Informal Credit in Village Economies: Contract Duration with Personal and Community Enforcement

by

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Abstract

This paper provides an explanation for several important features of informal credit contracts negotiated in economies where households often lack collateral, and where ready access to legal authorities and formal financial institutions is absent. Our analysis is the first to highlight the choice between loans with well-defined repayment periods (fixed durations) and those that are open-ended. We extend a Bulow-Rogoff type model of sovereign debt to situations where ability to repay may be private information and the enforcement mechanism is a choice variable. We argue that in lieu of collateral, non-credit (social) exchange with lenders can be withdrawn to encourage loan repayment, and that households negotiate fixed-duration loans to postpone non-credit sanctions that a lender might otherwise impose when the borrower's ability to repay is private information. Other differences in loan terms can be explained by the exclusive availability of community loan enforcement to lenders and borrowers residing in the same community. Drawing on a unique household-level survey, we find empirical support for our model's explanation for duration and the size of loans, as well as borrower's repayment behavior.

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Households residing in outlying villages of low-income rural economies often do not have access to formal financial institutions and legal authorities. When these households need to borrow, they negotiate informal, self-enforcing loan agreements directly with other households (Ray, 1998; Fafchamps, 1999). Loan terms in this setting are remarkably diverse.[1] Moreover, these contracts can be enforced in a number of ways, for example, using personal sanctions imposed by the parties to an agreement on each other, or with community sanctions imposed by other households as well.[2]

In this context, Platteau (1991), Townsend (1995) and others have observed that some households negotiate loans with well-defined repayment periods while others select loans that have no agreed upon length or final date. We refer to these as fixed-duration loans and open-ended loans, respectively. "Open-ended-ness" is generally assumed to be one of the defining attributes of a class of informal loans among households, often referred to as "quasi-credit," which is used to facilitate mutual consumption insurance (Plateau and Abraham, 1987; Udry, 1990, 1994; Lund and Fafchamps 2000; Ligon *et al*, 2002). Fixed duration loans, on the other hand, are taken to be synonymous with loans involving moneylenders or used for purposes of fixed investment.

In this paper, we establish that this kind of stylized segmentation or matching between contract terms, loan purpose and lender types often does not hold. We provide an alternative explanation for households' choices between informal loan contracts that are open-ended and those that have fixed durations, one that highlights the informational environment in which contracting occurs and the role of alternative enforcement mechanisms, namely, personal and community enforcement. The occupation of the lender and the purpose of the loan are entirely secondary factors. We

[1] See Plateau and Abraham (1987), Udry (1990, 1994), Platteau (1991), Fafchamps (1992), Besley (1995) and Townsend (1995).
[2] See, for example, Grief (1993, 1994).

then test our theory with data on loan contracts from rural China in the 1930s. In the rest of the introduction, we sketch out our basic argument.

A central feature of small village economies, such as those that we study here, is that households interact repeatedly with each other. With fewer than 100 households in any given village in our sample, and with most families having lived in these villages for several generations, these households are typically well acquainted, and often are related to each other. They also often obtain goods and services from each other. Non-credit exchange between households, which includes social as well as market exchange, is an important feature of village life.

In a different informal credit context, that of sovereign debt, Bulow and Rogoff (1989) and Cole and Kehoe (1994) show that non-credit exchange between countries that is made contingent on the borrower's outstanding debt and repayment effort expands the range of sanctions available to the lender. Non-credit exchange effectively plays the role of collateral in their analyses. In the village economies we examine, non-credit exchange between households can likewise be pledged to facilitate credit exchange. This feature helps to explain why asset poor households, some of which are already in debt, are often able to borrow in these villages. Nevertheless, non-credit exchange and non-credit sanctions do not justify fixed loan durations. To explain contract duration, we extend a Bulow-Rogoff type model to situations in which the borrower's ability to repay is private information.

From an incentives perspective, the use of collateral as an enforcement devise is effective only when a borrower can take actions, i.e., make payments, to prevent the loss of that collateral to a lender. Thus, the lender should seize collateral only if a borrower has outstanding debt and is able to but unwilling to pay. Analogously, a lending household should terminate non-credit exchange with a household that has an outstanding loan from it only if that household withholds repayment. This will only be feasible when the relationship between the lender and borrower allows the lender to monitor the borrower's ability-to-pay status. If the lender can, their loan agreement will involve non-credit sanctions that are contingent on both the borrower's outstanding debt and his ability to pay. But, in this case, the informal loan agreement will be open-

ended. Because the borrower's promise to repay the loan as soon as possible can be monitored and made credible, there is no role for a fixed duration or any other explicit time dependency.

A fixed-duration loan, on the other hand, will be advantageous to parties in cases in which a lender cannot observe the borrower's ability to repay the loan. The fixed duration provides the borrower a window during which non-credit sanctions are suspended independent of the amount they owe. The analogue here is a conventional fixed-length loan in which the lender cannot take possession of the borrower's collateral until the end of the loan period. In effect, a fixed-duration loan is a device for postponing non-credit sanctions that an uninformed lender might otherwise impose on a borrower who is unable to pay.

The benefit of a fixed-duration loan is postponed sanctions. The cost of postponing sanctions, however, is an attenuated incentive to repay and hence a smaller negotiated loan. Our data show that fixed-duration loans are indeed smaller than open-ended loans, but only when the parties live far apart, e.g., in different communities. Fixed-duration loans are actually larger when the lender and borrower live in the same or nearby village. Our explanation for this pattern is that the enforcement mechanisms available to households depend on where they live.

Community loan enforcement (Kandori 1992; Grief, 1993,1994; Levin, 2002), which entails coordinated collective sanctions that facilitate larger loans, is available only to households that reside in the same community. Central to collective sanctions are ongoing household interactions of the sort described above. Community loan enforcement will not necessarily be available for all types of informal loans among these households however. In order to coordinate their actions, participants must have the same information about the borrower. But even within a community, an individual borrower's ability to repay need not be widely known and freely available to all of its members. In this situation, we expect community enforcement to be largely limited to fixed-duration loans. This is because fixed-duration loans entail sanctions that simply depend on the passage of time, and participants other than the lender can more easily monitor the passage of time than the borrower's ability to pay.

Our formal analysis encompasses two types of contracts (fixed-duration and open-ended), two informational environments (the borrower's ability to pay is public or private), and two potentially co-existing enforcement regimes (community and personal).[3] Drawing on data from China from the 1930s, we provide empirical confirmation for our explanations for contract duration and size, and for the roles of personal and community enforcement mechanisms, going beyond the important early descriptive work of Grief, Platteau and others.

We show that the geographical and social proximity of a lender and borrower, both of which are a measure of the lender's direct access to information about the borrower, are important predictors of when a contract will be open-ended. Instrumenting contract duration choice with select attributes of the household and village that capture the differential cost of implementing fixed-duration and open-ended loans, we find that geography remains important for enforcement. When the lender and borrower reside in the same community, our econometric model indicates that they can negotiate fixed-duration loans that are considerably larger than open-ended loans; however, when the loan parties live far apart, they negotiate open-ended loans that are at least as large fixed-duration loans.

For a given enforcement mechanism, our theory explains why open-ended loans are at least as large fixed-duration loans; and, for a given loan duration type, our theory explains why community enforcement facilitates larger loans than does personal enforcement. Hence, the econometric evidence on duration, loan size and geography is consistent with the view that community enforcement is only available to households that live near each other and is largely limited to fixed-duration loans.

The rest of the paper is organized as follows: In section 1, we describe our data and the key observations we want to explain. We then develop a formal model in

[3] When these enforcement mechanisms co-exist, however, a lender's ability to personally induce a borrower to repay a loan by threatening to withdraw future loans is undermined by the availability of an alternative community source of credit. Indeed, there are circumstances in which a borrower cannot promise credibly to repay a loan enforced by a single lender unless non-credit sanctions are also available to that lender. In other words, we show that non-credit exchange among households may be necessary to prevent community loan enforcement from entirely "crowding out" personal loan enforcement in a given village.

sections 2 through 5. In sections 6 and 7, we present our empirical framework and results. Concluding remarks appear in section 8.

1. Data

The data we analyze were the product of an intensive household-level survey that was carried out in 1936 by the Japanese-installed government of what is now northeast China.[4] Every household in 22 geographically and economically separate villages was enumerated. Altogether, 1095 households were investigated. The survey covers the period from January through December of 1935, and includes data on family demographics, farm output, input use, physical and financial assets, incomes and expenditures. Agricultural income, broadly defined to include income from crop sales, animal husbandry, farm wages, and land rental, was the source of more than 80 percent of all income in these villages, with 95 percent of all households reporting positive agricultural income.

The unique feature of the survey is its detailed information on all credit, labor and land agreements involving villagers. With regard to credit, we have information on all credit contracts taken out in 1935, as well as those that were still outstanding as of the beginning of 1935. Table 1 reports summary information on the 774 informal credit arrangements between households made in 1935. In each case, either the lender or the borrower or both resided in one of the 22 surveyed villages; if both, they resided in the same village. Altogether, 385 (118) households from these villages borrowed from (lent to) another household in 1935.[5]

There are four basic types of informal loans, interest-free loans and three types of positive interest rate loans. The latter group includes pawns, land mortgages, and the residual category that we simply label positive interest-rate loans. Interest-free loans did not explicitly impose future obligations on the borrower other than the repayment of the principle. In the case of a land mortgage, on the other hand, interest

[4] Northeast China currently includes the provinces of Liaoning, Jilin and Heilongjiang.
[5] There were also 202 "formal" loans recorded in the survey in which the lender was either a local financial institution or "agent" of the government. Over 95 percent of these loans were in only 4 villages, with a majority of them in-kind, subsidized grain relief loans. Three of these villages experienced a severe harvest shock in 1935.

was only implicit: "land-use rights" ceded to the lender were in lieu of interest. Pawns and positive interest-rate loans are entirely conventional.

Within each loan category, we further distinguish between those that have fixed durations and those that are open ended. For each loan type-duration combination, Table 1 provides additional information on loan terms, the residency and relationship of the borrower and lender, the average loan size and purpose. We observe loans between parties that reside in the same village; in different villages but in the same district; and in different districts. A district is a sub-administrative unit of a county that typically contained 9-12 villages.

Positive Interest-Rate Loans

We focus our attention on one type of loan in this paper, the positive interest rate loans described in columns 3 and 4 of Table 1. We ignore the land mortgages and pawns because non-credit exchange and the reputation of the borrower are not at issue in the enforcement of these loans.[6] We exclude the interest-free loans from our analysis because community enforcement of these loans is unlikely.[7]

Loan Attributes

The positive interest loans were nearly evenly divided between those that were open-ended and those that were of fixed duration, typically a year or less in length. In general, the use of physical collateral for these loans was rare. More common was the

[6] A pawn is simply an asset sale coupled with a repurchase option. In the case of the land mortgage, it is the reputation of the lender that is at issue as he must be willing to return the land to the borrower once the principle has been repaid.

[7] Brandt and Hosios (2003) examines the choice between interest free and positive interest rate loans. We argue that in key respects the two kinds of loans are similar, the major difference being in the form of the payment of interest. In the case of zero interest loans, in lieu of interest, the lender receives a future option on the services of the borrower. The ability of the lender to monitor the borrower's ability to supply these services is critical. Since the community is at an informational disadvantage concerning the economic situation of individual lenders and borrowers, time-contingent loan terms are much more likely to be collectively enforced. And since it cannot be efficient to make these services supplied by the borrower to the lender time-contingent (rather than state-contingent), community enforcement of interest-free loans is especially unappealing.

use of a written contract or a third party.[8] However, even in the case of fixed-duration loans, these provisions were limited to less than fifteen percent of all contracts. Contracting with relatives or with households living in the same district was comparable for open-ended and fixed-duration loans. We also observe relatively modest differences between the two kinds of loans in terms of loan purpose. Fixed-duration loans were slightly more likely to be used for consumption purposes, while open-ended loans were more likely to be used for investment, which includes the costs of education.

Table 2 reports the distribution of occupations among lenders and borrowers participating in positive interest rate loans. Specialized lenders, including landlords and moneylenders, represent a very small part of the pool of lenders. Most lenders were farmers, or were working in agriculture, as were almost all of the borrowers. Also note that the occupational distributions for the borrowers and lenders for fixed-duration and open-ended loans are very similar. There is no obvious segmentation.

Table 3 provides summary information on average loan size by duration type and residency of the borrower and lender. There are three key features to note. First, fixed-duration loans between individuals living in the same district are significantly larger than open-ended loans. The difference is slightly more than fifty percent. In contrast, fixed-duration loans between individuals that do not reside in the same district are similar in size to open-ended loans. Second, open-ended loans between parties residing in different districts are larger than open-ended loans between individuals residing in the same district. Finally, the size difference between fixed-duration loans involving borrowers and lenders residing in the same and different districts is negligible.[9]

Table 4 summarizes overall household borrowing and repayment activity. Out of our sample of 1095 households, 301 had an outstanding loan, defined here as a loan

[8] The use of a written contract should not necessarily be associated with court enforcement. In the absence of court enforcement, a written contract may serve as a means of either identifying literate (high human capital) borrowers or facilitating inter-household communication concerning defaults.

[9] We later argue that these observations are consistent with the use of community enforcement for fixed-duration contracts between individuals residing in the same community, and of personal enforcement otherwise.

that had not been repaid in full, as of the beginning of 1935. Of these households, 33 or 10.9 percent had at least one loan in default, i.e., a fixed-duration loan due prior to the beginning of 1935 that had not been repaid in full. In 1935, on the other hand, 390 households borrowed, including 146 of those who had an outstanding loan as of the beginning of 1935. This implies that slightly less than half of all households with outstanding loans as of the beginning of 1935 were able to continue to borrow in 1935, including some households with loans in default at the beginning of 1935. In fact, almost half of the households with loans in default borrowed in 1935. Finally, half of all households with outstanding loans made payment on either principle or interest in 1935. Although a majority of these households made payment on loans that were not in default, defaulting households made payment on 37 loans, 11 of which were in default.

Village (Community) Attributes

Our analysis highlights the potential roles of non-credit exchange among households and community enforcement in the loan market. In Table 5, we report summary measures related to the "density" of household economic and social interactions in the villages in which they live. These include the age of the village, the average number of years that households had resided in a village, population density, the percentage of households that were members of clans, the percentage of households that were autarkic, and a measure of agriculture commercialization.

On average, and at the time the survey was carried out, several generations of households had already lived in the villages we analyze, with the oldest village in our sample first settled 350 years earlier. The average number of years that any one household had lived in these villages is considerably less, reflecting geographic mobility in the region. In the "youngest" of villages, the average number of years was only 10. Clan membership, on the other hand, was significant in our sample, with 46 percent of all households in a village related to other households in the village through male lineage. There was also considerable heterogeneity across villages, with a high (low) of 89.2 (12.0) percent of households in clans.

Finally, we use two measures to capture the extent of market interaction. First, we report the percentage of households in a village that were not involved in either the land rental or labor market. The village average was slightly less than 16 percent, but in one village more than half of all households were autarkic, while in two other villages every household participated in the local land or labor market. To help put these numbers in perspective, almost a third of all lend was rented, and more than half of all households hired labor either in and out. Second, we provide estimates of the percentage of farm output that was sold by households. On average, slightly less than a quarter of all farm output was sold, with a low (high) of 5.6 (50.3) percent.

2. The Model

We develop a formal model of informal credit and derive a number of testable implications concerning loan size, contract duration, non-credit relationships among households, and contract enforcement. Our analysis encompasses two types of contracts (fixed-duration and open-ended), two informational environments (the borrower's ability to pay is/is not observable), and two enforcement regimes (community and personal). In this section, we lay out the basic environment. In Section 3, we analyze open-ended agreements under both community and personal enforcement. Section 4 does the same thing for fixed duration loans. Section 5 then identifies enforcement externalities between the two enforcement regimes.

Consider a village populated by a finite number of households that engage in bilateral credit and non-credit transactions. Time is discrete. Each household is infinitely lived. A household's utility in period t is the sum of its payoffs from the various transactions in which it participates in period t. A household's lifetime utility at the beginning of t is the expected discounted sum of its utilities for periods $\tau \geq t$. The common discount factor applied between periods is $\delta < 1$. A household's borrower-lender status is fixed.[10] H denotes the set of households in the village that

[10] Our results do not depend on whether a household's lender-borrower status ever changes between periods.

want to borrower in every period, *I* denotes the complementary set of households in the village that are willing to lend, and *L* denotes the number of lenders in *I*.

Borrower *h*'s credit history at each point in time describes his past loans from, and payments to, each lender in *I*, and is public information. As most of the agreements in our data set are verbal, we assume that households' loan transactions are observed but not recorded. In this situation, lenders' and borrowers' decisions will depend on their expectations regarding other households' beliefs about what they owe each other.[11] A common set of beliefs is imposed following any history of loans and payments.

Loans can be enforced in two ways. If all lenders in *I* jointly impose sanctions on a borrower to induce repayment of an informal loan agreement between that borrower and any lender in *I*, the loan is said to be *community enforced*. If a lender imposes sanctions on a borrower to induce repayment of its own loan agreement with that borrower, while the borrower's interactions with any other household in *I* are independent of that loan's status, the loan is said to be a *personally enforced* loan. A borrower and lender choose the loan enforcement mechanism along with other loan terms.

Each period is divided into three stages or sub-periods (see Figure 1): t^1, in which lenders and borrowers are randomly matched, matched households negotiate loan terms and credit is exchanged; t^2, in which borrowers service their current and outstanding loans; and t^3, in which households engage in non-credit transactions. There is a single perishable good in each sub-period of the model.

Preferences: The payoff to borrower $h \in H$ in sub-period t^1 from receiving a loan of size *l* is $F(l)$, an increasing, concave function of *l* satisfying $F(0) = 0$. The payoff to lender $i \in I$ in t^1 from supplying a loan of size *l* is $-C(l)$, where $C(l)$ is a

[11] That is, if *h* believes that all lenders will condition their interactions with him on the belief that he owes an amount *m* to *i*, *h* will optimally behave as if he owes *m* to *i*, independent of his actual borrowing history. As shown later, these beliefs about households' debt obligations to one another provide a way to punish those lenders who do not follow through with community sanctions.

strictly increasing, convex function satisfying $C(l) = 0$. We assume that there are gains from trade, i.e., $F'(0) > C'(0)$.[12]

Matching: Households that exchange credit in period *t* are brought together pair-wise by a random matching process. Let α denote the probability that borrower $h \in H$ and lender $i \in I$ are matched. Probability α is fixed and cannot be influenced by either *h* or *i*.[13] Borrower *h* may also be matched with a lender outside of *I*, so that $\alpha L < 1$. Unmatched households can neither lend nor borrow during the remaining period.[14]

Negotiations: The borrower makes a take-it-or-leave-it offer to the lender, specifying four terms: (i) the size of the loan, $l \geq 0$, supplied by the lender to the borrower; (ii) the amount that the borrower agrees to repay to the lender, $r \geq 0$; (iii) the date when the entire amount owed is due; and (iv) whether community or personal enforcement is used. To simplify, we assume that loan agreements do not entail compounding, and so the amount owed remains fixed at *r*.[15]

There are two options regarding the timing of loan payments for a loan supplied to a borrower in t^1: First, the lender and borrower can negotiate an *open-ended* loan; in this case, the borrower promises to repay the lender in the earliest possible debt-servicing sub-period τ^2, $\tau \geq t$. Second, they can negotiate a *fixed-duration* loan lasting, say, *n* periods; in this case, the borrower is not required to make payments before period $t+n-1$, and promises to repay the lender in the earliest possible debt-servicing sub-period τ^2, $\tau \geq t+n-1$.

Debt Payment: Borrower *h* pays a non-negative amount to lender *i* in debt servicing sub-period t^2. Initially, we suppose that *h* is able to pay any amount owed

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[12] While *l* can represent either consumption or investment, the ability of household *h* to repay the loan does not depend, as in Atkeson (1991), on the allocation of *l* between consumption and investment.
[13] Allowing households to influence these matching probabilities does not affect our main results.
[14] Allowing two or more sequential matches per period does not change the model's basic structure, especially if $C(l)=(1+r)l$. When $C(l)$ is strictly convex, the borrower has to trade off the benefit of a large costly loan from a given lender against that of a smaller low-cost loan coupled with continued search for other lenders during the same period.
[15] With compounding, the amount owed by a borrower that is unable to service its debt will eventually become so large that (absent debt forgiveness) the household would sooner bear the cost of never borrowing again to paying the amount owed.

during a debt-servicing sub-period. Later, we introduce random wealth constraints, in which case the borrower must postpone repayment whenever this constraint binds.

Non-Credit Exchange: We use non-credit exchange to describe any economic and social interaction between households that does not involve credit. Non-credit exchanges occur in sub-period t^3. Unlike credit exchange, matching for non-credit purposes is neither random nor exclusive; each household has non-credit exchanges with the same set of households every period. A household's total payoff from non-credit exchange in t^3 is the sum of the individual payoffs from non-credit exchange with all other households.

While non-credit exchange between pairs of households can be extensive and varied, we limit attention to exchanges that can be made contingent on a borrower's credit status. For any borrower $h \in H$ and lender $i \in I$, these non-credit exchanges are represented by the outcomes of the two-player simultaneous-move game, denoted by G and depicted in normal form in Figure 2. In this game, $\{h,i\}$ choose actions from the set $\{E, DE\}$, where *E* stands for "exchange" and *DE* stands for "don't exchange." The fixed benefit to *h* of non-credit exchange with *i* is $\Delta \geq 0$. A transaction cost, $\kappa > 0$, is borne by a household when its efforts to exchange are unsuccessful.

The non-credit exchange modeled by G represents transactions between borrower *h* and lender *i* that are much more beneficial for the borrower than the lender. The rationale for focusing on asymmetric non-credit exchanges is straightforward. Borrower *h* can negotiate better terms from lender *i* when *i* can credibly commit to impose non-credit sanctions on *h* when *h* is delinquent. However, *i* will be *less* likely to impose sanctions if they are costly for *i* as well. It follows that *h* and *i* have a joint interest in placing at risk those non-credit exchanges that are most (least) beneficial to the borrower (lender). Setting the lender's gain to zero in G is a simple way to capture this effect without having to model explicitly how the non-credit exchanges at risk for any borrower-lender pair are determined.

3. Open-Ended Agreements

In this section, we describe informal loan agreements that do *not* have fixed durations. These self-enforcing agreements are equilibrium strategies in a dynamic game between households. Our model has multiple equilibria. We restrict attention here to the equilibrium that maximizes households' joint surplus. This equilibrium also has outcomes that are broadly consistent with the household behavior that we documented earlier in section 1 concerning loan duration choice, ongoing borrowing by households in debt, and loan repayment.

Our goal is to develop a model of a village economy in which alternative loan enforcement mechanisms co-exist. In this situation, a household's outstanding obligations and current credit needs determine whether it negotiates a loan that relies on community or personal enforcement. We begin in this section by describing two benchmark situations, one in which only community loan enforcement is available and one in which only personal loan enforcement is available. In both scenarios, the other type of enforcement is unavailable only in the sense that households adopt strategies that support its non-cooperative outcome.[16]

A. Community Enforcement

The amount that borrower h owes to lender i is the sum of h's obligations to i resulting from all prior loans supplied by i to h, less all payments concerning those loans made by h to i. The *total* amount that h owes to all households in I at the beginning of sub-period t^z is denoted by $m_{hI}^z(t)$, or m_{hI}^z for short, and is simply the sum of the amounts owed to each $i \in I$. With community loan enforcement, households' strategies depend on the outstanding obligations of individual households to the entire community. Specifically, borrower h's offer to lender i, and i's acceptance strategy, depend on m_{hI}^1; h's repayment strategy depends on m_{hI}^2; and the non-credit decision rules employed by households $\{h,i\}_{i\in I}$ depend on m_{hI}^3.

[16] In the version with community (personal) enforcement, lenders refuse to supply loans that rely on personal (community) enforcement, borrowers refuse to service loans that rely on personal (community) enforcement, and non-credit exchange is independent of any personal (community) loan obligations.

With respect to debt payment, we determine a critical aggregate debt value, m^*, such that borrower *h* will pay m_{hI}^2 in total to all lenders in *I* if and only if $m_{hI}^2 \le m^*$. With respect to credit supply, we determine a second critical aggregate debt value, $m^{**} \le m^*$, such that lender *i* will accept a loan proposal from *h* only if *h*'s total current obligation to lenders in *I* does not exceed m^{**}. When $m^{**} > 0$ and *h* owes $m_{hI}^1 < m^{**}$, *h* is said to have a *community line of credit* with *I* that enables it to continue to borrow while carrying forward outstanding debt from one period to the next; once $m_{hI}^1 \ge m^{**}$, however, this line of credit is exhausted and new loans will be withheld until the amount owing again falls below m^{**}.

In Appendix A, we determine values of $\{m^*, m^{**}\}$ that support a sub-game perfect equilibrium in which households use the following decision rules: First, when borrower *h* and lender *i* are matched in t^1, *h* offers *i* the contract that solves

$$(1) \qquad V(m^* - m_{hI}^1) = \text{Max}_{\{l,r\}}\, F(l) - r \text{ s.t. } -C(l) + r \ge 0,\ 0 \le r \le \max\{0, m^* - m_{hI}^1\},$$

where m_{hI}^1 is the amount that *h* owes to all lenders in *I* when *h* meets *i* in t^1; *h*'s remaining debt capacity with *I*, $m^* - m_{hI}^1$, is the largest additional payment obligation that *h* can credibly take on.[17] Next, after offers have been made in t^1, lender *i* accepts an open-ended loan offer from borrower *h*, $\{l_{hi}, r_{hi}\}$, if and only if two conditions are met: the aggregate amount that *h* owes to *I* is not too large, i.e., $m_{hI}^1 \le m^{**}$, and *i*'s anticipated payoff from offer $\{l_{hi}, r_{hi}\}$ is no less than its no-exchange alternative. Third, when borrower *h* owes m_{hI}^2 to households in *I* at the beginning of debt-servicing sub-period t^2, *h* pays the amount it owes to every $i \in I$ if the total satisfies $m_{hI}^2 \le m^*$, and

[17] The payoff function V in (1) is an increasing, concave function on the initial debt-capacity interval $[0, \hat{r}]$, where $\hat{r} = C(\hat{l})$ and $\hat{l}$ is the efficient loan size satisfying $F' = C'$; *V* is constant when $m^* - m_{hI}^1 > \hat{r}$ and there is sufficient debt capacity to allow the borrower to negotiate an additional efficient-sized loan. Also, $V(0) = 0$.

pays zero otherwise. Finally, when *h* owes m_{hI}^3 to *I* at the beginning of sub-period t^3, households *h* and *i* employ the same strategy in their non-credit game, G, choosing *E* (exchange) if $m_{hI}^3 = 0$, and *DE* otherwise.

The equilibrium values of $\{m^*, m^{**}\}$ must be such that, when all parties follow their equilibrium strategies, *h* prefers to pay any $m_{hI}^2 \leq m^*$ to lenders in *I* during t^2 rather than postpone payment (in whole or part) to $t+1$. As shown in Appendix A, m^*, the maximum amount which *h* can credibly promise to pay lenders in *I,* satisfies

$$\Delta L + \delta\alpha L V(m^*) = (1-\delta)m^* \quad . \tag{2a}$$

The left hand side of (2a) is the benefit of paying $m_{hI}^2 = m^*$ immediately, i.e., the value of ongoing non-credit exchange, ΔL, plus the expected discounted value of borrowing from *I*, starting debt free, $\delta\alpha L V(m^*)$. The right hand side is the present discounted value of postponing payment by one period. The solution to (2a) is depicted in Figure 3. As expected, the maximum total amount that *h* will pay to lenders in *I* is an increasing function of: (i) the benefit to *h* of non-credit exchange with the households in *I*, ΔL; (ii) the likelihood that in any future period *h* will again be matched with a household in *I*, αL; and (iii) the marginal benefit for *h* of a small loan, $V'(0)$.[18]

There is a range of possible equilibrium lines of credit, starting with zero, that household *h* can have with *I*. However, *h*'s preferred line of credit with *I* is the one that maximizes the amount of debt, m^{**}, that *h* can credibly carry before receiving his last loan, (after which credit sanctions are imposed); given m^*, we show that this maximal value for m^{**} satisfies $(1-\delta) \geq \delta\alpha L V'(m^* - m^{**})$ and

$$\Delta L + \delta\alpha L[V(m^*) - V(m^* - m^{**})] = (1-\delta)m^{**} \quad ,$$

[18] It follows that $m^* > 0$ if either (i) non-credit sanctions are available, $\Delta L > 0$, or (ii) collective credit sanctions alone are sufficient to induce repayment, i.e., $\delta\alpha L V'(0) > (1-\delta)$; alternatively, $m^* = 0$ if $\Delta L = 0$ and $\delta\alpha L V'(0) \leq (1-\delta)$.

where $V(m^* - m^{**})$ is the payoff from the optimal loan provided to a borrower with outstanding debt m^{**}; in this case, the benefit of paying immediately $m_{hI}^2 = m^{**} < m^*$ is the value of non-credit exchange, as before, plus the *differential* expected discounted gain from borrowing debt free, $V(m^*)$, and borrowing with outstanding debt m^{**}, $V(m^* - m^{**})$. Using the definition of m^* in (2a), this simplifies to

(2b) $$(1-\delta)(m^* - m^{**}) = \delta\alpha L V(m^* - m^{**}) \ .$$

Figure 3a uses (2a) and (2b) to depict a situation where $0 < m^{**} < m^*$. In these circumstances, *h* is willing to pay any aggregate obligation to households in *I* not exceeding m^*, and can continue to borrow from them until his total accumulated debt exceeds m^{**}. Figure 3b depicts a situation where $\Delta = 0$ and $\delta\alpha L V'(0) > (1-\delta)$, so that $m^{**} = 0 < m^*$. As non-credit exchange is absent in this case (or, at least, cannot be made debt-contingent), a conventional self-enforcing credit agreement results in which *h* can borrow from $i \in I$ only if its total outstanding debt with *I* is zero. Finally, Figure 3c depicts a situation where $\delta\alpha L V'(0) \le (1-\delta)$, so that $m^{**} = m^* > 0$ $(=0)$ when $\Delta > 0$ $(=0)$. This is the case highlighted by Bulow and Rogoff (1989), whence maintaining non-credit exchange is so important for *h* that households in *I* can allow *h* to continue to borrow until its debt equals m^*.

To complete this description of equilibrium play, we need to explain why it is in the interest of individual lenders to participate in the collective punishment of a delinquent borrower. Specifically, we need to describe how a lender is made worse off by supplying a loan to a borrower whose community-enforced debt exceeds m^{**}. As loan transactions are observable, several alternative punishment schemes are available. One especially Draconian option is to punish innocent households along with the guilty lender (Kandori, 1992). That is, if *i* gives *h* a loan when *h*'s community-enforced debt exceeds m^{**}, households then adopt non-cooperative sub-game perfect equilibrium

strategies in which all borrowers default on all of their current and future loans (including *i*'s most recent loan to *h*) and lenders no longer supply loans to borrowers. This works, but seems extreme. We consider an alternative situation in which community members insulate themselves from the consequences of a defection by any one lender who lifts its credit sanctions, and so costs are imposed (if at all) only on the deviant lender.

A given loan will be community enforced only if community members recognize it as such. The community-enforced label attached to a loan requires consensus. We assume that households withhold this label from any loans supplied to a borrower who has already exhausted his community line of credit. That is, once borrower *h*'s community-enforced debt exceeds m^{**}, all parties assume that any new loan from *i* to *h* will be enforced by *i* alone. Of course, assigning a personally-enforced label to new loans leaves the borrower's community-enforced obligation unchanged (so that $m_{hI}^{2} = m_{hI}^{1}$), and so the remaining lenders are unaffected. In these circumstances, *i* will lend to *h* only if *i* alone can credibly threaten actions that induce payment by *h*.

B. Ability-to-Pay Contingent Exchange

We observed earlier that many households in our sample had outstanding debt while negotiating new loans. Households carried debt over time and, in some cases, did so for many years while continuing to borrow. Along our model's equilibrium path, however, households begin every period debt free. Households that borrow in t^1 repay the entire amount owed in t^2 and so begin period *t*+1 without any debt. Borrowers are able to pay whatever they owe because wealth constraints are entirely absent during debt-servicing sub-periods.

Our model can be adapted easily to describe situations in which borrowers face random wealth constraints that preclude loan repayment.[19] With randomly-binding

[19] Wealth shocks are the consequence of resource-absorbing disturbances, such as family illnesses, unanticipated ceremonies (weddings, funerals), and adverse production conditions. Allowing these shocks to be serially correlated, and relaxing the assumption that ability-to-pay is a zero-one variable, complicates the analysis and notation (as credit priority becomes important) but does not change the basic results.

wealth constraints, non-credit exchange will be contingent on (i) a borrower's outstanding debt and (ii) its ability to pay. Households $\{h,i\}$ choose *DE* when *h* has debt and is able but unwilling to pay, and choose *E* otherwise. This is efficient because there is no incentive reason to punish borrowers who are willing but unable to pay. Households then carry open-ended debt from period *t* to *t*+1, in equilibrium, whenever they are unable to service their loans in t^2. As determined earlier, a household with outstanding open-ended debt can continue to borrow as long as its line of credit with *I* has not been exhausted. Beyond generating positive debt levels in equilibrium, the model with randomly-binding wealth constraints is essentially the same as the one without these constraints.

In this version of the model, there is symmetric information concerning borrowers' wealth constraints because lenders can directly observe whether or not any particular borrower is able to pay during each debt-servicing sub-period. As a result, non-credit exchange can be contingent on a borrower's ability-to-pay. Later, we consider situations where ability-to-pay is private information.

C. Personal Enforcement[20]

A loan is personally enforced when a single lender imposes credit and non-credit sanctions on a borrower, contingent only on the amount that the borrower owes to the lender. An informal loan between borrower *h* and lender *i* that relies on personal loan enforcement involves the same strategies introduced earlier, except that the set of lenders *I* is replaced by a single lender *i* ($L=1$).

We replace *m* with *w* to distinguish the obligations of personally enforced loans: If *h* and *i* are matched in t^1, *h* offers *i* the loan contract giving payoff $V(w^* - w_{hi}^1)$; *i* accepts the offer if and only if that amount *h* owes satisfies $w_{hi}^1 \leq w^{**}$ and *i* expects to be repaid; *h* pays w_{hi}^2 to *i* in t^2 if $w_{hi}^2 \leq w^*$, and pays zero otherwise; lastly, *h* and *i*

[20] This subsection describes the benchmark equilibrium with personal loan enforcement in which community enforced loans are neither given nor repaid.

both play E in t^3 if and only if $w_{hi}^3 = 0$. Substituting $L=1$ into (2) allows us to solve for $\{w^*, w^{**}\}$:

(3a) $$\Delta + \delta\alpha V(w^*) = (1-\delta)w^* \ .$$

(3b) $$(1-\delta)(w^* - w^{**}) = \delta\alpha V(w^* - w^{**}) \ .$$

where $(1-\delta) \geq \delta\alpha V'(w^* - w^{**})$. Diagrams depicting the determination of w^* and w^{**} look essentially the same as those in Figure 3 and have the same interpretations, but expressed in terms of personal rather than community-wide credit and non-credit sanctions.

D. Comparing Personal and Community Enforcement

In personal and community enforcement regimes alike, the maximum debt that a borrower can carry increases with the sanctions that an individual lender or group of lenders can impose. The standard intuition is that group sanctions are more severe. In the present model, with $L \geq 2$, credit sanctions are indeed more severe because $\alpha LV(x)$ is larger and steeper than $\alpha V(x)$ for any $x > 0$, and non-credit sanctions are also more severe because ΔL exceeds Δ.[21] We have:

RESULT 1: *As community enforcement generally imposes larger credit and non-credit costs on a delinquent borrower than does personal loan enforcement, a borrower can promise credibly to pay more towards a community enforced loan than a personally enforced loan, and can thereby secure a larger loan in the first place. Further, borrowers having larger socio-economic networks, which imply the prospect of enhanced collective sanctions, can negotiate larger community- enforced loans with any given lender; these same networks do not influence the size of any personally enforced loans.*

[21]Non-credit sanctions with community-enforced loans need not be larger. Suppose that an entirely different set of non-credit transactions is contingent on personal debt, with benefit Δ_h for borrower h. Then, the personal non-credit sanction is more severe if $\Delta_h > \Delta L$. On the other hand, if the same amount of non-credit exchange is withdrawn for any debt, community sanctions are more severe as $\Delta_h < \Delta_h + \Delta(L-1)$.

In both regimes, non-credit exchange allows borrowers with outstanding debt to continue to borrow until their line of credit is exhausted.

We observed earlier in Section 1 that households in debt may continue to borrow; we empirically examine the remaining parts of Result 1 in Section 7.

4. Fixed-Duration Agreements

A borrower is said to default on a loan agreement if that agreement ends and the borrower has not repaid the loan in full. Accordingly, default is a state that is specific to loan agreements with fixed durations. In this section, we extend our basic model to explain why lenders and borrowers may negotiate loans with fixed durations, why lenders continue to supply loans to households with outstanding loans in default, and why borrowers continue to service these loans. While our analysis applies in both enforcement regimes, we only consider the case of community enforcement. Personal enforcement can again be viewed as a special case.

When a lender and borrower negotiate an open-ended loan in t^1, the borrower promises to pay the lender in the earliest possible debt-servicing sub-period τ^2, $\tau \geq t$. An open-ended loan involves non-credit sanctions that are contingent on the amount owed and the borrower's ability to pay when ability-to-pay is observable; otherwise, these sanctions are contingent only on the amount owed. When a lender and borrower negotiate a fixed-duration loan lasting *n* periods, however, the borrower is not required to make payments before period $t+n-1$. By "not required," we mean that payment is not required to avoid non-credit sanctions during the first $n-1$ periods of the loan.

The distinguishing feature of a fixed-duration loan is that it allows non-credit sanctions to be postponed. In consequence, households' decision rules must be modified. Specifically, independent of the amount that *h* owes, *h* and each $i \in I$ play *E* in G as long as *h* has not defaulted; then, if a loan has not been repaid come its final period, the parties revert to the open-ended loan strategies that impose non-credit

sanctions on the borrower contingent on the amount owed and the borrower's ability to pay (if the latter information is available).[22]

Households may prefer to negotiate a fixed-duration loan only in circumstances in which postponing non-credit sanctions is beneficial, that is, when they would otherwise forgo non-credit exchange along the equilibrium path of the game. These circumstances are described below:

RESULT 2: *Borrower h and lender* $i \in I$ *will negotiate a fixed-duration loan only if: (i) h's wealth constraint randomly binds, i.e., h is occasionally unable to service its debts; (ii) the status of h's wealth constraint in any period is privately known to h, i.e., lenders cannot tell whether h is able to pay; and (iii) h has non-credit relationships with lenders in I.*

The explanation for Result 2 is straightforward. With symmetric information, the parties can negotiate open-ended loans with decision rules that make non-credit exchange contingent on a borrower's ability to pay (i.e., each party plays *E* when either debt is zero or the borrower is unable to pay). In this case, the borrower's repayment incentive constraint is relevant only in those states in which the borrower is able to pay, and so a borrower who is able to pay its debts will do so in equilibrium. With symmetric information, households do not forgo non-credit exchange in equilibrium, and so there is no need to negotiate a fixed-duration loan to postpone sanctions.

With asymmetric information concerning the borrower's ability to service its debt, open-ended loans admit two possibilities: In one case, non-credit exchange is independent of a borrower's credit situation and always occurs, which is equivalent to setting $\Delta = 0$; this implies that $m^{**} = w^{**} = 0$ and that households in debt are unable to borrow, which is counterfactual, and rules out any role for fixed-duration loans. The other possibility is that non-credit exchange occurs if and only if *h* has no obligations to *I*. In this case, non-credit exchange is withdrawn when the borrower fails to make a

[22]That is, for a given amount of debt, the sub-game beginning with the debt-servicing sub-period of the final period of a fixed-duration loan is indistinguishable from the sub-game beginning with the first debt-servicing sub-period of an open-ended loan.

promised payment, and so households forgo non-credit exchange with positive probability in equilibrium. In this case, postponing non-credit sanctions via a fixed-duration agreement can be beneficial.

Absent non-credit exchange between the parties and, hence, absent non-credit sanctions, there is nothing to postpone. As a result, the decision rules employed during the *k*-th interim period of an *n*-period loan, $k \leq n$, are identical to those employed during the *k*-th period of an open-ended loan. Since the borrower's incentive to pay is the same in every period following the negotiation of either loan, the borrower will repay the loan as soon as possible in both situations. Fixed loan duration is of no consequence in this case.

A. Duration and Loan Size

We illustrate the benefit-cost calculation determining contract duration with a simple example. Suppose that there is a positive probability that borrower *h* is unable to service its debt in one and only one period, *t*. That is, *h*'s wealth constraint binds with probability $q > 0$ in t^2 and, in subsequent debt-servicing sub-periods, *h* is able to pay any amount owed. The lenders in *I* cannot determine whether *h*'s wealth constraint is binding in t^2. Since periods $\tau < t$ are characterized by symmetric information and non-bonding wealth constraints, *h* will be debt free at the beginning of period *t*. To simplify further, we initially suppose that *h* will never again borrow from *I*, i.e., $\alpha = 0$ for all households $i \in I$ and all periods $\tau \geq t+1$. We relax this assumption later.

Suppose that *h* is matched with $i \in I$ at the beginning of period *t*. The absence of future credit transactions with *I* has two implications for fixed-duration loans: First, since the borrower's incentive to pay a given amount in the final period of a fixed-duration loan is the same as in the first period of an open-ended loan, we know from (2a) that the maximum amount that *h* can promise credibly to pay in the final period of any fixed-duration loan is $\Delta L/(1-\delta)$. Second, the maximum amount that *h* can promise credibly to pay prior to the final period of a fixed duration loan is zero; there is no incentive to pay because, on one hand, non-credit sanctions are postponed to the

end of the loan and, on the other hand, there is no further possibility of credit exchange with lenders from *I*.

In this setting, where a borrower's ability to pay in *t* is private information, households negotiate either an open-ended loan or an *n*-period fixed-duration loan, $n \geq 2$; a 1-period fixed-duration loan and an open-ended loan are identical. Letting V^n denote the payoff from an *n*-period loan, and defining $\mu = 1 - q + \delta q$, we have

$$V^1 = \max_{\{l,r\}} F(l) - \mu r - q\Delta L \quad \text{s.t.} \quad -C(l) + \mu r \geq 0,\ 0 \leq r \leq \frac{\Delta L}{(1-\delta)},$$

$$V^n = \max_{\{l,r\}} F(l) - \delta^{n-1} r \quad \text{s.t.} \quad -C(l) + \delta^{n-1} r \geq 0,\ 0 \leq r \leq \frac{\Delta L}{(1-\delta)},\ \ n \geq 2.$$

Thus,

$$V^1 = F(l^1) - C(l^1) - q\Delta L \qquad \text{and} \quad V^n = F(l^n) - C(l^n),\ n \geq 2, \tag{4}$$

where l^j denotes the corresponding optimal loan size. Since $V^2 \geq V^n$ for $n \geq 3$, the choice is between an open-ended loan and a 2-period fixed-duration loan with payoffs V^1 and V^2, respectively.

When the enforcement constraints in both problems do not bind, $l^2 = l^1$, and (4) implies that a 2-period loan dominates because of the benefit of postponing non-credit sanctions. Since $\mu > \delta$, the enforcement constraint binds first for relatively small fixed-duration loans. Thus, when one or both enforcement constraints are binding, we have $l^2 < l^1$. In this case, the open-ended loan is preferred if the benefit of a larger loan exceeds the expected cost of non-credit sanctions (i.e., if $V^1 > V^2$).

These results do not depend on whether or not *h* can continue to borrow from households in *I* after period *t*. This is because, for any pattern of equilibrium interim and final payments, the joint payoffs are again given by (4).[23] As a result, we have:

RESULT 3a: *For any borrower and set of lenders, and a given enforcement regime, open-ended loans are at least as large as fixed-duration loans.*[24]

While this result holds whether or not the borrower's ability to pay is private information, a fixed-duration loan will be negotiated only if it is private. In some circumstances, moreover, private information is sufficient for fixed-duration loans. From the definitions of V^1 and V^n, we have:

RESULT 3b: *There is a* $q^* \in (0,1)$ *such that if the borrower's ability to pay is private information and the probability his wealth constraint binds exceeds q*, then, a fixed-duration loan will be optimal.*

As an empirical matter, the latter result indicates that fixed-duration loans will likely dominate with private information because the circumstances that necessitate borrowing in the first place are likely to be auto-correlated. In other words, *q* will likely be close to one in the initial periods after a loan has been negotiated, and so the benefit of postponing (almost certain) non-credit sanctions exceeds the possible cost of a smaller loan.

5. Personal and Community Enforcement Externalities

[23] If *h* can continue to borrow, we need only replace $\Delta L(1-\delta)^{-1}$ with w^*, and introduce the incentive constraints for interim payments made during the course of a 2-period loan.

[24] This result holds whether or not the borrower's ability to pay is observable. That is, asymmetric information only lowers V^1 by $q\Delta L$ but does not otherwise affect $\{V^1, V^2\}$ or $\{l^1, l^2\}$. In turn, this shows that open-ended loans dominate with symmetric information, because $V^1 + q\Delta L > V^2$ when $l^1 \geq l^2$, and that fixed-duration loans necessarily reflect costly ability-to-pay information.

The empirical portions of this paper provide evidence that lenders and borrowers who reside close to each other choose between personal and community loan enforcement. As in Section 3 of this paper, previous research compares outcomes with one mechanism to those with the other (Grief, 1994; Levin, 2002), but fails to consider situations in which both are available. In this section, we briefly describe a setting in which these two mechanisms co-exist. As a byproduct, we identify a negative externality among self-enforcing agreements, whereby the availability of loans using one type of mechanism undermines the credible payment promises that can be made with the other one.

Consider a situation in which wealth constraints never bind, and so matched households negotiate open-ended loans. Suppose that for each borrower-lender pair, $\{h,i\}$, there is a pair of identical but separate non-credit coordination games: The strategies in one coordination game are contingent on *h*'s current total obligations to households in *I* as a consequence of past loans to *h* that are collectively enforced by all households in *I*; the strategies in the other game are contingent on *h*'s current obligations to i as a consequence of past loans to *h* from i that are enforced by i alone.

We aim to determine values for $\{m^*, m^{**}\}$ and $\{w^*, w^{**}\}$ that support an equilibrium in which open-ended loans may alternatively be individually or collectively enforced. To simplify, we suppose that $\delta\alpha LV'(0) \leq (1-\delta)$, which implies that $\delta\alpha V'(0) \leq (1-\delta)$ for each $i \in I$. In these circumstances, as depicted in Figure 3c, credit sanctions alone are insufficient to induce borrowers to repay their loans. Hence, $w^{**} = w^*$, and $m^{**} = m^*$. As shown in the appendix, there exists an equilibrium with both community and personal loan enforcement in which $\{m^*, w^*\}$ satisfy

$$\Delta = (1-\delta)w^* \quad , \tag{5}$$

$$\Delta L + \delta\alpha L\left[V(m^*) - V(w^*)\right] = (1-\delta)m^* \quad . \tag{6}$$

Accordingly, if h owes m to I as a consequence of past community-enforced loans and owes w to each $i \in I$ as a consequence of past personally enforced loans, then, h prefers to pay $m+wL$ in the current period rather than postpone any payment whenever $m \le m^*$ and $w \le w^*$.

The intuition behind (5) and (6) is straightforward. Consider (5) first. Suppose that h owes w to i in t^2 and has no outstanding community-enforced loans, $m=0$. If h meets i in the following period, they will negotiate a community-enforced loan, independent of whether or not h paid anything to i in t^2. This is because borrower h has a larger line of credit with the community as a whole than with any individual lender, i.e., (5)-(6) imply that $w^* < m^*$, which implies that $V(m^*) > V(w^*) > V(w^* - w)$.[25] As a result, the only benefit for h of paying w to i in t^2 is the non-credit gain, Δ; the benefit of postponing payment to $t+1$ is $(1-\delta)w$. The maximum amount that h will pay on a personally enforced loan therefore satisfies (5). The availability of larger community-enforced loans reduces (and in this particular case eliminates) the impact of any personal credit sanctions. As a result, personal non-credit sanctions are critical for maintaining the viability of personal loans.

Now, consider (6). A household that has drawn down its community line of credit can always switch to personal loans. Suppose that h has no outstanding personal loans in t^2 but owes m to I, where m satisfies $V(w^*) > V(m^* - m)$. If m is left unpaid, h and i will negotiate a personal loan if they meet in $t+1$. The left-hand-side of (6) describes the benefit for h of paying m to I in t^2, and has two terms; the non-credit gain, ΔL, plus the benefit of being able to access community-enforced loans again in the following period. With personal loans as a fallback option, the benefit of accessing community-enforced loans is only the differential gain, $V(m^*) - V(w^*)$, available from

[25] To establish that $w^* < m^*$, note that $G(x) = \Delta L + \delta\alpha L\left[V(x) - V(w^*)\right]$ is an increasing, concave function of x that is bounded above. Since $\delta\alpha V'(0) \le (1-\delta)$, (9) implies that $\delta\alpha V(w^*) < \Delta$, so that $G(0) > 0$. Since $G(w^*) = \Delta L > (1-\delta)w^*$ and $G(m^*) = (1-\delta)m^*$, $m^* > w^*$.

these loans. As a result, the maximum amount that h will pay to I is smaller than what h would pay if personal loans are entirely unavailable to h, as described by (2a).

Together (2)-(3) and (5)-(6) give

RESULT 4: *When the loan enforcement mechanism is a choice variable, the repayment promises that are credible with each mechanism are reduced, i.e., the largest community and personal credit obligations,* m^* *and* w^**, have smaller values than in their respective benchmark situations, in* (2a) *and* (3a).

6. An Empirical Framework

For each household in our sample that borrowed during 1935, we observe the duration type and size of each of its loans but do not have direct information on a loan's enforcement mechanism. On the other hand, for each loan we know if the lender resides in the same village as the borrower, in the same district but in a different village, or in a different district. Since these villages are typically very small (50 households, on average) and are often located within several kilometers of 10-15 other villages, the distinction between a lender that lives in the same village as a borrower or in an adjacent or nearby village, i.e., in the same district, is of a second-order. Below, we explain how this information on the residency of the two parties can be used to develop testable predictions concerning their choice of duration and loan enforcement type across space. In our empirical analysis, we will distinguish lender-borrower pairs in which both parties reside in the same district from those in which they reside in different districts.

In our theoretical model, there is a range of contract terms available to a given lender and borrower. Their loan agreement can be open-ended or have a fixed duration; be enforced with personal or community sanctions; and have sanctions made contingent on the borrower's ability-to-repay (should the lender choose to acquire this information). This provides a total of eight contractual possibilities. In addition, the borrower must decide to borrow locally or to look outside his community for credit. The borrower's payoffs from these different choices are given as follows: Let $V_{FD}^{S,C}(n)$ and $V_{OE}^{S,C}(n)$ denote the borrower's payoff from its optimal community (C) enforced fixed-duration

(*FD*) and open-ended (*OE*) loans, respectively, when there is symmetric (*S*) information concerning the borrower's ability to pay and there are $n-1$ households in addition to the lender who participate in loan enforcement. Similarly, let $V_{FD}^{A,C}(n)$ and $V_{OE}^{A,C}(n)$ denote the corresponding payoffs when there is asymmetric (*A*) information concerning the borrower's ability to pay. The respective payoffs with personal (*P*) enforcement, $\{V_{OE}^{S,P}, V_{FD}^{S,P}, V_{OE}^{A,P}, V_{FD}^{A,P}\}$, are each equal to their community-enforced counterpart when *n*=1.

The total number of contractual alternatives available to borrowers and lenders, and which we much consider empirically, is significantly less than eight. First, our theoretical model implies that with symmetric information, an open-ended loan is always preferred to a fixed-duration loan; in other words, where feasible, income-contingent loans dominate time-contingent loans. This gives $V_{OE}^{S,C}(n) \geq V_{FD}^{S,C}(n)$ and $V_{OE}^{S,P} \geq V_{FD}^{S,P}$, and reduces the possible number of contractual choices from eight to six.

Second, we showed that asymmetric information between the loan parties is a necessary condition for the parties to prefer a fixed-duration loan. With asymmetric information, a fixed-duration loan is preferred to an open-ended loan when the benefit of postponing non-credit sanctions exceeds the possible cost of a smaller loan. This will be the case, according to Result 3b, when a household's income (or wealth) is highly auto-correlated.[26] As this is a common feature of economic life in remote rural villages, we adopt:

ASSUMPTION 1: *Fixed-duration loans are negotiated whenever there is asymmetric information between the lender and the borrower regarding the borrower's ability to repay.*

Assumption 1 implies that $V_{FD}^{A,C}(n) \geq V_{OE}^{A,C}(n)$ for all *n* and $V_{FD}^{A,P} \geq V_{OE}^{A,P}$, so that the total number of contractual choices we need to consider is only four: fixed-duration loans with

[26] When a household's income (wealth) exhibits a high degree of auto-correlation, they are unlikely to be able to repay in the initial periods following a loan. If the lender is asymmetrically informed about the ability of the borrower to repay the loan, non-credit sanctions will be immediately imposed. Thus, from the perspective of the borrower, the benefit of postponing these sanctions swamps other considerations. With symmetric information, autocorrelation is not an issue.

asymmetric information and either personal or community enforcement; and open-ended loans with symmetric information and either personal or community enforcement.

A community enforced loan can then be either open-ended with symmetric information or have a fixed duration with asymmetric information. Central to this choice is the determination of *n*, the number of participants in community enforcement. An open-ended loan requires that information on the borrower's ability to pay be available to all participating households. For many and perhaps most participating households, this information is costly to acquire, either directly or from an informed lender. Moreover, the total cost is likely to be substantial because a borrower's ability-to-pay changes from period to period and, hence, must be monitored and communicated on an ongoing basis.

We assume that the number of participants in an open-ended loan is found by maximizing the borrower's payoff, net of the monitoring, communication and coordination costs borne by the lender:

$$\text{Max}_{n\geq 1}\, V_{OE}^{S,C}(n) - c(n-1)^2 - C^P,$$

Here, C^P is the cost borne by the lender to monitor the borrower's ability to pay and $c(n-1)^2$, with $c>0$, is the lender's cost of communicating this information to, and coordinating with the other $n-1$ participants in loan enforcement; C^P is also borne with personal enforcement ($n=1$). By comparison, a community-enforced fixed-duration loan only requires that the lender and other households involved in enforcement monitor the passage of time. A fixed-duration loan thereby reduces the costs of information acquisition and exchange as the lender forgoes monitoring and interacts less frequently with the other participants. The corresponding problem is:

$$\text{Max}_{n\geq 1}\, V_{FD}^{A,C}(n) - d(n-1)^2,$$

where $d(n-1)^2$ is the cost of the lender's communication-coordination activities and $d>0$.

It seems likely that $d<c$, simply because fixed-duration loans involve fewer contingencies. The relevant empirical question is how *d* and *c* vary with the distance between where the lender and borrower reside.

A. When Households Live Far Apart (Out-of-District)

When the contracting parties live relatively far apart, e.g., in different districts, the lender's market and non-market activities will not usually involve members of the borrower's community. Similarly, the borrower's activities will be independent of the lender's circle. In these circumstances, community loan enforcement is extremely difficult, if not impossible.[27] These observations suggest the following:

ASSUMPTION 2: *When lenders and borrowers reside in different districts, the communication-coordination costs of loan enforcement,* $\{c,d\}$, *are large enough that all loans between them must rely on personal loan enforcement.*[28]

Hence, out-of-district loan choice is simple: all loans are enforced personally by the lender, and have a fixed-duration if $V_{FD}^{A,P} > V_{OE}^{S,P} - C^{P}$ and are open-ended otherwise.

Three testable implications follow from this assumption and our model when loans between parties from different districts rely exclusively upon personal enforcement:

(a) The size of the optimal fixed-duration loan between two households residing in different districts will not exceed the optimal open-ended loan they could also negotiate;
(b) A borrower's social network, which is relevant only for community enforcement, will not influence the terms of its loans with lenders in other districts;
(c) Households that reside in different districts are more likely to negotiate open-ended loans when they are related or acquainted than when they are unacquainted.

[27] McMillan and Woodruff (1999) make a similar geographic argument for the absence of community sanctions in the case of self-enforcing agreements between domestic suppliers in Vietnam and foreign customers. The presumption here is that members of the community in which a borrower resides do not participate in the collective enforcement of a loan secured from a lender who resides geographically, economically and socially outside of that community (see Grief, 1994).

[28] That is, as c and d become large, the optimal value of n in each of the above problems converges to the corner solution n=1, which is the case of personal enforcement.

Regarding (c), a key determinant of a loan's duration type is the cost, C^P, of monitoring the borrower's ability to pay. When this monitoring cost is small, as might be the case when the parties are related or interact frequently (even when they live far apart), we expect the parties to negotiate a personally enforced loan that is open ended. When the lender's monitoring costs are substantial enough that $V_{FD}^{A,P} > V_{OE}^{S,P} - C^P$, it will be more efficient to forgo monitoring, remain uninformed and negotiate a (possibly smaller) fixed-duration loan. In this sense, monitoring is endogenous.

B. When Households Live Nearby (In-District)

Assumption 2 implies that community enforcement is only available to parties that live near each other. While our contract data are rich in many dimensions, we cannot tell how a loan is enforced. That is, among in-district fixed-duration loans, the presumption is that they involve both personal and community enforcement, and likewise for in-district open-ended loans.

Our model explains why, with personal enforcement, fixed-duration loans are smaller than open-ended loans. The argument also holds for community enforced loans, as long as the number of participants *n* is the same, or nearly so, for both types of loans. Thus, if we observe that in-district, fixed-duration loans are no larger than open-ended loans, we could not reject the hypothesis that all in-district loans rely on personal enforcement, as do all out-of-district loans. On the other hand, if we observe that fixed-duration in-district loans are strictly larger, we would then conclude that there must be some community enforcement of in-district fixed-duration loans. On average, the larger size obtains because either the proportion of fixed-duration loans that are community enforced exceeds the proportion of open-ended loans that are community enforced or, with comparable proportions, the number of participants, *n*, in any community-enforced open-ended loans is smaller, so that the resulting loan is also smaller.[29]

[29] Community enforcement requires that information about the borrower be shared among *n* participants, which is costly. Moreover, these costs will be larger when the information is more complex and is collected and disseminated more frequently. As a result, the communication-coordination costs of open-ended loans likely exceed those of fixed-duration loans. That is, open-ended loans require ongoing acquisition and exchange of ability-to-pay information about the borrower, while fixed-duration loans only require that the passage of time be monitored and communicated. A case can then be made that $c>d$ and that *c* is relatively large, which implies that the number of households participating in community

From Table 4, we know that in-district, fixed-duration loans are in fact on average larger than open-ended loans. In a regression context, we will test to see if:

(d) The size of the optimal fixed-duration loan between households residing in the same district exceeds the size of the optimal open-ended loan they could otherwise negotiate.
(e) The borrower's socio-economic network influences his choice between fixed-duration and open-ended loans when the borrower and lender reside in the same district.

These two propositions will hold only if some of the fixed-duration loans rely on community enforcement. Evidence rejecting either proposition casts doubt on the importance of this enforcement mechanism.

The third testable implication regarding loans between households that live near each other is:

(f) Households that are related will be *no* more likely than unrelated households to negotiate open-ended loans when they reside in the same district.

That is, as households residing in the same or nearby village generally know each other, we expect that being related will not confer the same informational advantage that it would if the parties lived far apart.

7. Empirical Implementation

In order to test predictions (a)-(f), we formulate a standard switching-regression model (Maddala, 1983). There are two enforcement-*cum*-geographic regimes, the in-district regime and the out-of-district regime. According to Assumption 2, loan

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enforcement of open-ended loans is considerably smaller than the number participating in community enforcement of fixed-duration loans. Indeed, if c is large enough, a corner solution results in which all open-ended loans are personally enforced, as in the case of out-of-district loans.

agreements may be enforced in-district with either community or personal sanctions, but are enforced exclusively with personal sanctions out-of-district. The empirical model is

$$\text{Regime R:} \qquad \text{Size}_h = \beta'_{R1} X_h + \beta_{R2} \text{Dur}_h + \varepsilon^S_{Rh} \qquad \text{R=In, Out,}$$

$$\text{Dur}_h = \beta'_{R3} Y_h + \beta_{R4} \text{SEN}_h + \beta_{R5} \text{AI}_h + \varepsilon^D_{Rh},$$

where Size_h is the size of household *h*'s loan, X_h is a set of household variables affecting loan size, Dur_h=1 if the loan has a fixed duration and is zero otherwise, Y_h is set of household determinants of duration choice, SEN_h measures the extent of *h*'s social and economic network in its village, and AI_h measures the cost of making ability-to-pay information available to the lender.

A criterion function, $\gamma' Z_h - \varepsilon_h$, determines if the borrower contracts with a lender residing in the same district as the borrower or outside. Each regime has an equation describing the loan size and the probability of negotiating a fixed-duration loan; a linear probability model is used in the latter case. We correct the equations in each regime for potential selection effects related to the decision to contract either inside or outside the district, and correct the loan-size equations in each regime for endogeneity of the duration decision using two-stage least squares.[30]

In light of predictions (a) through (f), the empirical implications of our model are:

Out-of-District	**In-District**
(a) $\beta_{\text{Out},2} \leq 0$,	(d) $\beta_{\text{In},2} > 0$,
(b) $\beta_{\text{Out},4} \approx 0$,	(e) $\beta_{\text{In},4} > 0$,
(c) $\beta_{\text{Out},5} > 0$,	(f) $\beta_{\text{In},5} \approx 0$.

[30] We also estimated the model without corrections for selection related to going outside for a loan. Both the OLS and TSLS results are very similar to those obtained with the correction.

A. Lender Location

There are 285 positive-interest-rate loans between households in our data.[31] These data are used to estimate a probit model for lender location, where y_h=1 (=0) when borrower h resides in the same (different) district as its lender and Prob(y_h=1) = Prob($\gamma' Z_h \geq \varepsilon_h$). The estimated coefficients from the probit are reported in Table 5. We include two broad sets of attributes, those of the borrower, and those of the village in which he resides. Borrower attributes include their predicted income, household size, shocks to the household over 1935 (harvest shock or death in the family), as well as the age of the head of the household, the number of years the household has been in the village, clan membership, and a measure of the household's market interaction. The latter three variables are designed to capture the socio-economic network of the household. Village attributes, on the other hand, are intended to capture the extent of local economic opportunities and include a measure of agriculture commercialization, the percentage of households that are economically autarkic, population density, the distance to the county seat, and the mean real local wage.[32] Definitions of these variables are provided in Appendix B.

The noteworthy aspect of this probit is that village attributes are significant while borrower attributes are generally unimportant. A household's decision to borrow locally, i.e., remain in-district for a loan, tends to increase with our measures of the level of local economic activity. This is expected to the extent that local borrowing opportunities are correlated with local economic activity. Borrowers are also more likely to remain in-district the greater the potential supply of lenders (as captured by the population density) and the greater the distance to the county seat (which may offer alternative sources of credit).

Two household attributes appear to be important: The number of years a household's family has resided in a village, and clan membership. Years-in-village has a significant positive effect on the probability of staying in-district for a loan if that household is not a member of a village clan. Clan membership offsets the years' effect

[31] There are 291 loans in all but 6 are missing information.

[32] We experimented with alternative measures of borrower and village attributes, and versions of this probit, but found that they offered no additional insight.

and, by itself, has a positive effect on the probability of borrowing in-district. We view years-in-village and clan membership to be measures of the extent of a household's local economic and social network; as such, we expect them to enhance the viability of community enforcement and, hence, make larger community-enforced fixed-duration loans available to households that borrow in-district.

B. Loan Size and Duration

Table 6 contains separate estimates of the loan-size and duration equations for agreements between households residing in the same and different district. Given our maintained hypotheses, these estimates correspond to loans negotiated in regimes with and without community enforcement. The probit reported in Table 5 is used to correct these equations for possible selection effects due to the residencies of the borrower and lender.

B.1 Effect of Duration on Loan Size: OLS

Columns (IDa) and (ODa) report in-district and out-of-district OLS estimates, respectively, of the effects of the fixed-duration dummy variable, Dur_h, on loan size in a regression model that adds a set of borrower controls and a selection correction for the choice of lender location. Borrower controls include the household's predicted income, household size, the age of the head of the household, and two household shock variables, namely, a death in the family and the harvest shock. We also include the relationship between the parties. Out-of-district, households can be either related or acquainted (and not related); the omitted category is not related or acquainted. In-district, since all households report being at least acquainted with the lender, we only include a dummy for being related. We also identify parties that live in the same village.

Fixed-duration has a significant, positive effect on the size of in-district loans. On average, these fixed-duration loans are estimated to be 3.46 yuan larger; this is a substantial effect as the average in-district loan is 9.36 yuan. Out-of-district, in contrast, the effect of fixed-duration on loan size is much smaller and in fact statistically insignificant. In-district, we also find that loan size is positively correlated with the household's predicted income and our measures of shocks to the household's welfare.

Households experiencing deaths in the family and negative farm shocks take out larger loans; only the latter effect is statistically significant. Loans from relatives are also slightly larger, while those from fellow villagers tend to be smaller. Out-of-district, the effects of the household-level variables are fairly similar to those observed in-district. Note, however, that the relationship between the parties has no bearing on loan size out-of-district.

These preliminary results are consistent with the view that households negotiate fixed-duration loans in-district that rely on community enforcement, which allows them to promise credibly to repay more than they could otherwise, and that this technology is unavailable out-of-district when lenders and borrowers reside far apart.

B.2 Effect of Duration on Loan Size: TSLS

Loan size and contract duration are negotiated together, and so the error term in the size equation may be correlated with the probability of negotiating a fixed-duration loan. This will bias our estimate of the effect of contract duration on loan size. Candidate instruments for duration are measures of household interaction in the village, and village-level variables that affect the differential communication-coordination costs of implementing fixed-duration and open-ended loans but do not have independent effects on loan size. This is because Prob(Dur_h =1) increases with the difference between *h*'s benefit from its best fixed-duration loan and from its best open-ended loan, and decreases with the differential cost of implementing these two loans.

We use a combination of household-level and village-level variables as instruments. The household-level variables are selected to capture the density of the borrower's local socio-economic network, and include the age of the head of the households, the number of years the household has resided in the village, clan membership, market participation, as well as the household's relationship with the lender. The village-level variables, on the other hand, are meant to reflect the costs of coordinating community sanctions, and include the percentage of households that are autarkic, the population density, and the degree of commercialization in the village. We discuss the first-stage regressions, reported in (IDb) and (ODb), separately below.

In columns (IDc) and (ODc), we report the TSLS estimates for the effect of loan duration on loan size. Both set of estimates easily pass the over-id test. In-district, fixed duration has a positive and significant effect that is almost twice as large as that estimated using OLS. Recall that in-district, fixed-duration loans can be either personally or community enforced. Our explanation for the larger TSLS coefficient is that, under our identification strategy, we are now effectively estimating the impact of fixed duration from those households who are accessing fixed duration in the context of community enforcement. We will offer additional support for this interpretation in our discussions of the first-stage regressions. Out-of-district, on the other hand, the effect of a fixed duration is now actually negative, albeit insignificant. Theory predicts that these loans should be no larger than their open-ended counterparts. Out-of-district, as well as in-district, the rest of the coefficients on the household-level variables are fairly similar to those obtained using OLS.

Two variables in the loan size equation in-district merit additional discussion, namely, contracting with relatives, or a fellow villager. We observe that loans with relatives are larger. Personal sanctions are arguably greater (and community sanctions are marginally so) when the lender is also a relative. In both instances, the borrower can credibly promise to repay larger sums, whether the loan is fixed or open, and so larger loans will be forthcoming. In this context, the negative coefficient of Both Villagers in (IDc) is curious as the argument appears to be the same as with the Related variable; that is, personal sanctions will presumably be larger when the lender and borrower are neighbors and interact more frequently. Unlike the Related variable, however, Both Villagers has a community-enforcement selection effect that works in the opposite direction. A borrower who contracts with a lender residing in the same village is likely to have a localized community enforcement network, i.e., limited to the borrower's village (the villages in our sample contain an average of 50 households). Contracting with a non-villager (in the same district) suggests that a wider network is accessed that can correspondingly impose greater collective sanctions and therefore make larger loans self-enforcing.[33]

[33]This view is entirely consistent with the notion that households borrow outside their villages to secure larger loans than would be available on the inside.

B.3 Determinants of Contract Duration (First-stage Regressions)

Columns (IDb) and (ODb) report first-stage in-district and out-of-district regressions, respectively, for duration. We expect that the costs of implementing fixed-duration and open-ended loans will differ across regimes. Out-of-district, fixed-duration and open-ended loans both rely on personal enforcement and a fixed duration is adopted only when the lender is at an informational disadvantage with respect to the borrower's ability to pay; the differential enforcement cost of an open-ended loan, C^P, is the cost of making the borrower's ability to pay known to the lender. In-district, on the other hand, we hypothesize that the use of fixed-duration loans is tied heavily to the use of community enforcement, and thus related to household- and community-level variables enhancing community enforcement. Thus, while the same variables are used in (IDb) and (ODb) to capture the effect of the borrower's relationships with other households on the differential cost of a fixed-duration loan, these variables are expected to have different effects in each regime.

B.3.a Lender-borrower relationship

For each credit agreement, we know whether the borrower and lender are related, are acquainted but not related, or are neither related nor acquainted; as well, for in-district loans, we know if the lender resides in the borrower's village. Since the cost of communicating with *other* households will not substantially depend on the borrower-lender relationship, this relationship should not appreciably affect the extra cost of implementing a loan in-district that involves community enforcement. As expected, the coefficients of the Related and Both Villagers dummy variables in (IDb) are statistically insignificant; the Acquainted dummy variable is suppressed in model (IDb) since all in-district borrower-lender pairs in our data are either related or acquainted.[34]

[34] Since all in-district lender-borrower pairs are already acquainted, we expect the lender's monitoring cost, C^P, to be relatively small in this setting. When $C^P \approx 0$, open-ended loans dominate fixed-duration loans that rely on personal enforcement because $V_{OE}^{S,P} > V_{FD}^{A,P}$. Households will then negotiate fixed-duration loans only if they rely on community enforcement and thereby facilitate larger loans.

Out-of-district, households should choose fixed-duration loans (with personal enforcement) only when the lender's information on the borrower's ability to pay is limited. Since the lender is expected to have more information on the borrower when they are related or at least acquainted (as they live in different districts), the Related and Acquainted variables should have a negative effect on the probability of negotiating a fixed-duration loan. As some borrower-lender pairs are neither related nor acquainted, we can estimate the coefficient of the Acquainted dummy variable in the out-of-district equation. The coefficients of Related and Acquainted in (ODb) are negative and significant.

B.3.b Borrower-community relationship

We are interested in the extent to which a borrower is socially and economically connected to other households in its village. For in-district loans, we expect these connections to facilitate coordinating those future credit and non-credit exchanges between the borrower and other households that underlie community enforcement. These connections can increase the likelihood of negotiating a fixed-duration loan only if fixed-duration loans relay on community enforcement. For loans involving out-of-district personal enforcement, however, these connections should be relatively unimportant for the choice between fixed-duration and open-ended loans since they are unlikely to make additional borrower information available to the lender.

We observe the number of years a household's family has resided in a village (Years in Village), whether the household is a member of a village clan (Clan Membership), and the extent to which a household participates in the land and labor markets (Market Index). In-district, years in village, clan membership and market participation increase the likelihood of a fixed-duration loan, which is consistent with our view that in-district fixed-duration loans include some that rely on community enforcement; the negative interaction terms indicate that clan membership and market participation are *per se* less important for borrowers whose families have a long history in the village. Out-of-district, where we argue that fixed-duration loans rely on personal enforcement, we find that these measures of a borrower's network are empirically unimportant.

B.3.c Village attributes

In some villages, it is easier to coordinate households' exchanges to implement community loan enforcement than in other villages. The relevant set of households includes those that interact frequently with a given borrower, or may do so in the future. We expect that the costs of coordinating these households will be lower in situations where they are more easily identified, i.e., in villages characterized by lower overall levels of economic activity and social interaction, and with smaller numbers of active players and alternative exchange opportunities.

We consider three measures of village activity: The percentage of households that do not participate in either land, labor or credit markets (Autarky); the population density (Pop Den); and the percentage of agricultural output that is sold (Commercialization). Thus, as input markets become thinner (Autarky increases), as output markets become less active (Commercialization decreases), and as population density decreases (Pop Den falls), a given borrower's exchanges are more likely to be limited to a smaller number of households. In this setting, community-enforced loans should be relatively less costly and more attractive. Fixed-duration loans that rely on community enforcement are certainly consistent with the in-district results in column (IDb), where autarky and population density both have significant effects at 0.025 percent.

Out-of-district, on the other hand, fixed-duration loans rely on personal enforcement. What is relevant in the choice of a fixed-duration loan is a lender's cost of monitoring a borrower who resides in a village outside his district, C^P, as the relevant payoffs are $V_{OE}^{S,P} - C^P$ and $V_{FD}^{A,P}$. And, here we observe that fixed duration is significantly less likely in more commercialized and densely populated areas. An interpretation consistent with this finding is that the costs of obtaining information and of monitoring the borrower are lower in these environments, thus making open-ended loans desirable from the perspective of both parties.

8. Final Remarks

Households in remote villages of low-income economies face restricted access to financial and legal institutions. In consequence, credit is exchanged directly between

households using informal (largely verbal) loan agreements. A number of researchers have noted that some loan agreements between households are open-ended while others have fixed durations, but have failed to ask why. In a world where consumption (investment) loans are open-ended (fixed duration) and supplied by households (money lenders or landlords), it is easy to see why the question of loan duration may be deemed uninteresting. In fact, the world we study is very different. Drawing on a sample of loan contracts from rural China in the 1930s, we establish that loan purpose has little to do with loan duration or lender occupation. We observe individuals who are neither moneylenders nor landlords supplying consumption loans that have fixed durations, and investment loans that are open ended.

This paper is the first to develop and test a theory of loan contract duration. For the remote village economies considered here, it is reasonable to begin by restricting attention to loans that are self-enforcing. However, whether the lender exclusively enforces the loan through personal enforcement or other households are involved via community enforcement, the sanctions that can be imposed on a borrower are essentially the same and fall into one of two groups: Credit sanctions and any other kind of sanction, or non-credit sanctions for short.

Collateral, which is property pledged as a guarantee for loan repayment, is an obvious vehicle for imposing non-credit sanctions on a borrower. In our setting, however, collateral is problematic as many borrowers simply do not own property that can be pledged. And for those that do, there is the added complication that transferring this property must also be voluntary and self-enforcing. Not surprisingly, then, the percentage of loans that use collateral in our sample is very small.

The fact that so few informal loans required collateral suggests that there must have been substitutes available for effecting non-credit sanctions. The obvious source for these substitutes is household relationships. Households residing in the same or adjacent villages are often related or well acquainted, and interact repeatedly, both socially and economically. Since a lender who is involved in these exchanges with a borrower can withdraw them when loan payments are not forthcoming, these non-credit exchanges are a ready source for non-credit sanctions.

We argue in this paper that the distinguishing feature of a fixed-duration loan is simply that it creates a "breathing space" for the borrower during which non-credit sanctions are prohibited. With a fixed-duration loan, the threat to impose non-credit sanctions is postponed until the end of the loan period. An open-ended loan, on the other hand, does not shield the borrower from sanctions, even in the short term. As a result, the only circumstance in which a borrower would negotiate an open-ended loan is when this breathing space is unnecessary, specifically, when a state-contingent loan is feasible. Sanctions are then imposed only when the borrower is able but unwilling to make an agreed upon payment.

State-contingent sanctions are feasible when the party or parties charged with enforcing the terms of a loan are able to monitor the borrower's ability to pay, i.e., his income and financial needs. When this information is costly or unavailable, state-contingent sanctions are ruled out. Sanctions are still required to encourage repayment, but may now be mistakenly imposed on a borrower who is unable to pay because this information is private. In this situation, a fixed-duration loan offers a borrower short-term protection against "inappropriate" sanctions. The cost of a fixed-duration loan is that by encouraging borrowers to delay payment, it generally results in a smaller loan than otherwise.

Our empirical work confirms that fixed-duration loans are indeed smaller then open-ended loans, and that the likelihood of negotiating an open-ended (state-contingent) loan increases when the parties have a close social relationship. On the enforcement side, we provide considerable evidence that households which live near each other are more likely to negotiate community-enforced loans than those that live far apart, and that the incidence of these loans is greater in villages in which small groups of households interact repeatedly.

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Table 1: Breakdown of Loans by Type and Attributes (1935)								
Loan type	**Zero Interest**		**Positive Interest**		**Land Mortgage**		**Pawns**	
Duration Type	**Fixed**	**Open**	**Fixed**	**Open**	**Fixed**	**Open**	**Fixed**	**Open**
Number of Loans	93	275	155	148	12	30	58	3
Written (%)	1.1	1.5	12.3	8.8	58.3	42.3	13.8	0
Third Party (%)	3.2	2.5	16.9	8.8	50.0	26.9	0	0
Collateral (%)	1.1	1.5	5.2	3.3	100.0	100.0	100.0	100.0
No Security (%)	95.7	95.4	73.5	83.8	0	0	0	0
Related (%)	54.8	51.2	45.2	56.9	25.0	42.3	1.8	0
Same Village (%)	28.0	19.6	16.8	10.1	16.7	36.7	0	0
Same District (%)	45.2	43.2	58.1	58.1	75.0	36.7	10.3	0
Average Size (yuan)[1]	6.57	6.41	15.48	9.45	61.13	29.8	2.13	3.67
Purpose (%)[2]								
Consumption	68.2	67.3	66.9	54.4	55.0	85.7	66.7	89.3
Investment	27.1	27.1	27.7	44.2	40.0	14.3	0.0	10.7
Other	4.7	5.6	5.4	1.4	5.0	0.0	33.3	0.0

Notes: 1. Loan size is expressed in "real" yuan, by deflating nominal yuan by the local price of grain (the numeraire). 2. A consumption loan includes loans for consumption purposes, emergencies, and ceremonies; investment includes fixed and current investment, as well as education expenses; and other includes loan repayment, taxes, rents, and other miscellaneous uses.

Table 2: Occupational Distribution of Borrowers and Lenders (1935)				
Loan Type	**Positive, Fixed Duration**		**Positive, Open-ended**	
	Lender	**Borrower**	**Lender**	**Borrower**
Occupation	%	%	%	%
Landlord	9.7	3.9	6.1	3.4
Farmer	54.8	87.7	58.1	77.7
Wage Labor[1]	8.4	1.9	10.1	14.2
Commerce	12.9	0	10.8	0.7
Professional[2]	3.9	4.5	5.4	2.7
Moneylender	1.9	0	0	0
Unknown	8.4	1.9	9.5	1.4

Notes: 1. Wage laborer primarily includes farm laborers, but also some individuals hiring out in non-agricultural activity. 2. Professional includes teachers, doctors, etc.

Table 3: Average Loan Size by Duration Type and Residency (1935)[1]				
	Fixed Duration Loans	**Open-ended Loans**	**T-test Difference**	**Totals**
	(yuan)	(yuan)		(yuan)
Borrower and Lender:				
Reside in Same District	11.00	7.31	2.23	9.38
Reside in Different Districts	10.87	9.34	0.94	10.00
Totals	10.94	8.51		9.71
Note: 1. Loan size is expressed in "real" yuan.				

Table 4: Households' Portfolio and Borrowing and Repayment Activity (1935)							
	Number of Households	**Number of Households Borrowing in 1935**				**Number of Households Making Payment in 1935 on Loans Outstanding as of Beg. of 1935**	
		Total	Loan Type[1]			Loan Not in Default	Loan in Default
			OE	FD	Both		
No outstanding loans as of beginning of 1935	794	244	124	88	32		
Outstanding loans as of beginning of 1935	301	146	85	31	30	140	11
Of which:							
No loans in default as of beginning of 1935	268	131	80	23	28	114	NA
At least one loan in default as of beginning of 1935	33	15	5	8	2	26	11
Total	1095	390	209	119	62	140	11

Note: 1. OE refers to open-ended loans, and FD refers to fixed duration loans; thus, 124 (88) refer to the number of households borrowing exclusively by open-ended (fixed duration) loans. "Both" refers to the households borrowing by both types.

Table 5: Summary Measures of Village (Community) Attributes				
	Mean	SD	Minimum	Maximum
Village Variable				
Village age	121.6	95.2	24	350
Years in Village	59.2	55.1	10.2	173.7
% of HH in Clan	46.0	21.1	12.0	89.2
Pop. Density	0.18	0.14	0.06	0.67
% HH Autarkic	15.9	14.4	0.0	57.0
Commercialization (%)	23.7	12.2	5.5	50.3
Notes: Variable definitions are provided in Appendix B.				

Table 6: Probit Regressions for Contracts In District versus Out of District			
Intercept	1.543	Market Participation Index	-.056
	(0.65)		(.12)
Consumption Loan	-.053	**Village Attributes**	
	(0.17)		
Borrower Attributes		Local Wage	.925*
			(.25)
Predicted Income	-.004**	Commercialization	1.594**
	(.002)		(.82)
Household Size	.029	Population density	.357**
	(.031)		(.17)
Age of Head	-.004	Distance to County Seat	.009*
	(.006)		(.003)
Years in Village	.015*	% HH Autarkic	-3.068*
	(.004)		(.84)
Clan Member	.303		
	(.222)		
Clan Member*Years	-.015		
	(.004)		
Farm Shock	.203		
	(1.01)		
Death in Family	.173		
	(0.66)		
Observations	285	R^2	.111
Note: Variable definitions are provided in Appendix B.			

Table 7: Loan Size and Contract Duration Type						
	In District Loans			Out of District Loans		
	(IDa)	(IDb)	(IDc)	(ODa)	(ODb)	(ODc)
	Loan Size	Fixed Duration	Loan Size	Loan Size	Fixed Duration	Loan Size
Indep. Variables	**(OLS)**	**FD = 1**	**(TSLS)**	**(OLS)**	**FD = 1**	**(TSLS)**
Intercept	15.533*	-.438	3.017	3.210	.984	6.188
	(4.98)	(.45)	(4.71)	(8.97)	(.60)	(8.041)
Fixed Duration	3.458**		6.887**	1.530		-1.017
	(1.51)		(3.54)	(1.79)		(4.10)
Consum. Loan	-2.359	-.052	-1.888	-2.164	-.225*	-2.738
	(1.56)	(.09)	(1.56)	(1.80)	(.08)	(1.857)
Household Attributes						
Farm Shock	18.873*	.150	15.896**	-21.407***	1.058	-20.331
	(6.56)	(.46)	(7.00)	(12.40)	(.71)	(12.75)
Death in Family	3.341	-.012	4.378	8.249**	-.166	7.784**
	(3.30)	(.14)	(3.21)	(3.41)	(.15)	(3.464)
Pred. Income	.075*	-.001	.072*	.080**	.001	.083*
	(.014)	(.001)	(.014)	(.017)	(.001)	(.109)
Household Size	-1.119*	.047*	-1.220*	-.391	-.017	-.427
	(.33)	(.017)	(.332)	(.95)	(.015)	(.415)
Age of Head	.108**	-.004	.140**	.086***	-.002	.080
	(.06)	(.003)	(.069)	(.053)	(.003)	(.06)
Years in Village		.002			.003	
		(.001)			(.003)	
Clan Member		.862*			.139	
		(.21)			(.22)	
Market Index		.333*			.126	
		(.08)			(.08)	
Clan*Years		-.004**			-.004	
		(.02)			(.003)	
Market*Years		-.336*			.010	
		(.11)			(.11)	
B-L Relationship						
Parties Related	4.462*	-.122	4.563*	1.476	-.412*	
	(1.47)	(.09)	(2.94)	(3.059)	(.16)	
Acquainted				1.062	-.397**	
				(3.31)	(.17)	
Live in Same Village		.092	-3.414***			
		(.09)	(1.88)			
Village Attributes						
% HH Autarkic		1.087**			-.208	
		(.50)			(.52)	
Population Density		-.214**			-.187**	
		(.09)			(.081)	
Commercialization		-.247			-1.139**	
		(.475)			(.50)	
Selection 1	26.693*		30.685*			
	(9.37)		(9.21)			
Selection 2				-2.084	-.193	-2.101
				(5.798)	(.42)	(6.09)
Sargan Over-ID Test (P-value)			.744			.890
Observations	131	131	131	154	154	154
R^2	0.384	0.321	0.380	0.449	0.218	0.532

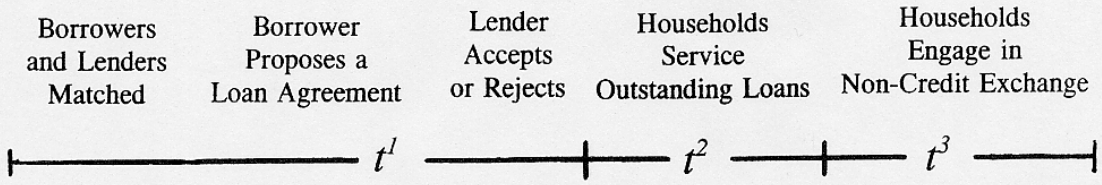

Figure 1

Payoff Matrix for Non-credit Exchange

Household *h* \ Household *i*	DE	E
DE	$-\Delta, 0$	$-\Delta, -\kappa$
E	$-\Delta-\kappa, 0$	$0, 0$

Figure 2

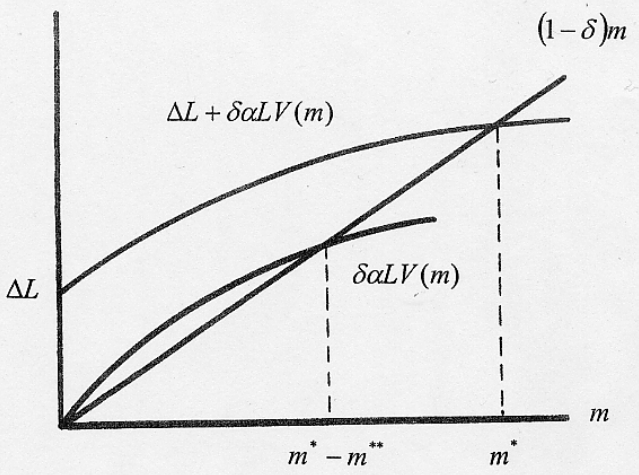

Figure 3a

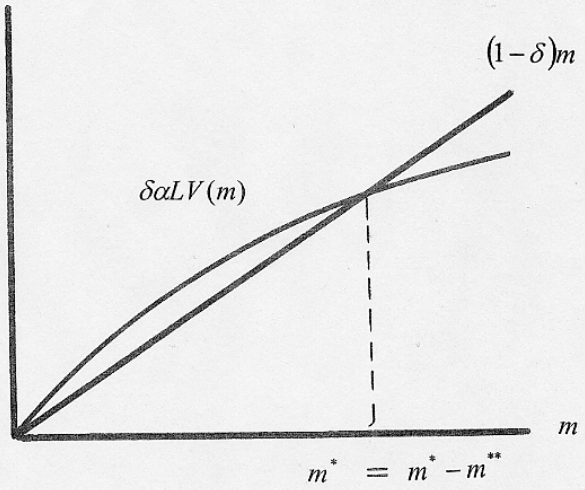

Figure 3b

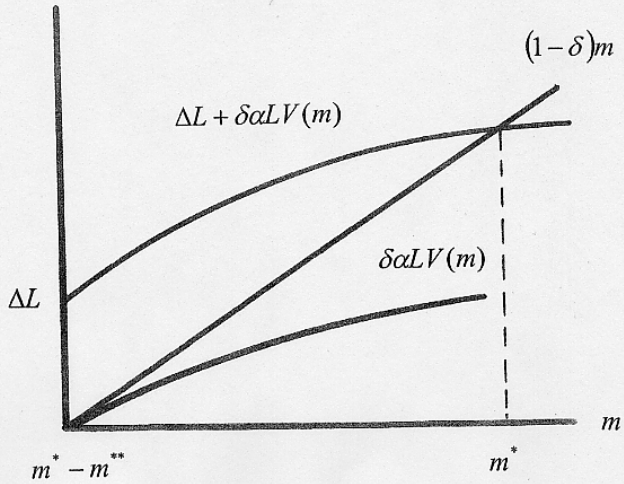

Figure 3c

Appendix A

A. Derivation of (2a,b)

We determine values for m^* and m^{**}, and beliefs concerning the evolution of household debt, so that the strategies described in the text comprise a sub-game perfect equilibrium (SPE).

Let $m_{hi}^z(t) \geq 0$ denote the amount that household *h* owes to household *i* at the beginning of sub-period t^z, $z = 1,2,3$; when there is no confusion, we write m_{hi}^z instead of $m_{hi}^z(t)$. The total amount that *h* owes to lenders *I* at the beginning of t^z is $m_{hI}^z = \Sigma_{i \in I} m_{hi}^z$.

Since loan transactions are observed but not recorded, a common set of beliefs is imposed following any history of loans and payments. Specifically, if *i* rejects *h*'s loan offer $\{l_{hi}, r_{hi}\}$ in t^1, *h*'s obligations to both *i* and *I* at the beginning of the next debt-servicing sub-period, t^2, are unchanged, whence $m_{hi}^2 = m_{hi}^1$ and $m_{hI}^2 = m_{hI}^1$. If *i* accepts *h*'s offer, m_{hi}^2 is defined by:

$$m_{hi}^2 = \begin{cases} m_{hi}^1 & \text{if } m_{hI}^1 > m^{**}, \quad \text{(A.1a)} \\ m_{hi}^1 + r_{hi} & \text{if } m_{hI}^1 \leq m^{**},\ m_{hI}^1 + r_{hi} \leq m^* \quad \text{(A.1b)} \\ m_{hi}^1 + m^* - m_{hI}^1 & \text{if } m_{hI}^1 \leq m^{**},\ m_{hI}^1 + r_{hi} > m^*. \quad \text{(A.1c)} \end{cases}$$

According to (A.1a), an obligation resulting from a loan that is supplied to a borrower who has already exhausted his community line of credit is ignored; according to (A.1c), any new loan obligation that removes a borrower's incentive to service its outstanding debt (by raising the amount owed above m^*) is partially forgiven to restore this incentive. These beliefs have the property that all parities ignore new loan obligations

that undermine *h*'s incentive to repay its outstanding debt.[35] The total amount that all households expect that *h* owes to *I* at the beginning of t^2 is $m_{hI}^2 = \Sigma_{i \in I} m_{hi}^2$.

Let $\rho_{hi}(t) \geq 0$, or ρ_{hi} for short, denote the amount paid by borrower *h* to lender *i* in debt servicing sub-period t^2.[36] The total amount paid by *h* in t^2 to lenders in *I* is $\rho_{hI} = \Sigma_{i \in I} \rho_{hi}$. Borrower *h* pays $\rho_{hi} = m_{hi}^2$ if $m_{hI}^2 \leq m^*$, and $\rho_{hi} = 0$ otherwise. The amount that h is commonly believed to owe to *i* at the beginning of t^3 is defined as:

$$m_{hi}^3 = \max\{0, m_{hi}^2 - \rho_{hi}\}. \tag{A.2}$$

The total amount that *h* owes to *I* at the beginning of t^3 is $m_{hI}^3 = \Sigma_{i \in I} m_{hi}^3$.

Suppose that borrower *h* owes $m \leq m^*$ to lenders in *I* at the beginning of t^2. Let $M(m)$ denote *h*'s payoff when borrowing from any $j \in I$, given that *h* already owes *m* to lenders in *I*. Since *h* can continue to borrow only if $m \leq m^{**}$,

$$M(m) = \begin{cases} V(m^* - m) & \text{if } m \leq m^{**}, \\ 0 & \text{if } m > m^{**}. \end{cases}$$

We now describe *h*'s payoffs from paying *m* in t^2 and from postponing payment to $t+1$. Assuming that all parties follow their equilibrium strategies in all subsequent periods, *h*'s payoff from paying *m* in t^2, given (A.1)-(A.2), is

$$-m + \gamma[\alpha L V(m^*) + (1 - \alpha L)X],$$

[35] An alternative modeling approach is to introduce verifiable loan obligations to condition (i) trigger strategies to mimic the punishment of lenders in (A.1a), and (ii) contract renegotiation to mimic the debt forgiveness in (A.1c). With these complications, (A.1a) and (A.1c) then describe outcomes off the equilibrium path of the game.

[36] The reason why payments are subscripted is that while borrowers *h* and *h*' have identical production functions and matching probabilities, they are likely to have different debt portfolios as a consequence of different matching histories. Different obligations to lenders translate into different payment patterns.

where $\gamma = \delta/(1-\delta)$ and *X* denotes *h*'s expected payoff from borrowing outside the community involved with collective loan enforcement. The payoff from postponing payment of *m* to the next debt-servicing sub-period is[37]

$$-\Delta L + \delta[\alpha LM(m) + (1-\alpha L)X - m + \gamma[\alpha LV(m^*) + (1-\alpha L)X]].$$

Thus, *h* prefers to pay $m \le m^*$ to lenders in *I* in period t if

(A.3) $$\Delta L + \delta\alpha L\left[V(m^*) - M(m)\right] \ge (1-\delta)m \ .$$

It follows that the maximum amount which *h* can credibly promise to pay lenders in *I*, m^*, is the largest value of *m* that satisfies (A.3), and therefore solves:

(A.4a) $$\Delta L + \delta\alpha LV(m^*) = (1-\delta)m^* \ .$$

We now determine *h*'s line of credit with lenders from *I*. There is actually a range of possible values consistent with equilibrium. Using the definition of m^* from (A.4a), we rewrite (A.3) as $(1-\delta)(m^* - m) \ge \delta\alpha LV(m^* - m)$ when $m \le m^{**}$ and $(1-\delta)(m^* - m) \ge 0$ when $m > m^{**}$. This version of (A.3)) simplifies to $m^* - m \ge x^*$ when $m \le m^{**}$, and $m^* - m \ge 0$ when $m > m^{**}$, where x^* satisfies $(1-\delta)x^* = \delta\alpha LV(x^*)$ and $(1-\delta) \ge \delta\alpha LV'(x^*)$; from (A.4a), we know that $m^* \ge x^*$, and that $m^* > x^*$ when $\Delta > 0$. Since the first condition states that $m \le m^* - x^*$ when

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[37]Instead of postponing payment of *m*, the borrower could alternatively pay $(1-\beta)m$ in t^2 and postpone paying βm to the next debt-servicing sub-period, which yields

$$-(1-\beta)m - \Delta L + \delta[\alpha LM(\beta m) + (1-\alpha L)X - \beta m + \gamma[\alpha LV(m^*) + (1-\alpha L)X]].$$

This payoff is an increasing function of β if and only if $(1-\delta) > -\delta\alpha LM'(\beta m)$. It follows from (A.4b) below, which defines m^{**}, that this inequality is satisfied for $m \le m^*$; hence, given that some payment is postponed, it is optimal to postpone the maximum amount possible, i.e. set $\beta = 1$.)

$m \leq m^{**}$, it follows that each element of the set $[0, m^* - x^*]$ is a candidate value of m^{**}. Now, for each $\omega \in [0, m^* - x^*]$, there exists a SPE in which each lender $i \in I$ is willing to accept a loan offer from borrower *h* only when the total amount that *h* owes to all lenders from *I* does not exceed ω. As lenders are indifferent among $[0, m^* - x^*]$ while *h* prefers the largest value (because it maximizes the amount of debt h can carry before credit sanctions are imposed), we define $m^{**} = m^* - x^*$, so that m^{**} satisfies

(A.4b) $$(1-\delta)(m^* - m^{**}) = \delta\alpha LV(m^* - m^{**}) \quad .$$

Expression A.4a, and A.4b correspond to 2a and 2b in the text.

B. Deriving (5)-(6)

We aim to determine values for $\{m^*, m^{**}\}$ and $\{w^*, w^{**}\}$ that support an equilibrium in which open-ended loans may alternatively be enforced with personal or community sanctions. We consider a situation in which loans are repaid sequentially to different lenders within each debt-servicing sub-period, i.e., if borrower *h* owes $\{m_{hI}^2, w_{h1}^2, w_{h2}^2, ..., w_{hL}^2\}$ at the beginning of t^2, *h* sequentially decides whether or not to repay each obligation in turn, starting with m_{hI}^2 and proceeding through the list of personally enforced loans from lenders $i = 1,..,L$.[38]

We restrict attention to situations in which $\delta\alpha LV'(0) \leq (1-\delta)$, so that $\delta\alpha V'(0) \leq (1-\delta)$ for each $i \in I$. In these circumstances credit sanctions alone are insufficient to induce borrowers to repay their loans and so, as confirmed later below, $w^{**} = w^*$ and $m^{**} = m^*$, where $0 < w^* < m^*$ when $\Delta > 0$. We assume that $\Delta > 0$.

Suppose that borrower *h* has outstanding loans at the beginning of t^2. Some of these loans are community-enforced, with total obligation $m_{hI}^2 \leq m^*$. The remaining

[38]The community-enforced loans that comprise m_{hI}^2 are repaid simultaneously. This can happen before personally enforced loans repaid, between the repayment of personal loans from different lenders, or after all personally enforced loans have been repaid; as well, the order in which personally enforced loans are repaid is inconsequential.

loans are enforced personally by lender *i*, and have corresponding obligation $w_{hi}^2 \le w^*$. There are no other personal obligations, i.e., $w_{hj}^2 = 0$ for $j \ne i$; our results do not depend on the latter assumption. To simplify notation, let $m = m_{hI}^2$ and $w = w_{hi}^2$.

We first consider borrower *h*'s decision to repay *m*. As *h* expects to subsequently repay $w \le w^*$, it follows from our earlier analysis that *h* will pay $m \le m^*$ to lenders in *I* in period t, rather than postpone payment to t+1, if

$$\Delta L + \delta\alpha L\left[V(m^*) - N(m)\right] \ge (1-\delta)m \quad . \tag{A.5}$$

where

$$N(m) = \begin{cases} V(m^* - m) & \text{if } m \le m^{**} \text{ and } m^* - m \ge w^*, \\ V(w^*) & \text{otherwise.} \end{cases}$$

That is, *h* can continue to borrow using community enforced loans if $m \le m^{**}$, and *h* prefers community enforced loans if $m^* - m \ge w^*$. Since the LHS of (A.5) is strictly positive at $m = 0$, and is an increasing, concave function on $m \ge 0$ that is bounded above, we define m^* to be the value of *m* for which (A.5) holds as an equality. Hence,

$$\Delta L + \delta\alpha L[V(m^*) - V(w^*)] = (1-\delta)m^* \quad , \tag{A.6}$$

which gives (5). To confirm that $m^{**} = m^*$, we show that (A.5) is satisfied for any candidate $m^{**} \in [0, m^*]$. Observe that $(1-\delta) \ge \delta\alpha L V'(0)$ implies that

$$(1-\delta)(m^* - m) \ge \delta\alpha L V(m^* - m) \ge \delta\alpha L[V(m^* - m) - V(w^*)] \quad , \tag{A.7a}$$

while $m \le m^*$ implies that

(A.7b) $$(1-\delta)(m^* - m) \geq 0 \ .$$

Given the definition of m^* in (A.6), (A.7a) is equivalent to (A.5) when $m \leq m^{**}$ and $m^* - m \geq w^*$, while (A.7b) is equivalent to (A.5) otherwise. It follows that (A.5) is satisfied for any m^{**} in the interval $[0, m^*]$; we then set $m^{**} = m^*$ as a larger line of credit is a Pareto-improvement.

We now consider borrower *h*'s decision to repay *w*, taking an unpaid community obligation $m \in [0, m^*]$ as given. There are four cases to consider:

(i) If $m^* - m \geq w^* \geq w^* - w$, *h* will next borrow using a community enforced loan independent of whether it repays *w*. Since *h*'s only benefit from paying *w* to *i* is its non-credit exchange with *i*, paying will dominate postponement if

(A.8a) $$\Delta \geq (1-\delta)w \ .$$

(ii) If $w^* > m^* - m \geq w^* - w$, *h* will resort to community enforced loans in the following period only if repayment of *w* is postponed. Hence, payment dominates postponement if

(A.8b) $$\Delta + \delta\alpha[V(w^*) - V(m^* - m)] \geq (1-\delta)w \ .$$

(iii) If $w^* \geq w^* - w > m^* - m$ and $w \leq w^{**}$, *h* will use personally enforced loans in the following period, whether or not repayment of *w* is postponed. Payment then dominates postponement if

(A.8c) $$\Delta + \delta\alpha[V(w^*) - V(w^* - w)] \geq (1-\delta)w \ .$$

(iv) And if $w^* \geq w^* - w > m^* - m$ but $w > w^{**}$, h will resort to community enforced loans in the following period if repayment of w is postponed, and so payment dominates postponement if (A.8b) is satisfied.

Since a borrower's community obligation cannot exceed m^*, this obligation will be repaid as soon as possible in equilibrium. As a result, $m=0$ whenever a borrower is deciding whether or not to repay a personal obligation along the equilibrium path of the game. This implies that (A.8a) is used to define w^*, i.e.,

$$\Delta = (1-\delta)w^*, \tag{A.9}$$

which gives (6).[39] Finally, (A.6) and (A.9) show that $w^* < m^*$.

[39] It is clear that (A.8a,b,c) are satisfied for all $w \leq w^*$; off the equilibrium path, when the borrower's community obligations are large enough to affect its personal loan options, the incentive to repay w is actually enhanced, as revealed by (A.8b,c).

Appendix B: Explanatory Variables

Variable	Definition
Consumption Loan Dummy	Dummy variable that equals 1 if loan is either for consumption purposes, emergency, or ceremony.
Farm Shock	% of household's cultivated farm with yield less than half of "normal" yield (as defined by the surveyors) in 1935
Death in Family	Dummy variable = 1 if family experienced death in family in 1935
Pred. Income	Households' predicted income based on household's landholdings and labor, valued at mean village returns
Household Size	# of individuals in the household
Age of Head	Age of the head of the household
Years in Village	# of years that the family (including ancestors) have lived in the village
Clan Member	Dummy variable = 1 if family is a member of clan or kinship group
Market Index	Index of household participation in local land and labor markets (rent-in, rent-out, hire-in, hire-out). Assumes value between 0 and 4.
Parties Related	Borrower and Lender related
Acquainted	Borrower and Lender acquainted with each other
Live Same Village	Borrower and Lender live in the same village
% HH Autarkic	% of households in the village that do not participate in either land, labor or credit markets
Population Density	Village population divided by cultivated land
Commercialization	% of farm output marketed by households in the village.
Distance to County Seat	Distance from the village to the county seat, the local center of economic and administrative activity.
Local Wage	Average monthly wage paid to unskilled farmhands