemblance to an informal loan, as defined in the theory section, than to a formal loan. Similar issues arise with loans from village institutions and organizations, such as PCGs, rice and buffalo banks as well as village poor and elderly funds, respectively. For completeness, and as an additional check on the sensitivity of our results, however, we report the results when we include the BAAC and other financial organizations into our analysis, broadening the definition of a formal loan significantly. Table 5 below reports the corresponding estimates for the following three alternatives. In the first column (1), formal credit is defined as comprised of commercial banks, moneylenders, and BAAC loans [this is the original sample augmented by the BAAC loans]. The second column (2) has the broadest definition, where formal credit in addition includes PCG, Village Funds, and Rice Banks. The narrowest definition of formal credit is in the last column (3), where formal credit is defined as being exclusively extended by commercial banks. We see that the estimates on the loan size variable are qualitatively the same, although the effect is stronger than in the original definition of formal credit, and almost triples when we only consider commercial banks. The effect of the loan-to-wealth ratio is no longer significantly negative. While the measured effect is negative in columns (1) and (2), it becomes positive, although not statistical significant, in column (3). One problem with the last specification is that if formal credit is defined so narrowly, the number of observations for that category drops dramatically. Out of 807 observations, only 73 are instances of formal credit which reduces the precision of the estimates.

Finally, we address the issue of endogeneity. One valid concern with our identification strategy is that loan size may be endogenous. If friends and relatives indeed have limited funds available (as we hypothesized) and the credit needs of a household exceed those funds, then one alternative to taking out a (more expensive) formal sector loan for households to split up a large amount into smaller loans, using multiple personal relations to arrive at the desired sum. If this was a widespread practice, the causality from loan size to type of credit would be reversed: rather than choosing to rely less

often on friends and family for larger loans, households would endogenously choose smaller loans once they have decided not to enter the formal credit market. Note that this possibility does not a priori invalidate our theory; allowing households to split larger loans up would not alter our conclusions qualitatively, other than increasing the range for which informal credit is feasible (the upper limit $\bar{\theta}$). For our empirical analysis, however, the presumed exogeneity of loan size is important as otherwise, the estimated coefficients on both explanatory variables of interest, loan size and loan-to-wealth ratio will be biased.

Fortunately, the questionnaire in the Townsend household survey also contained a question that allows to adequately address this concern, by employing a truly exogenous proxy for loan size. Specifically, households were told to imagine a hypothetical situation in which they needed funds for an emergency situation. Among the questions asked was how they would get the required amount. The possible answers included selling assets (land, equipment, livestock, car, etc), use savings, as well as taking out a loan, where the source of the loan had to be specified. The same questions were posed for two different loan amounts, 2,000 Baht and 20,000 Baht. Neither particularly is particularly high (they both fall below the median loan size in the dataset), but since everyone was confronted with the same figure, this hypothetical loan amount is clearly exogenous, and orthogonal to any (unobserved) household characteristics. If we reasonably assume that households answered this hypothetical question in a way that corresponds to their behaviour had they actually faced the situation in real life, we can employ indicator variable for the two loans sizes as a regressor, and the corresponding answer as our outcome variable. For brevity of exposition, Table 5 only reports the estimated coefficients on our main explanatory variable of interests in the corresponding regressions. All regressions include the full set of covariates, as well as regional fixed effects (for the random effects model).

We see that our findings from the previous section continue to hold: even in the household fixed effects model, an increase exogenous increase in the size of the loan has a significant effect and negative effect on the likelihood that the household will turn to a personal relation for credit. Similarly, the probability that a household names friends and family as the desired source of the loan still decreases in the loan-to-wealth ratio, or put differently, still rises with wealth. Holding the loan size constant, households with more assets and savings are *more likely*, not less likely, to report that they would ask friends and family for a loan, rather than go to a bank or moneylender. Our theory provides a possible answer to this puzzle: lower wealth households prefer banks to friends because they cannot eliminate the risk of not being able to pay back the average loan. Default in friend loans, however, is very costly as social capital is indivisible.

5 Conclusion

To be added

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6 Appendix

Proof of Lemma 1:

Call $g \equiv G(\frac{r_F^0}{w})$. Then (PC_L) can be written as:

$$pr_F^1 + (1-p)(1-g)r_F^0 - \theta \geq \gamma[(1-p)g - 1] \tag{6}$$

Given (NN), the left hand side of (6) is larger or equal to $\theta[p + (1-p)(1-g) - 1] = -g(1-p)\theta$. The latter is larger or equal to $\theta[(1-p)g - 1]$ as long as $1 \geq 2g(1-p)$ which holds by Assumption A1 and since $g \leq 1$. We also have that $\theta[(1-p)g - 1] > \gamma[(1-p)g - 1]$, which is the right hand side of (6), since $(1-p)g < 1$ and $\gamma \geq \theta$ by (IC) and (NN). This implies that, given our assumptions, the lender's participation constraint (PC_L) is always satisfied for any r_F^0, r_F^1 which satisfy (IC) and (NN).■

Lemma A1: *$G'' < 0$ is a sufficient condition for uniqueness of the threshold $\hat{\alpha}_F(w)$ in Proposition 1.*

Proof: The first derivative of the left hand side of (1) with respect to θ is,

$$pR - 1 + (1-p)G(\theta/w) + (1-p)G'(\theta/w)\frac{1}{w}(\theta - \gamma)$$

which cannot be signed in general. The second derivative is

$$2G' + G''\frac{1}{w}(\theta - \gamma)$$

If $G'' \leq 0$ (the cdf G is weakly concave) the above expression is positive since $\gamma > \theta$ for all $\theta \in [0, \bar{\theta}]$ by Assumption A2. That is, the left hand side of (1), call it $\Phi(\theta)$, is a strictly convex function of θ over the interval $[\alpha_{\min} w, w]$. This implies that $\Phi(\theta)$ can cross the horizontal axis exactly once since it is continuous and since $\Phi(\alpha_{\min} w) > 0$ while $\Phi(w) < 0$ (draw a graph to see more clearly). So if $G'' \leq 0$ the threshold $\hat{\alpha}_F(w)$, defined as the $\alpha = \hat{\theta}/w \in (\alpha_{\min}, 1)$ such that $\Phi(\hat{\theta}) = 0$, is unique.

Table 3: Probit Regressions for Loan Source

dependent variable	loan source (friend=1)			
independent variable	(1)	(3)	(3)	(4)
loan size (log)	-0.24***	-0.20***	-0.25***	-0.24***
	(0.069)	(0.054)	(0.053)	(0.053)
LTW ratio (log)	-0.09*	-0.11***	-0.08**	
	(0.052)	(0.041)	(0.039)	
age	-0.01**	-0.01***	-0.01***	-0.01***
	(0.004)	(0.004)	(0.004)	(0.005)
gender	-0.16	-0.08	-0.11	-0.09
	(0.149)	(0.141)	(0.158)	(0.159)
education	-0.04*	-0.04	-0.04	-0.04
	(0.025)	(0.022)	(0.027)	(0.029)
married	-0.31	-0.19	-0.21	-0.21
	(0.193)	(0.197)	(0.196)	(0.185)
business owner		-0.01	0.02	0.03
		(0.051)	(0.051)	(0.052)
tenure		-0.28	-0.27	-0.27
		(0.208)	(0.218)	(0.223)
salary		0.11	0.09	0.09
		(0.156)	(0.170)	(0.170)
bank access		-0.12	-0.15**	-0.15**
		(0.076)	(0.069)	(0.069)
income (log)			0.12***	0.12***
			(0.037)	(0.039)
LTW ratio				
1st quintile				-0.03
				(0.031)
2nd quintile				-0.04
				(0.028)
3rd quintile				-0.02
				(0.015)
4th quintile				-0.01
				(0.043)
5th quintile				0.12***
				(0.039)
Observations	1,229	1,105	1,105	1,105
pseudo R^2	.11	.11	.12	

[a] **Note:** Dependent variable is Lsource, which equals 1 if the source is a friend or relative, and 0 if the source is a commercial bank or moneylender. BAAC loans are excluded from the analysis. All regressions include regional fixed effect. The standard errors reported in parentheses are heteroskedasticity–robust, and clustered at the regional level. Superscripts ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 4: Heckman Correction Probit Regressions for Loan Source

dependent variable independent variable	loan source (1)	selection (1')	loans source (2)	selection (2')
loan size (log)	-0.24***		-0.25***	
	(0.074)		(0.049)	
LTW ratio (log)	-0.09		-0.10**	
	(0.063)		(0.040)	
age	-0.01	-0.03***	-0.02**	-0.03***
	(0.012)	(0.001)	(0.009)	(0.003)
gender	-0.14	-0.26***	-0.08	-0.35***
	(0.185)	(0.067)	(0.246)	(0.056)
education	-0.04	-0.03	-0.03	-0.00
	(0.033)	(0.024)	(0.039)	(0.041)
married	-0.33*		-0.19	
	(0.174)		(0.213)	
salary			0.20**	
			(0.094)	
business owner			-0.02	
			(0.051)	
income (log)		0.20***	0.12**	0.16***
		(0.038)	(0.060)	(0.036)
bank			-0.26**	-0.10
			(0.103)	(0.084)
assets (log)		0.05		0.03
		(0.040)		(0.031)
savings (log)		-0.16***		-0.17***
		(0.021)		(0.028)
constrained				0.21*
				(0.114)
Observations	1228	851	978	600
Corr of Error terms ρ		-.14		.22
		(0.49)		(0.348)
Wald test p -value		0.777		0.5348

[a] **Note:** Dependent variable is Lsource, which equals 1 if the source is a friend or relative, and 0 if the source is a commercial bank or moneylender. BAAC loans are excluded from the analysis. All regressions include regional fixed effect. The standard errors reported in parentheses are heteroskedasticity–robust, and clustered at the regional level. Superscripts ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 5: Alternative definitions of formal credit

dependent variable independent variable	loan source 1 (1)	loan source 2 (2)	loan source 3 (3)
loan size (log)	-0.36***	-0.32***	-0.99***
	(0.042)	(0.034)	(0.121)
LTW (log)	-0.05*	-0.02	0.17
	(0.030)	(0.026)	(0.118)
age	-0.01***	-0.01***	-0.01
	(0.003)	(0.002)	(0.008)
gender	-0.04	-0.01	0.35
	(0.101)	(0.087)	(0.234)
edu	-0.03***	-0.03***	-0.04*
	(0.007)	(0.008)	(0.026)
salary	0.06	0.06	0.10
	(0.133)	(0.126)	(0.176)
married	-0.08	-0.07	0.29**
	(0.120)	(0.119)	(0.143)
income (log)	0.09***	0.09***	0.26***
	(0.020)	(0.015)	(0.595)
tenure	-0.08	-0.14	-0.68
	(0.149)	(0.112)	(0.690)
bcaa	-1.16***	-1.10***	0.099
	(0.062)	(0.066)	(0.096)
bank	0.06**	-0.02	-1.55***
	(0.023)	(0.030)	(0.097)
business owner	-0.03	-0.03	0.75
	(0.051)	(0.043)	(0.46)
Observations	2,081	2,263	807
pseudo R^2	.27	.25	.59

[a] **Note:** Dependent variable is the source of the loan which equals 1 if the source is a friend or relative, and 0 otherwise (see the main text for the categorization in different samples). All regressions include regional fixed effect. The standard errors reported in parentheses are heteroskedasticity–robust, and clustered at the regional level. Superscripts ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.

Table 6: Exogenous Loan Size Regressions

dependent variable	loan source (friend =1)			
estimation method	FE	FE logit	RE GLS	RE logit
independent variable	(1)	(2)	(3)	(4)
loan size	-0.01***	-.077***	-0.01***	-0.04***
	(0.001)	(0.011)	(0.002)	(0.010)
loan-to-wealth ratio(log)			-0.03**	-0.25**
			(0.011)	(0.064)
Observations	2,003	290	1,771	1,771
Number of HH's	1,413	145	1,245	1,245
R-squared	0.088		0.088	

[a] **Note:** Dependent variable is Lsource, which equals 1 if the HH answered that it would obtain the loan from a friend or relative, and 0 if the answer was a commercial bank or a moneylender. BAAC answers were excluded from the analysis. The standard errors reported in parentheses are heteroskedasticity–robust, and clustered at the regional level. Superscripts ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.