Cosigners Help

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Abstract: We investigate how well social collateral does as an alternative to traditional physical collateral. We do so by studying cosigned loans – a borrower's loan is backed by the personal guarantee of a cosigner. We use a regression discontinuity approach with data from South Indian bidding Roscas. Our main finding is that cosigners do indeed provide social collateral: doubling the number of cosigners halves the probability of arrears for high risk borrowers. We then distinguish between different theories of social collateral. Cosigners may be effective as a monitoring device (a borrower would pay to rid herself of the nuisance of a cosigner) or as an insurance device (a borrower would pay for the benefit of a cosigner). We show that these two interpretations of cosigning have different empirical predictions in the context of a bidding Roscas. We find support for the insurance role of cosigners.

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1 Introduction

In this paper we investigate how well social collateral does as an alternative to traditional physical collateral. We do so by studying cosigned loans, in which a borrower's loan is backed by the personal guarantee of a cosigner. Such loans are extremely common in the contemporary United States (Berger and Udell, 1998; Johnstone, 2000), in Europe (Pozzolo, 2004) and in many developing countries. For instance, in Vietnam, 40% of formal credit is backed by cosigners (Tra and Lensink, 2004). There are also many historical instances of this lending practice, including early 20th century United States (Phillips and Mushinski, 2001), 19th century Britain (Newton, 2000) and Russia (Baker, 1977), and early renaissance Venice (Chojnacki, 1974). Finally, a popular practice of microcredit is based on a variant of cosigned loans in which members of a group all cosign each other's loans (Armendariz and Morduch, 2005).

We first test if the social collateral provided by a cosigner actually helps in improving repayment by the borrower. We do so by exploiting the relaxing of the cosigner requirement in a particular financial institution in India. Having established that cosigners are indeed effective, we next look inside the black box of social collateral and ask why cosigners are effective in reducing arrears. There have been several theories put forward in the development literature for the effectiveness of social collateral. Economists have hypothesized that social collateral can reduce default rates by better screening (Armendariz and Gollier, 2000; Ghatak 2000; Laffont 2003), monitoring (Besley and Coate, 1995; Stiglitz, 1990) and through insurance (Rai and Sjöström, 2004). We show that these theories have different predictions for the particular financial institution we study. We find evidence for the insurance role of cosigners.

The financial institutions we study are bidding Roscas (Rotating Savings and Credit Associations). In these schemes, a group of people get together regularly, each contributes a fixed amount, and at each meeting the highest bidder receives the collected pot. Once a participant has received a pot she is ineligible to bid for another. Such a participant may default (stop making contributions) after receiving the pot.

To prevent defaults, the Rosca organizer requires recipients to provide cosigners. We exploit a discontinuity in the cosigner requirement – there are fewer cosigners required for recipients in the second half of the Rosca than in the first. Effective cosigners will screen out bad risks, prevent risky project choices, insure a borrower against shocks and/or help the borrower to commit to repay. If cosigners are effective then there must be an upward trend break in default rates at the middle round of Roscas. Moreover, we show that there will be an upward trend break in winning bids at the middle round of Roscas if the function of cosigners is to pressure the borrower, e.g. through monitoring or screening. The reason is that cosigners are restrictive when they screen or monitor, so a participant would be willing to pay more for the pot when the cosigner requirement is relaxed. In contrast, we predict that winning bids exhibit no, or a downward, trend break if a cosigner requirement helps the borrower. This is because relaxing the requirement hurts the borrower and so she is willing to bid more with the additional cosigner than without.

In our empirical analysis, we use data on almost 6,000 loans awarded by a commercial Rosca organizer in South India between 2002 and 2004. We find that the Rosca organizer's cosigner requirement is effective in improving repayment for a sub-group of borrowers which the organizer assesses as high risks, but ineffective for the pooled sample of all borrowers. Our point estimates suggest that, for high risk borrowers, doubling the number of cosigners halves the probability of an arrear. On the other hand, we find a trend break in winning bids in none of the sub-samples, which suggests that borrowers find cosigning helpful.

Our study is motivated in large part by a related lending contract, group loans with joint liability. Among economists there has been considerable theoretical interest in this contract, in which each borrower in a group effectively cosigns the loan of all other group members.[1] Economists have hypothesized that group loans can overcome imperfections in credit markets that individual loan contracts cannot. Since group members have better information about each other than an outside bank, they can overcome moral hazard problems

[1] The distinction between cosigned and group loans has been studied by Bond and Rai (2005) and by Lensink and Gangopadhyay (2005).

through peer monitoring and adverse selection problems through peer selection. Finally, a suitably modified group lending contract can induce borrowers to help each other, i.e. to provide peer support. The theoretical prediction of all these models of social collateral is that group loans should have higher repayment rates than individual loans because group members select, monitor or insure each other. Robust empirical evidence in support of, or against any of these theories is, however, thin.[2] We believe that our results on cosigners give some empirical support also to certain group lending theories, in particular the one of peer support, and help explain group lending's remarkable popularity over the past 30 years.

Moreover, over the past few years microfinance practitioners have acknowledged problems and limitations of joint liability lending. In response, several microfinance institutions have moved to individual liability, most notably Bangladesh's Grameen Bank, whose current lending scheme, Grameen II, is built around individual liability loans. In this connection, we explore cosigning as one important way of making individual loans economically viable in environments without traditional collateral.[3]

We proceed as follows. In section 2, we provide background on the bidding Roscas underlying the analysis of this paper. In section 3, we construct simple models of peer monitoring and peer support through cosigning in bidding Roscas. In section 4, we discuss our empirical identification strategy. In section 5, we discuss the estimation results. We conclude in section 6.

[2] Karlan (2004) finds that social connections among group members improve repayment through peer monitoring and enforcement in joint liability credit groups in Peru. In a recent field experiment, Gine and Karlan (2006) find that the repayment rates on group loans are no different from the repayment rates on individual loans, which suggests that peer pressure is little effective. Other research includes Wydick (1999) and Ahlin and Townsend (2003) who use a structural approach to disentangle the role of joint liability in groups.

[3] A prominent microfinance institution which already uses cosigned loans is India's SEWA (Self-Employed Women's Association) Bank.

2 Institutional Background

The loans used in our analysis are awarded in rotating savings and credit associations organized by a financial company in south India. In this section, we first portray the general rules which govern our sample Roscas. Subsequently, we discuss securing and enforcement of these loans, and measures of defaults.

Rules and Denominations

Bidding Roscas are sophisticated savings and credit schemes. Each month participants contribute a fixed amount to a pot. They then bid to receive the pot in an oral ascending bid auction where previous winners are not eligible to bid. The highest bidder receives the pot of money less the winning bid and the winning bid is distributed among all the members as a dividend. Consequently, higher winning bids mean higher interest payouts to later recipients of the pot. Over time, the winning bid falls as the duration for which the loan is taken diminishes. In the last month, there is no auction as only one Rosca participant is eligible to receive the pot.

The Chit Fund Act of 1983, enforced in September 1993, stipulated a ceiling on bids of 30% of the pot for each auction. This ruling was relaxed in January 2002, when the ceiling was lifted to 40%. If several participants bid up to the ceiling only one of them receives the pot by lottery.[4]

Example (Bidding and Payoffs) *Consider a* 3 *person Rosca which meets once a month and each participant contributes* \$10*. The pot thus equals* \$30*. The law caps bids at* \$12*. Suppose the winning bid is* \$12 *in the first month. Each participant receives a dividend of* \$4*. The recipient of the first pot effectively has a net gain of* \$12 *(i.e. the pot less the bid plus the dividend less the contribution,* $30-12+4-10$*). Suppose that in the second month, when there are* 2 *eligible bidders, the winning bid is* \$6*. And in*

[4] More details on the Chit Fund Act and related legislation can be found in Eeckhout and Munshi (2005) and Klonner and Rai (2006).

the final month, there is only one eligible bidder and so the winning bid is zero. The net gains and contributions are depicted as:

Month	*1*	*2*	*3*
Winning bid	*12*	*6*	*0*
First Recipient	*12*	*-8*	*-10*
Second Recipient	*-6*	*16*	*-10*
Last Recipient	*-6*	*-8*	*20*

The first recipient is a borrower (he receives \$12 *and repays* \$8 *and* \$10 *in subsequent months, which implies a* 43% *monthly interest rate. The last recipient is a saver: she saves* \$6 *for* 2 *months and* \$8 *for a month and receives* \$20*, which implies a 25% monthly rate. The intermediate recipient is partially a saver and partially a borrower.*

In South India, Roscas originated in villages and small communities where participants are informed about each other and can enforce repayments (Radhakrishnan, 1975). The bidding Roscas we study are larger scale: the participants typically do not know each other and the Rosca organizer (a commercial company) takes on the risk of default. Bidding Roscas are a significant source of finance in South India, where they are called chit funds. Deposits in regulated chit funds were 12.5% of bank credit in Tamil Nadu and 25% of bank credit in Kerala in the 1990s, and have been growing rapidly (Eeckhout and Munshi, 2004). There is also a substantial unregulated chit fund sector.

The data we use is from Shriram Chits and Investments Ltd., an established Rosca organizer with headquarters in Chennai. The company started its business in Chennai, the state capital of Tamil Nadu. It began organizing Roscas in 1973 and has been expanding gradually since then. The company operated 87 branches by May 2005. For this study, we collected data from one of the three administrative zones of the company, which comprises 18 branches. We also restrict the sample to groups that were started no earlier than January 2002, to ensure that all Roscas in our sample are subject to the same rules with regards to the bid ceiling.

In our data, there are 17 distinct Rosca denominations with 25 to 40 members and contributions between Rs. 250 and 10,000 per month (see Table 1). Calculated as the product of the number of members and the monthly contribution, pot sizes vary between Rs. 10,000 and 300,000. Since all Roscas administered by Shriram meet once per month, the number of members also equals the duration.

Securing of Loans

Early recipients clearly have an incentive to drop out and stop making contributions. The organizer of the Roscas offers protection to participants against such defaults. If a recipient fails to make a contribution, the organizer will contribute the funds. The organizer receives two forms of payment. He acts as a special member of the Rosca who is entitled to the entire first pot (i.e. the first pot at a zero bid). He also receives a commission (6 percent) of the pot in each round.

In contrast with the personalized informal financial arrangements in village economies, these organized urban Roscas are anonymous. In each branch, interested individuals simply sign up to join a Rosca of a specific denomination, and a new Rosca commences once enough individuals have signed up. Further, since the organizer takes on the risk of default, we do not expect social pressure among members of the same group to play any role. Participants in a particular Rosca have no loss from a default in their Rosca since their Rosca is just one in thousands organized in that year. So they have no incentive to select or monitor the other Rosca members.

Rosca participants do not put up any traditional collateral. Instead, the organizer relies on the promise of future financial access and cosigners. According to the organizer's published rules, recipients in the first half of a Rosca have to provide three cosigners with a total monthly net income of fifteen percent of the pot, and recipients in the second half of a Rosca have to provide two such guarantors. In the sequel, we will refer to this change in rules as policy shift. The rationale for the relaxation of the cosigner requirement is that recipients of early pots have larger liabilities because each recipient owes as many installments as there are rounds remaining until the termination of the Rosca. Cosigners must not have other liabilities vis a vis Shriram, e.g. from another Rosca membership. There is no restriction on the relationship between borrower and cosigner, i.e. spouse and relatives as well as colleagues are eligible.

In principle, that is according to Shriram's published rules, lending in any round takes place as follows. Immediately after the auction, the company verifies the winner's employment and salary through an inquiry with her employer. Within thirty days of the day of the auction, the winner has to provide the required number of cosigners, who have to appear in the company's branch and sign a promissory note. The company subsequently verifies employment and incomes of the cosigners. If the borrower and her cosigners meet the company's requirements, the winner is paid the prize money, which equals the pot less the winning bid, by a check. Otherwise the prize money is withheld until the winner furnishes appropriate cosigners. If she fails to do so within thirty days of the auction, the pot is reauctioned among the other members of the Rosca who are still eligible to receive a pot. If the reauction ends with a lower winning bid than the original auction, the winner of the original auction owes the difference between the two winning bids to the company as, at this point, Shriram has already paid dividends based on the original winning bid to the other Rosca members. While we do not have figures on the frequency of reauctions, Shriram officials told us that reauctions take place after less than two per cent of auctions.

About one third of all Rosca participants are finance companies (institutional investors), which have a close business relationship with Shriram. Typically a particular finance company holds several memberships in a given Rosca and a representative of the finance company attends the auctions. In our data, institutional investors are more likely to win auctions in the middle of a Rosca. Therefore, they account for substantially more than one third of auction winners in our sample, in which only observations from exactly four rounds before and after the policy shift are included (see Table 1). Since finance companies never default, loans awarded to them are exempt from all security requirements which have just been enumerated. For this reason, pots allocated to them are excluded from most of our subsequent analysis.[5]

Each loan is processed by a loan officer in the branch where the Rosca is administered and the auctions take place. Loan officers have a fair amount of discretion. In particular, they may ask for fewer than the published number of required cosigners or skip the income verification process for the borrower or the cosigners, which saves the company administrative costs. Eventually the branch manager who is the loan officer's superior is accountable toward Shriram's center for operational earnings and losses arising from defaults in her branch. In effect, according to the figures in Table 1, only 13% of loans to private, i.e. non-institutional, customers are secured with 3 cosigners and the average number of cosigners attached to a loan equals 1.26, which is just about one half of the hypothetical average for this sample if the cosigner rule were followed strictly. Moreover, only 52% of private borrowers undergo an income verification.

Enforcement

If a prized subscriber, i.e. a participant who has already received a pot, misses 3 installments, Shriram sends out an informal warning to the subscriber, which says that if payment is not made within a month, a notice will be sent out to the cosigners. If payment is not received within another 30 days, the borrower is sent a formal notice, which is signed by a lawyer. If no payment is received within another 15 days, similar formal notices are sent to the cosigners. At the same time, the borrower receives a second legal notice. Still another two to six months later, Shriram takes the borrower to a local chit fund arbitrator, which is a required step before a case can be taken to a civil court. The arbitrator considers the case and, according to Shriram, typically makes a payment plan which requires the borrower to meet her obligations within another four weeks. The arbitrator does not approach the cosigners. If the borrower fails to comply, she is taken to a civil court within another two to three months. The court typically issues a court notice to the borrower and each cosigner

[5] Participation by institutional investors in Shriram's Roscas is the subject of Eeckhout and Munshi (2004), where more details on this matter can be found.

within three to six months, which is, however, not enforceable. Obtaining an enforceable executive petition takes six to 24 months from involving the civil court. The court collects the money from the borrower and cosigners subsequently and compensates Shriram another two years later on average.

To summarize, collecting money through the legal process takes the Rosca organizer three to five years. Moreover, Shriram has no means to force cosigners to pay if not through an executive petition issued by a civil court.

Arrears and Defaults

For completed Roscas, Shriram keeps two kinds of figures on each borrower's repayment record. First, arrears at termination of the Rosca, which is the repayment outstanding by a borrower at the due date of the last installment. Second, the amount currently due which equals the amount currently owed by a borrower. In this paper we focus on arrears at the termination of the Rosca for two reasons. First, we collected data from Shriram on November 30, 2005. In this connection, arrears at termination are comparable across Roscas that ended at different dates while the amount owed on the day of data collection is not. Second, in this paper we are especially interested in the social, rather than the material, collateral provided by a cosigner. In line with the group lending literature, we define social collateral as repayment-relevant peer pressure, peer selection, or peer insurance,[6] while we define material collateral as payments which are involuntarily extracted from the cosigner by the lender, e.g. through the legal system. In our empirical context, material collateral typically consists of the cosigner's wage income, which is eventually retained by the court through an executive petition. Put differently, improved repayment performance through a cosigner's material collateral involves a deadweight loss, which arises from additional collection costs, while social collateral improves a borrower's repayment performance on scheduled installments. In this connection, arrears at the termination of a Rosca are

[6] See Wydick (1999) and Karlan (2004) for a discussion of various aspects of social collateral in group lending contracts.

appropriate for measuring effects of social collateral on repayment performance as such arrears do not include involuntary payments by the cosigner, which are collected only after the Rosca's termination.

In our empirical analysis, we will consider two specific measures of arrears, arrear incidence and arrear rate. The arrear incidence is equal to one if the borrower has failed to repay in full by the termination of the Rosca, and zero otherwise. The arrear rate is defined as the arrear amount relative to the amount owed. Notice that, for a given borrower, the amount owed equals the sum of remaining gross installments after being prized minus remaining dividends. According to the last two rows of Table 1, almost two thirds of private customers have not repaid in full at the termination of the Rosca and the average arrear rate equals 11.5%. For Shriram, write-off rates for loans to private customers are smaller than two per cent historically, which suggests that a substantial fraction of claims is collected only after a Rosca's termination.

3 Theory

In this section we shall discuss two models of cosigning, peer monitoring and peer support. In both models, effective cosigners will reduce default rates. In the first, the cosigner is a nuisance from the borrower's point of view while in the second the borrower is beneficial for the borrower. Our aim is to provide testable implications which will distinguish between these two views of cosigning.

Asymmetric information is the only friction in the peer monitoring model. In this model the lender, who is the Rosca organizer, is uninformed about borrower actions. The environment is based on Stiglitz and Weiss (1981) and the cosigner plays a peer monitoring role similar to the role played by another group member in Stiglitz (1990). Limited enforcement and asymmetric information are both frictions in the second model, which is based on Rai and Sjöström (2004). Here the lender cannot observe whether a project has succeeded or failed, nor can he enforce repayments from borrowers without imposing a punishment.

Both models share the following basic structure: There are many agents with access to productive opportunities all of whom live for a length of time T. Since we are interested in generating testable implications of our models in which there are discontinuities in arrear rates and winning bids, we shall adopt a continuous time model, which draws on Besley et al. (1994). So we shall imagine a continuum of agents indexed by t, where $t \in [0, T]$. Agents receive an exogenous income flow of 1. Each agent has access to an investment opportunity of fixed size T. This project fails with probability θ and yields 0 at every subsequent date $(t, T]$, and succeeds with probability $1 - \theta$ and yields a constant flow of $\frac{R}{1-\theta}$ for the remainder of the agent's life. So the project has an expected per-period return of R. To finance the difference between the fixed investment size T and the funds received from winning the pot $b(t)$, a recipient must borrow on the outside credit market, which has an exogenous and one-time cost of β per unit borrowed, where $\beta > 1$.

The bidding Rosca meets at every date $t \in [0, T]$. The agents participate in a bidding Rosca to obtain funds to invest. Without loss of generality, we shall index a Rosca participant by the date t when she wins the pot. Each agent contributes 1 at each date which implies that the pot is T. The winning bid is denoted $b(t)$ where $b(T) = 0$ (since there is just one eligible bidder at the last date). The date t recipient of the pot receives $T - b(t)$, and all Rosca participants who are making contributions receive $\frac{1}{T}b(t)$ at each time t.

Agents are risk neutral with additively separable preferences over time. There is no discounting. Since early recipients have longer investment horizons than late recipients, they will be willing to pay more for the pot. The bid schedule $b(t)$ is therefore typically decreasing in t.

We shall also assume that there are two "special" agents in this economy. One is agent S (with no productive opportunity) and the other is the Rosca organizer. Agent S receives an income flow of T in each period, and does not have access to any investment project. He does not participate in the Rosca (we assume it is simply too tedious for him to attend the Rosca meetings). The Rosca organizer makes contributions if any agents fail to make contributions.[7]

The Rosca organizer imposes a cosigner requirement in the first half of the Rosca (i.e. before $\frac{T}{2}$) but not in the second half, which is a simplified variation of the observed institutional context where the Rosca organizer requires three cosigners in the first, and two in the second half. We shall denote the equilibrium bid schedule (the winning bid as a function of t) in the first half of the Rosca by $b_1(t)$ and the equilibrium bid schedule in the second half of the Rosca by $b_2(t)$. To be precise,

$$b(t) = \begin{cases} b_1(t),\ t < T/2 \\ b_2(t),\ t \geq T/2. \end{cases}$$

Let $\theta_1(t)$ denote the default risk of recipient t in the first half of the Rosca, and let $\theta_2(t)$ be the default risk of agent t in the second half of the Rosca, which are defined analogously to $b_1(t)$ and $b_2(t)$. In the peer monitoring model, the default risk will be the participant's project choice. Participants who undertake risky projects will have default risk θ while those who undertake safe projects will have zero default risk. In the peer support model, the default risk will be the project failure rate θ if the participant is uninsured, and will be zero if the participant is insured.

Peer Monitoring

In this model, participants are ex ante identical. There are two types of projects, risky and safe, that each participant can choose to invest in. The risky project fails with probability $\theta > 0$ while the safe project never fails. Both risky and safe projects have an expected return flow of R.

All agents (including agent S) observe project choices. But the Rosca organizer is uninformed – he cannot distinguish safe from risky. In the first half of the Rosca, a recipient at any time t must provide a cosigner. The Rosca organizer has access to agent t's project returns to satisfy his claims. The cosigner will thus remain unaffected if either

[7] In the model we abstract from the commission that the Rosca organizer charges in practice to cover his default costs. Our results would be unchanged if such a commission were included.

t chooses the safe project, or t chooses the risky project and the project succeeds. If t is unsuccessful with the risky project and t has S as cosigner, we assume that the Rosca organizer is able to collect t's outstanding liabilities from S eventually. In accordance with empirical observation, the Rosca organizer collects dues from the cosigner only after the termination of the Rosca. Thus arrears at the termination of a Rosca are due to the riskiness of projects chosen by Rosca participants.

When agent t chooses the safe project, agent S will never be approached by the Rosca organizer. We assume that, in this case, S is willing to cosign t's loan for free. If, on the other hand, agent t chooses the risky project, agent S charges agent t $C_1(t)$ if the project succeeds, and zero otherwise.[8]

Consider first the case where there is no cosigner requirement. Any agent t clearly prefers the risky project since the expected utility from the risky project exceeds the expected utility from the safe project,

$$\begin{aligned} & -\beta b(t) + (1-\theta)\left[(T-t)\left(\frac{R}{1-\theta}-1\right) + \frac{1}{T}\int_t^T b(\tau)d\tau\right] \\ > \quad & -\beta b(t) + (T-t)(R-1) + \frac{1}{T}\int_t^T b(\tau)d\tau, \end{aligned}$$

which simplifies to

$$(T-t) > \frac{1}{T}\int_t^T b(\tau).$$

This latter inequality always holds because $b(t) < T$ for all t (the winning bid cannot exceed the pot). In other words, recipient t has to make a net contribution $-1 + \frac{1}{T}b(t)$ with probability $1-\theta$ if she chooses the risky project, but with probability 1 is she chooses the safe project. Since $b(t) < T$, this net contribution $-1 + \frac{1}{T}b(t)$ is negative, and so the agent is better off with the risky project.

[8] To ensure that an agent can afford to spend $C_1(t)$ in the successful state, we may assume that it is payed in constant installments from the time of receipt of the pot until the termination of the Rosca.

Since agents are ex ante identical, each agent must be indifferent with respect to the date at which she receives the pot. This defines the equilibrium bid schedule,

$$\frac{d}{dt}\left[-\beta b(t) + (1-\theta)(T-t)\left(\frac{R}{1-\theta}-1\right) + (1-\theta)\frac{1}{T}\int_t^T b(\tau)d\tau\right] = 0,$$

which gives rise to the first-order ordinary differential equation

$$\beta b'(t) + R - 1 + \theta + \frac{1}{T}b(t) = 0$$

with boundary condition $b(T) = 0$ since there is no auction in the last round.

Next we will discuss the case when the cosigner requirement is imposed. We show that if $C_1(t)$ is sufficiently large, participants in the first half of the Rosca will choose the safe project because it is too costly for them to pay the cosigner and choose the risky project. We will refer to this case as the cosigner requirement being effective.

We introduce some additional notation. Let $\widetilde{b}(t)$ and $\widetilde{\theta}(t)$ denote the bid and default risk schedules, respectively, when participants in the first half of the Rosca choose the safe project. For $t \in [0, T/2)$, agent t weighs the cost of the cosigner requirement, which reduces her profit in the good state by $C_1(t)$, against the expected gain from defaulting. If the additional cost of the cosigner is high enough and we assume that the safe project is chosen when expected payoffs of the two options are identical, the safe project is chosen if, and only if,

$$\begin{aligned} & -\beta\widetilde{b}(t) + (1-\theta)\left[(T-t)\left(\frac{R}{1-\theta}-1\right) + \frac{1}{T}\int_t^T \widetilde{b}(\tau)d\tau - C_1(t)\right] \\ \leq \quad & -\beta\widetilde{b}(t) + (T-t)(R-1) + \frac{1}{T}\int_t^T \widetilde{b}(\tau)d\tau. \end{aligned}$$

The left hand side of this inequality is the expected payoff from choosing the risky project and compensating the cosigner accordingly. The right hand side is the expected payoff from choosing the safe project, in which case agent S cosigns for free. This inequality simplifies to

$$C_1(t) \geq \frac{\theta}{1-\theta}\left((T-t) - \frac{1}{T}\int_t^T \widetilde{b}(\tau)d\tau\right). \tag{1}$$

Turning to the cosigner's participation constraint, if agent $t < \frac{T}{2}$ chooses the risky project, agent S will only agree to cosign if agent t makes a sufficiently large payment $C_1(t)$ in the successful state to compensate for the payment flow of $1 - \widetilde{b}(\tau)/T,\ \tau \in (t, T]$, that agent S has to make on agent t's behalf should the project fail. Recall that agent S can make binding contracts with a Rosca participant with regards to project choice. So agent S breaks even when cosigning for a risky project if, and only if,

$$(1-\theta)C_1(t) \geq \theta \int_t^T \left(1 - \frac{1}{T}\widetilde{b}(\tau)\right) d\tau. \tag{2}$$

The left hand side equals S's payoff when the project succeeds times the probability of success and the right hand side S's liability toward the lender if the project fails times the probability of this event. Inequality (2) is equivalent to (1). Thus, whenever agent S's participation constraint is satisfied, the cosigner requirement is effective. This result is intuitive as agent S neutralizes the adverse incentive effect that arises from the borrower's limited liability.

The equilibrium bid schedule is determined by the condition that each Rosca member is indifferent between alternative times of receipt of the pot. Working backwards, this clearly implies, as above,

$$\widetilde{b}_2(T) = 0, \tag{3}$$

$$\beta\widetilde{b}_2'(t) + R - 1 + \theta + \frac{1}{T}\widetilde{b}_2(t) = 0,\ t \geq \frac{T}{2}. \tag{4}$$

To make recipients around the policy shift indifferent between alternative times of receipt, it is required that the expected payoffs of receiving the pot just after and just before the policy shift are identical,

$$-\beta\widetilde{b}_2\left(\frac{T}{2}\right) + \frac{T}{2}(R-1+\theta) + (1-\theta)\frac{1}{T}\int_{T/2}^{T} \widetilde{b}(\tau)d\tau = -\beta\widetilde{b}_1\left(\frac{T}{2}\right) + \frac{T}{2}(R-1) + \frac{1}{T}\int_{T/2}^{T} \widetilde{b}(\tau)d\tau,$$

which simplifies to

$$\widetilde{b}_1\left(\frac{T}{2}\right) = \widetilde{b}_2\left(\frac{T}{2}\right) - \frac{\theta}{\beta}\left(\frac{T}{2} - \frac{1}{T}\int_{T/2}^{T} \widetilde{b}(\tau)d\tau\right). \tag{5}$$

This latter identity shows that there is an upward jump in winning bids at $T/2$ because recipients after that date can choose the risky, and hence more profitable, project from the borrower's perspective, which is compensated by a higher, and hence less profitable, winning bid.

Indifference between alternative times of receipt in the first half of the Rosca when only safe projects are chosen, requires that

$$\beta \widetilde{b}_1'(t) + R - 1 + \frac{1}{T}\widetilde{b}_1(t) = 0,\ t < \frac{T}{2}, \tag{6}$$

which is just like (4) with θ set equal to zero. Taken together, equations 3, 4, 5 and 6 define $\widetilde{b}(t)$.

The insights gained so far are summarized in the following proposition.

Proposition 1 ***(Peer Monitoring)***

(i) If the cosigner breaks even, then the cosigner requirement is effective for the entire first half of recipients.

(ii) If the cosigner requirement is effective, then there is an upward trend break in the default risk at $T/2$,

$$\widetilde{\theta}_1(t) = 0 \text{ and } \widetilde{\theta}_2(t) = \theta,$$

and there is an upward trend break in equilibrium bids at $T/2$,

$$\widetilde{b}_1\left(\frac{T}{2}\right) < \widetilde{b}_2\left(\frac{T}{2}\right).$$

(iii) If the cosigner requirement is ineffective, then there is no trend break in the default risk at $T/2$

$$\theta_1(t) = \theta_2(t) = \theta$$

and there is no trend break in equilibrium bids at $T/2$,

$$b_1\left(\frac{T}{2}\right) = b_2\left(\frac{T}{2}\right).$$

Participants choose the safe project if the cosigner is required and effective, and risky projects if the cosigner is not required or ineffective. There is an upward trend break in equilibrium bids since when the cosigner requirement is relaxed, an agent can make the risky and hence more valuable project choice.

Peer Support

In this model, participants are ex ante identical and have access only to a risky project. The project fails with probability θ, and succeeds with probability $1-\theta$. If it succeeds, it has a constant investment flow of $\frac{R}{1-\theta}$ for the remainder of the participant's life. We assume that the Rosca participants and the agent S in this economy have limited commitment. The organizer does not observe if a participant's project succeeds or fails. But the other agents (including agent S) do observe the outcome of the project.

To induce an agent to pay her dues, the organizer punishes defaulters. These punishments can be thought of as non-monetary punishments, e.g. hassling or shaming her in front of her neighbors or employer, and/or denying future Rosca access. So the organizer threatens a punishment flow of $f \geq 1$ for missing a contribution. The organizer can impose these punishments costlessly. Since the organizer cannot observe if the project has succeeded or failed, he imposes the punishment f on the borrower as well as the cosigner whenever a due installment is not paid promptly, regardless of whether the project has succeeded or failed. The condition $f \geq 1$ makes paying her dues if she can incentive compatible for agent t.

An agent who receives the pot at date t, invests immediately and with probability θ fails to make contributions for the Rosca's remaining duration of $T-t$ periods. So agent t's expected utility with no cosigner is

$$-\beta b(t) + (1-\theta)\left[(T-t)\left(\frac{R}{1-\theta}-1\right) + \frac{1}{T}\int_t^T b(\tau)d\tau\right] - \theta(T-t)f.$$

An agent would ideally like to avoid the deadweight loss of punishment,

$$\theta \int_t^T \left[f - \left(1 - \frac{1}{T}b(\tau)\right)\right] d\tau.$$

This feature introduces an insurance motive into this economy of risk neutral agents. In particular, an agent t would like to contract with agent S who could meet her obligations if the project fails. Let $C_1(t)$ be the payment made to agent S if the project succeeds.[9] For such an insurance arrangement to work, however, it needs to satisfy agent S's incentive constraint, i.e. S has to pay the Rosca organizer on agent t's behalf when the project fails. Since S cannot commit, however, and not paying the Rosca organizer gives S a higher payoff than paying, the incentive constraint for S is clearly violated. Thus an insurance contract between agent t and S is not feasible.

Next let us investigate whether an insurance contract between agent t and agent S is enforceable in the presence of a cosigner requirement. Recall that the organizer credibly threatens the cosigner with the same punishment f if the borrower does not pay. To judge the feasibility of an insurance contract between agent t and S in the presence of a cosigner requirement, we have to examine agent t's participation constraint as well as S's incentive and participation constraints.

Agent t will demand such insurance if her expected utility from being insured is greater than being autarkic,

$$\begin{aligned} & -\beta b(t) + (1-\theta)\left[(T-t)\left(\frac{R}{1-\theta}-1\right) + \frac{1}{T}\int_t^T b(\tau)d\tau - C_1(t)\right] \qquad (7) \\ \geq \quad & -\beta b(t) + (1-\theta)\left[(T-t)\left(\frac{R}{1-\theta}-1\right) + \frac{1}{T}\int_t^T b(\tau)d\tau\right] - \theta(T-t)f. \end{aligned}$$

This simplifies to

$$\theta(T-t)f \geq (1-\theta)C_1(t), \qquad (8)$$

which essentially imposes an upper bound on $C_1(t)$.

Agent S's incentive compatibility constraint is clearly satisfied because the punishment per period f is greater than S's obligation per period, which is smaller than 1. Agent

[9] As in the peer monitoring model, we may assume that $C_1(t)$ is payed in equal installments from the time of receipt of the pot until the termination of the Rosca.

S's participation constraint is that entering the insurance contract has a higher payoff than remaining autarkic, i.e.

$$(1-\theta)C_1(t) - \theta\left((T-t) - \frac{1}{T}\int_t^T \widehat{b}(\tau)d\tau\right) \geq 0, \tag{9}$$

where $\widehat{b}(t)$ denotes the equilibrium bid schedule with effective cosigning in this model. This inequality is just as (2) and imposes a lower bound on $C_1(t)$. Moreover, since the right hand side of (2) is strictly smaller than the left hand side of (8), for each t there exist values of $C_1(t)$ for which (8) and (9) are satisfied simultaneously.

As the cosigner requirement is only in place for the first half of the Rosca, for appropriate values of $C_1(t)$ all recipients in the first half will be insured and never default, while all recipients in the second half will not be insured and default with probability θ. We thus have that the default risk schedule is $\widetilde{\theta}(t)$, as in the peer monitoring model with an effective cosigner requirement.

Next we turn to equilibrium bids. As in the peer monitoring model, we work backwards. For the second half of recipients, as in the peer monitoring model, we have

$$\widehat{b}_2(T) = 0, \tag{10}$$

$$\beta\widehat{b}_2'(t) + R - 1 + \theta + \frac{1}{T}\widehat{b}_2(t) = 0, \ t \geq \frac{T}{2}. \tag{11}$$

Moreover, in equilibrium, the date $\frac{T}{2}$ recipient must be indifferent between winning at bid $\widehat{b}_1(\frac{T}{2})$ and facing the cosigner requirement, and waiting for an instant to receive the pot at bid $\widehat{b}_2(\frac{T}{2})$ without the cosigner requirement. Provided conditions (8) and (9) are satisfied, this means that the $\widehat{b}_1(\frac{T}{2})$ must adjust to make an agent indifferent between winning the pot at time $T/2$ and winning it an instant earlier, i.e.

$$\begin{aligned} & -\beta\widehat{b}_2\left(\frac{T}{2}\right) + (1-\theta)\left[\frac{T}{2}\left(\frac{R}{1-\theta} - 1\right) + \frac{1}{T}\int_{T/2}^T \widehat{b}(\tau)d\tau\right] - \theta\frac{T}{2}f \\ = \ & -\beta\widehat{b}_1\left(\frac{T}{2}\right) + (1-\theta)\left[\frac{T}{2}\left(\frac{R}{1-\theta} - 1\right) + \frac{1}{T}\int_{T/2}^T \widehat{b}(\tau)d\tau - C_1\left(\frac{T}{2}\right)\right] \end{aligned}$$

or

$$\widehat{b}_1\left(\frac{T}{2}\right) = \widehat{b}_2\left(\frac{T}{2}\right) + \frac{1}{\beta}\left[\theta\frac{T}{2}f - (1-\theta)C_1\left(\frac{T}{2}\right)\right]. \tag{12}$$

Notice that the term in squared brackets is non-negative by virtue of condition (8). For the first half of the Rosca, the bid schedule is defined by

$$\beta\widehat{b}_1'(t) + R - 1 + \theta + \frac{1}{T}\widehat{b}_1(t) + (1-\theta)C_1'(t) = 0,\ 0 \le t < T/2, \tag{13}$$

which is obtained from setting the derivative of the left hand side of (7) with respect to t equal to zero. To summarize, the equilibrium bid schedule is characterized by equations 10, 11, 12 and 13.

The equilibrium just characterized shares the feature of an upward discontinuity in the default risk around the policy shift with the peer monitoring model. The distinguishing feature of the peer support model is, however, the absence of an upward jump in the bid schedule and the possibility of a downward jump. The exact behavior of the bid schedule at $T/2$ depends on the value of $C_1(T/2)$. If insurance is fair and the Rosca participant takes all the gains from trade, then condition (9) holds with equality and, according to (12), the downward jump in the bid schedule equals $\frac{\theta}{\beta}\int_{T/2}^{T}\left(f - 1 + \widehat{b}(\tau)/T\right)d\tau$. But if insurance is unfair and the cosigner captures all the gains from trade, then (8) holds with equality and the bid schedule is continuous at $T/2$.

Proposition 2 ***(Peer Support)***

(i) The cosigner requirement is effective if (8) and (9) hold simultaneously for all $t < T/2$*.*

(ii) If the cosigner requirement is effective, there is an upward trend break in the default risk of participants at $T/2$*,*

$$\theta_1(t) = 0 \text{ and } \theta_2(t) = \theta,$$

and there is either no trend break or a downward trend break in equilibrium bids at $T/2$

$$b_1(\frac{T}{2}) \ge b_2(\frac{T}{2}).$$

(iii) If the cosigner requirement is ineffective, then there is no trend break in the default risk at $T/2$

$$\theta_1(t) = \theta_2(t) = \theta$$

and there is no trend break in equilibrium bids at $T/2$,

$$b_1\left(\frac{T}{2}\right) = b_2\left(\frac{T}{2}\right).$$

Discussion

So far we have discussed two very specific models of cosigning. Both peer monitoring and peer support predict an upward trend break in default rates at the middle of the Rosca in response to the relaxing of the cosigner requirement. Intuitively, if the cosigner requirement is effective, then relaxing it would increase defaults. But the peer monitoring and peer support models have opposite predictions for the equilibrium winning bid schedule. The peer monitoring models predicts an upward trend break in winning bids at the middle of a Rosca. In contrast, the peer support model predicts either no or a downward trend break in winning bids at the middle of the Rosca. The reason for the difference is that in the peer monitoring model the borrower would be willing to pay to get rid of the cosigner while in the peer support model the borrower would be willing to pay to obtain a cosigner. In the peer monitoring model, the cosigner is a nuisance from the borrower's perspective, while the cosigner is desirable in the peer support model.

The testable implications of propositions 1 and 2 are not limited to the specific models studied there. Instead the peer monitoring model easily generalizes to any model of lending in which an effective cosigner requirement is a nuisance for the borrower. Whenever this is the case, the bid schedule exhibits an upward jump at the policy shift to make borrowers indifferent between loans with and without a cosigner. An example of an alternative model along these lines has risky and safe borrower types in the spirit of Stiglitz and Weiss (1981). In such a model with no cosigner requirement, risky types receive early and safe types late pots. An effective cosigner requirement, in contrast, introduces peer selection with the outcome that safe types receive early and risky types late pots.

In the peer support model, on the other hand, having access to cosigning is beneficial to the borrower. The testable implications of proposition 2 apply to any model with effective cosigning in which, *ceteris paribus*, the borrower prefers to obtain a loan with, rather than without, a cosigner. An example of another such model has agents who care about their reputation but discount future consumption hyperbolically (as in Laibson, 1997). When entering the Rosca, each agent would prefer to repay her future loan, but at the time of receipt she chooses to default. An effective cosigner then serves as a valuable commitment technology.

To summarize, the key difference between the two classes of models is that the borrower would pay to have one less cosigner in the first, and so the bids jump. In the second, the borrower would pay to have one more cosigner, and so the bids don't jump up. Accordingly, we view the subsequent econometric analysis not merely as a test between the two specific models developed in this paper. Instead, we are testing between two classes of models, one in which cosigners are a nuisance, and the other in which they are a benefit from the borrowers' perspective.

4 Econometric Specifications and Identification

In this section we derive testable econometric restrictions from the theoretical models of the previous section. If the Rosca organizer applied the cosigner rule strictly, a test of our theories would be straightforward using a regression discontinuity design. In particular, when the cosigner requirement is ineffective, the default schedule is continuous (peer monitoring and peer support model) at the round where the cosigner requirement is relaxed in both models. When, on the other hand, cosigning is effective, the default schedule has an upward discontinuity at the policy shift. So a regression of a measure of arrears on trend terms and the number of cosigners identifies the effect of the third cosigner,

$$y_{it} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \beta z_{it} + \varepsilon_{it}, \tag{14}$$

where y_{it} is a measure of arrears in Rosca i in round t, $\dot{z}_{it}$ are the number of cosigners attached to the loan, and ε_{it} is an error term. The null hypothesis of ineffectiveness of cosigning can be tested through $\beta = 0$. A negative value of β is evidence for the effectiveness of cosigning.

When cosigning is effective, the bid schedule has an upward discontinuity in the peer monitoring model. It has a downward or no discontinuity in the peer support model. We thus regress winning bids on trend terms and a trend break term,

$$b_{it} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \gamma late_{it} + \varepsilon_{it},$$

where b_{it} is the winning bid in round t in Rosca i and $late_{it}$ equals one in all rounds after the policy shift and zero otherwise. Provided that β is estimated negative, a zero or negative γ lends support to the peer support model while a positive value of γ is in accordance with the peer monitoring model. If the data is generated by elements of both models simultaneously, a negative or zero estimate of γ is evidence in favor of the peer support model as otherwise γ is necessarily negative.

As is clear from Table 1, Shriram does not apply the published cosigner rule strictly. Instead, loan officers have a fair amount of discretion about how many cosigners are attached to a loan. We think of the number of cosigners Shriram requires as a function of (i) variables that are observed by the researcher, such as the winning bid, (ii) variables that are observed by the loan officer but unobserved by the researcher, such as previous interaction that the loan officer has had with this customer, and (iii) the published cosigner rules. In such a scenario, naive estimates of β will be biased. If the policy shift in the cosigner requirement is part of the loan officer's decision function, however, we can exploit this exogenous element to identify the effect of an additional cosigner. In particular, the use of $late_{it}$ as an instrument for z_{it} in (14) will allow to identify the causal effect of an additional cosigner on arrears.

5 Results

Number of Cosigners

Before discussing the results of arrear and bid regressions, we first analyze how the number of cosigners is determined by the loan officer. Recall that the number of cosigners does have endogenous component in practice. Table 2, column 1 contains results of a probit analysis of whether Shriram verified a borrower's income or not. From all sample Roscas we use four rounds before and after the relaxation of the official cosigner requirement. While there is no significant structural break in the incidence of income verification, Shriram is much more likely to verify the income of borrowers who have won a pot at a comparatively high price. The marginal effect of a one percentage point increase in the winning bid relative to the pot increases the probability of income verification by 0.63 percentage points. This compares to an average relative winning bid of 16% and an income verification rate of 52%.

In columns 2 and 3, the results of a probit analysis of the incidence of a third cosigner are set out. Using only income-verified borrowers (column 2) and controlling for trend terms, a third cosigner is more likely to be attached to loans of borrowers who have bid high and have a low income. After the center round, a third cosigner is significantly less likely. The marginal effect associated with this coefficient is 9.9 percentage points. According to column 3, these figures are similar when all customers are used in the estimation. Interestingly, whether the salary is verified has no significant effect on the incidence of a third cosigner.

In columns 4 and 5, the results of linear regressions of the number of cosigners are set out. In contrast to column 2, the trend break ceases to be significant for the income-verified customers (column 4). In the regression with all customers (column 5), the trend break term has a significant negative coefficient, as in the corresponding probit analysis (column 3). Moreover, income-verified customers furnish significantly more cosigners, on average 0.34 (which compares to a mean of 1.30; see Table 1). Given the insignificant coefficient of the income verification dummy in column 3, this suggests that much of the action between verified and non-verified borrowers is between 0, 1 and 2, rather than between 2 and 3, cosigners.

Arrears

We next test if cosigners are effective in improving repayment. Recall that effective cosigning implies an upward trend break for arrears in both our models (propositions 1 and 2). The results of various probit analyses of arrear incidence are set out in Table 3. According to columns 1 and 4, a significant discontinuity occurs for the sub-sample of income-verified borrowers, but not when all borrowers are included in the estimation. Columns 2 and 5 contain the results of a regression of the arrear incidence on the third cosigner dummy, where the endogeneity of the number of cosigners is not taken into account. In columns 3 and 6, in contrast, the presence of a third cosigner is instrumented by the dummy variable *late*, which equals one in rounds after the policy shift and zero otherwise. A comparison of the results of the probit models with and without the instrument clearly suggests that the naive, that is the uninstrumented, specification suffers from an endogeneity problem as, according to columns 2 and 5, a third cosigner increases the arrear incidence. When the loan officer makes the cosigner requirement contingent on information unobserved by the researcher, e.g. the borrower's risk type, such a relationship between third cosigner incidence and arrears may well arise (see also the discussion in the previous section). In the instrumented specifications, in contrast, where the causal effect of a third cosigner is isolated, the coefficient of the third cosigner dummy has the expected negative sign. For the subsample of income-verified borrowers the estimated coefficient of the IV model is, moreover, statistically significant. The predicted effect of a third cosigner for income-verified borrowers is large. When all other regressors are evaluated at their sample means, the predicted probability of arrear is 83.4% in a hypothetical sample in which no borrower furnishes a third cosigner while it is 12.9% in a sample in which all borrowers have three cosigners. For the sample of all private customers, the statistically insignificant coefficient of the third cosigner dummy of -0.97 still implies a predicted change in arrears from 68.7% to 31.4%.

The specifications whose results are set out in columns 7 to 10 have the number of cosigners rather than a dummy for the presence of a third cosigner as explanatory variable of interest. Qualitatively, the findings of columns 2, 3, 5 and 6 are confirmed without a single exception. The point estimates predict that an additional cosigner reduces the arrear incidence by 29 and 15 percentage points among income-verified and all borrowers, respectively.

We next turn to the control variables included in the estimations. In all specifications, the winning bid is a significant predictor of arrear incidence. Moreover, when the effect of additional cosigners is instrumented (columns 3, 6, 8 and 10), the effect of the winning bid on arrear incidence is larger than when it is not (columns 2, 5, 7 and 9), which confirms the endogeneity problem associated with the number of cosigners. In contrast, the repayment burden, which is a function of the winning bids after the round of receipt of the pot, does not significantly impact arrears in any of the ten specifications. When the cosigner variable is instrumented, income has a significant negative effect on arrears for income verified borrowers, which is as expected. Interestingly, when all observations are used, arrears do not differ systematically by whether the lender has previously verified the borrower's income.

These results suggest that, after winning the auction, borrowers are classified in two groups by the lender, relatively safe and relatively risky ones. For the latter, income verification and additional cosigners have a relatively small return to the lender. For the former, on the other hand, income verification and additional cosigners have economically significant returns. Accordingly, types that are deemed relatively risky are more likely to be subject to income verification and a stricter enforcement of the cosigner requirement because the reduction in the risk of default brought about by these steps is larger than the additional cost. Relatively safe types, on the other hand, are less likely to be income verified and are required fewer cosigners, which reduces administrative costs by more than it increases the risk of the loan. Consequently, additional cosigners are effective only in the subsample of income-verified borrowers (Table 3, columns 3 and 8) and arrears do not significantly differ across income-verified and not income-verified borrowers in the pooled estimations (Table 3, columns 6 and 10).

In Table 4 the results of Tobit regressions with the arrear rate as dependent variable are set out. In terms of the signs of effects, all findings of the probit analysis are confirmed. The coefficients of interest in columns 3,6, 8 and 10 cease to be statistically significant at conventional levels, however. This is likely due to the smaller variation of the dependent variable arrear rate, which, according to Table 1, has a mean of 11% versus 64% for arrear incidence.

To summarize the findings of the arrear regressions, we find evidence for the effectiveness of additional cosigners among the subgroup of borrowers for which the lender employs additional screening at the time the loan is handed out. This finding is in accordance with the predictions of both models sketched in the theoretical framework.

Winning Bids

We proceed to test between the peer monitoring and peer support models. These models have opposite predictions for the trend break on bids (Propositions 1 and 2). While the former predicts an upward jump at the policy shift, the latter predicts a downward or no jump. Columns 1 through 5 of table 5 contain the results of various regressions with the relative winning bid as dependent variable. The quadratic polynomial appears to capture the trend over rounds satisfactorily as the quadratic term is insignificant in all specifications. The point estimates of the trend break term, which is the independent variable of interest, are statistically no different from zero, with each coefficient smaller than its standard error. Column 5 gives the results for loans to institutional investors and can be regarded as the outcome of a placebo experiment, as these borrowers never have to provide a single cosigner. The positive point estimate of the trend break term in this estimation puts the point estimates in the other four specifications further into perspective and thus confirms that none of them should be regarded as significantly positive.

The significant negative coefficient of the institutional investor dummy in column 4 shows that these borrowers take pots when bidding is sluggish and thus realize arbitrage opportunities. To check that the shape of the bid schedule around the policy shift is not driven by a change in competition between private and institutional borrowers, we also conduct a probit analysis of the incidence of pots obtained by institutional investors, whose results are set out in column 6. The statistically insignificant coefficient of the second half dummy suggests that there is in fact no such change, as expected.

Taking the results of tables 3, 4 and 5 together, we find a significant impact of additional cosigners on arrears but no upward trend break in the bid schedule. This is in accordance with the peer support model, in which the possibility to commit a cosigner is appreciated by the borrower. The fact that the default schedule exhibits an upward, and the bid schedule no, discontinuity is, moreover, consistent with two alternative configurations, between which we are not able to distinguish. First, peer support and peer monitoring are simultaneously at work and the opposite effects cancel each other out. Second, peer monitoring is absent and the cost of a cosigner just equals the extra utility derived from a cosigner. What both configurations have in common, nevertheless, is that peer support plays a significant role in the cosigner-borrower relationship.

6 Conclusion

A long-standing question among economists has been how social collateral improves borrowers' repayment performance. This paper is the first one to investigate this question in the context of a widely prevalent practice to secure loans, cosigning. We exploit a policy shift regarding the number of cosigners required to receive an individual loan in a Rosca to identify the impact of an additional cosigner on repayment by the borrower.

We find that cosigners are effective in improving repayment for a subsample of borrowers which the lender classifies as high risk. Our estimates imply that doubling the number of cosigners halves the incidence of arrears among such borrowers. On the other hand, our results regarding winning bids in these Roscas imply that the requirement of an additional cosigner does not reduce borrower welfare. These findings are consistent with a model of peer support, where cosigning helps the borrower to obtain informal insurance against income shocks.

Our findings are relevant for the design of microfinance, where a key problem is how to secure loans in environments with little physical collateral and weak legal institutions. While, as a remedy, group lending with joint liability lending has been used by microfinance lenders around the globe, this practice has been challenged in recent years on the grounds of being too inflexible to meet more sophisticated borrower needs and prone to create social tensions among borrowers.[10] In this connection, our results may lead the way to an alternative to group loans with joint liability, cosigned individual loans. In contrast to the complaints of borrowers about joint liability in credit groups, we find that Rosca members, who obtain cosigned individual loans, do not find the requirement of an additional cosigner burdensome. This is likely due to the greater flexibility regarding the identity of the cosigner. In a group loan with joint liability, the set of cosigners is restricted to fellow group members, who effectively cosign each other's loans. In the context studied in this paper, in contrast, borrowers have a free choice of cosigners and in fact cosigning by a fellow group member is ruled out by the lender.

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Table 1. Descriptive Statistics

	Mean	Std Dev	Minimum	Maximum
All Observations (N=5,856)				
Duration	29.8	6.1	25	40
Contribution per Month (Rs.)	1,366.8	1,511.7	250	10,000
Pot (Rs.)	40,485.0	46,684.8	10,000	300,000
Beginning Date	2-Sep-02	179*	4-Jan-02	5-Oct-03
Auction Date	16-Oct-03	170*	30-Aug-02	23-Dec-04
Bid Relative to Pot	0.161	0.064	0.05	0.4
Bid Ceiling Binding (Incidence)	0.002	0.041	0	1
Amount Owed Relative to Pot	0.470	0.074	0.334	0.632
Institutional Investor (Incidence)	0.430	0.495	0	1
Only Private Customers (N=3,337)				
Salary Verified by Lender (Incidence)	0.522	0.500	0	1
Income (Rs.)**	7,622	25,192	12	720,957
Third Cosigner Attached to Loan (Incidence)	0.132	0.339	0	1
Number of Cosigners	1.295	1.032	0	5
Borrower in Arrear at Termination (Incidence)	0.637	0.481	0	1
Arrear Amount Relative to Amount Owed	0.115	0.161	0	1

* in days

** where verified by lender (N=1,741)

Notes: Sample consists of four rounds before and four rounds after the cosigner policy shift for each Rosca denomination.

Table 2. Determinants of Income Verification and Cosigners

	1	2	3	4	5
	Income Verified	Third Cosigner		Number of Cosigners	
	All	Income Verified	All	Income Verified	All
Second Half	-0.0357	-0.5492	-0.4365	-0.1096	-0.1363
	(0.0970)	(0.1780)**	(0.1297)**	(0.0878)	(0.0666)*
Winning Bid	1.5992	2.8091	2.2951	2.4286	2.3619
	(0.4897)**	(0.8467)**	(0.6086)**	(0.4699)**	(0.3519)**
Borrower's Income (logarithmic)		-0.1768		-0.0989	
		(0.0395)**		(0.0222)**	
Income Verified (Indicator)			0.0228		0.3458
			(0.0670)		(0.0371)**
Round	-0.0044	-0.0760	-0.0787	-0.0809	-0.0680
	(0.0220)	(0.0367)*	(0.0268)**	(0.0206)**	(0.0162)**
Round Squared	-0.0067	0.0191	0.0190	0.0050	0.0039
	(0.0051)	(0.0092)*	(0.0066)**	(0.0047)	(0.0036)
Constant	-0.8288	0.1817	-1.5818	2.6604	1.2422
	(0.1671)**	(0.5179)	(0.2189)**	(0.2615)**	(0.1039)**
Observations	3337	1741	3337	1741	3337
Method	Probit	Probit	Probit	OLS	OLS
R-squared				0.19	0.18

Notes: Standard errors in parentheses; * significant at 5%; ** significant at 1%; observations: only loans to private customers, institutional investors excluded; all specifications include 17 branch and 16 denomination dummies whose estimates are not reproduced

Table 3. Probit Regressions of Arrear Incidence

	1	2	3	4	5	6	7	8	9	10
	Income Verified			All			Income Verified		All	
Second Half (Dummy)	0.2584 (0.1317)*			0.0660 (0.0941)						
Third Cosigner (Indicator)		0.1121 (0.1007)	-2.0923 (0.7073)**		0.2176 (0.0761)**	-0.9680 (1.3094)				
Number of Cosigners							0.1476 (0.0368)**	-0.9939 (0.2183)**	0.1446 (0.0249)**	-0.4193 (0.5380)
Winning Bid[1]	2.7444 (0.7165)**	2.6995 (0.7186)**	3.3375 (0.6828)**	3.1693 (0.5078)**	3.0724 (0.5093)**	3.4197 (0.5194)**	2.4184 (0.7227)**	3.7137 (0.7144)**	2.7973 (0.5124)**	3.8285 (0.7167)**
Repayment Burden[1]	0.0655 (2.0280)	0.0711 (2.0267)	-0.4902 (1.7978)	-0.0494 (1.5045)	0.0214 (1.5046)	-0.4196 (1.5234)	-0.0024 (2.0323)	0.4292 (1.6273)	-0.2522 (1.5075)	0.4246 (1.5518)
Income (logarithmic)	-0.0641 (0.0319)*	-0.0581 (0.0320)	-0.1174 (0.0308)**				-0.0480 (0.0321)	-0.1248 (0.0275)**		
Income Verified (Indicator)				-0.0164 (0.0511)	-0.0167 (0.0512)	-0.0100 (0.0508)			-0.0651 (0.0520)	0.1316 (0.1955)
Round	-0.0651 (0.0723)	-0.0124 (0.0679)	-0.0847 (0.0633)	-0.0299 (0.0542)	-0.0096 (0.0512)	-0.0530 (0.0676)	-0.0081 (0.0680)	-0.0592 (0.0545)	-0.0157 (0.0512)	-0.0247 (0.0485)
Round Squared	-0.0019 (0.0070)	-0.0029 (0.0070)	0.0085 (0.0077)	0.0004 (0.0050)	-0.0009 (0.0050)	0.0047 (0.0080)	-0.0032 (0.0070)	0.0044 (0.0062)	-0.0006 (0.0050)	0.0020 (0.0054)
Constant	0.0357 (1.1184)	0.0860 (1.1177)	0.7726 (1.0242)	-0.6688 (0.7814)	-0.6611 (0.7803)	-0.4930 (0.7873)	-0.1472 (1.1230)	1.8295 (0.9740)	-0.6252 (0.7815)	-0.5503 (0.7466)
Instrumented	No	No	Yes	No	No	Yes	No	Yes	No	Yes
Observations	1741	1741	1741	3337	3337	3337	1741	1741	3337	3337

[1]Relative to pot

Notes: only loans to private customers are used as observations.

Identifying instrument in IV specifications: dummy for rounds after relaxation of official cosigner requirement

All specifications include 17 branch and 16 denomination dummies whose estimates are not reproduced

Table 4. Tobit Regressions of Arrear Rate

	1	2	3	4	5	6	7	8	9	10
	Income Verified			All			Income Verified		All	
Second Half (Dummy)	0.0320			0.0103						
	(0.0221)			(0.0168)						
3rd Cosigner (Indicator)		0.0118	-0.3865		0.0327	-0.1941				
		(0.0160)	(0.2830)		(0.0126)**	(0.2692)				
Number of Cosigners							0.0221	-0.3084	0.0255	-0.0891
							(0.0061)**	(0.3318)	(0.0043)**	(0.1323)
Winning Bid[1]	0.5560	0.5520	0.7906	0.6950	0.6794	0.7599	0.5017	1.3308	0.6313	0.9008
	(0.1199)**	(0.1204)**	(0.2309)**	(0.0900)**	(0.0901)**	(0.1560)**	(0.1206)**	(0.8683)	(0.0902)**	(0.3535)*
Repayment Burden[1]	-0.0728	-0.0708	-0.1862	0.0272	0.0378	-0.0427	-0.0888	0.0298	-0.0066	0.1333
	(0.3390)	(0.3390)	(0.3869)	(0.2649)	(0.2646)	(0.2880)	(0.3381)	(0.5677)	(0.2636)	(0.3256)
Income (logarithmic)	-0.0121	-0.0114	-0.0250				-0.0095	-0.0421		
	(0.0054)*	(0.0054)*	(0.0117)*				(0.0054)	(0.0339)		
Income Verified (Indicator)				-0.0135	-0.0137	-0.0108			-0.0225	0.0189
				(0.0091)	(0.0091)	(0.0093)			(0.0092)*	(0.0460)
Round	-0.0088	-0.0023	-0.0165	0.0027	0.0058	-0.0027	-0.0018	-0.0196	0.0051	0.0027
	(0.0121)	(0.0114)	(0.0156)	(0.0095)	(0.0090)	(0.0134)	(0.0113)	(0.0251)	(0.0089)	(0.0097)
Round Squared	0.0013	0.0013	0.0032	0.0008	0.0006	0.0016	0.0012	0.0030	0.0007	0.0011
	(0.0012)	(0.0012)	(0.0021)	(0.0009)	(0.0009)	(0.0015)	(0.0012)	(0.0027)	(0.0009)	(0.0011)
Constant	0.0774	0.0825	0.2249	-0.1557	-0.1544	-0.1223	0.0496	0.6537	-0.1496	-0.1434
	(0.1868)	(0.1868)	(0.2307)	(0.1375)	(0.1372)	(0.1427)	(0.1865)	(0.6589)	(0.1367)	(0.1456)
Instrumented	No	No	Yes	No	No	Yes	No	Yes	No	Yes
Observations	1741	1741	1741	3337	3337	3337	1741	1741	3337	3337

All notes to previous table apply

Table 5. Results of Bid Regressions

	1	2	3	4	5	6
	Relative Winning Bid					Institutional Investor Incidence
	Private Borrowers		All Borrowers		Institutional Investors	All Customers
	Income Verified	All				
Second Half (Dummy)	0.0045	0.0008	0.0013	0.0017	0.0028	0.1157
	(0.0047)	(0.0035)	(0.0025)	(0.0025)	(0.0032)	(0.0706)
Round	-0.0152	-0.0155	-0.0124	-0.0127	-0.0087	-0.0745
	(0.0011)**	(0.0008)**	(0.0006)**	(0.0006)**	(0.0007)**	(0.0158)**
Round Squared	-0.0001	0.0002	0.0000	-0.0000	0.0000	-0.0090
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0038)*
Institutional Investor (Dummy)				-0.0112		
				(0.0013)**		
Constant	0.2091	0.1970	0.1748	0.1821	0.1682	0.4162
	(0.0096)**	(0.0062)**	(0.0040)**	(0.0041)**	(0.0052)**	(0.1004)**
Observations	1741	3337	5856	5856	2519	5856
Statistical Model	OLS	OLS	OLS	OLS	OLS	Probit
R-squared	0.54	0.53	0.48	0.49	0.49	

Notes: * significant at 5%; ** significant at 1%; robust standard errors in parentheses; all specifications include 17 branch and 16 denomination dummies whose estimates are not reproduced