Cosigners As Collateral

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Abstract: We investigate the role of cosigners as collateral using data from a South Indian financial institution. Our identification is based on a rule of thumb that allows loan officers to discontinuously relax the cosigner requirement based on the duration of the loan repayment. We establish a negative *causal effect* of cosigners on defaults. A reduction in the number of cosigners by about one-third increases the incidence of default by 10 percent for loans that are repaid over 12 months relative to similar loans that repaid over 13 months. Our results suggest that cosigners induce borrowers to repay.

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1 Introduction

The lack of collateral – and the accompanying financial constraints on entrepreneurship – are thought to be a primary cause of underdevelopment (Banerjee 2003, Townsend 1997). When borrowers have no collateral of their own, lenders can ask for cosigners to pledge collateral instead. Such cosigned loans are extremely common.[1] In this paper we ask if cosigners induce borrowers to repay.

The difficulty with identifying the influence of cosigners on repayment arises from an information asymmetry between the researcher and the lender. Lenders often have "soft" information about the riskiness of particular borrowers – and this information is not observed by the researcher (Petersen and Rajan 1994, Uzzi and Lancaster 2003). A lender will typically ask riskier borrowers to pledge more collateral (provide more cosigners) based on this soft information, leading to a positive correlation between cosigners and default rates.[2] Such a positive correlation may very well mask the causal link between cosigners and default rates. For identification we need some variation in cosigners assigned to similar loans that is exogenous to the lender's soft information on the borrower.

We use data from a non-bank financial institution in South India which organizes Roscas (Rotating Savings and Credit Associations). In these Roscas, participants pledge to make monthly contributions and bid to receive the collected savings. Unlike traditional Roscas (Besley, Coate and Loury 1993), the participants in these Roscas do not enforce repayments from each other. The organizer takes on the default risk that Rosca winners may fail to make subsequent contributions – and requires Rosca winners to pledge cosigners as collateral.

Our identification strategy is based on a discontinuity in the organizer's rules. Borrowers

[1] Cosigned loans are popular in the United States (Berger and Udell, 1998), in Europe (Pozzolo, 2004) and in many developing countries. There are also numerous historical accounts of this lending practice (Baker, 1977; Guinnane, 1994; Newton, 2000; Phillips and Mushinski, 2001).

[2] A positive correlation between traditional collateral and defaults has been found in a variety of developed and less developed financial markets (Berger and Udell, 1990; Jimenez, Salas and Saurina 2006). Though most theory suggests that increases in traditional collateral will reduce defaults, there has been little investigation of this causal link.

with repayments for 12 months or less are allowed fewer cosigners than borrowers with longer repayment durations. We compare borrowers who differ in their repayment durations and hence in their cosigner requirements despite having otherwise similar loan terms. In particular, there is a reduction in the number of cosigners by about one-third for loans that are repaid over 12 months relative to similar loans that repaid over 13 months. We find that this relaxation increases the incidence of default by 10 percent for those borrowers with 12 month loans relative to those with 13 month loans holding other loan terms constant. This cosigner requirement is relaxed only for the subset of borrowers whom the organizer does not screen directly. For the remaining borrowers, who are screened through an occupation (and income)-verification process, the cosigner requirement is not relaxed and there is no increase in default rates.

The organizer first attempts to collect repayments directly from the borrower – and if that fails, goes through a long legal process to collect payments from the cosigners. We measure default rates before the organizer has collected repayments from the cosigners thereby isolating the influence of cosigners on the borrower's repayment. Our results therefore imply that additional cosigners do more than simply provide a way to collect funds after the loan has been defaulted on by the borrower. Put differently, we reject the null hypothesis that cosigners serve *only* as a hedge against default risk in favor of the alternative that they promote repayment by the borrower.

Our results are consistent with several theories of cosigning. Cosigners may improve repayment by the borrower herself by solving adverse selection problems (Besanko and Thakor, 1987) and/or moral hazard problems (Banerjee, Besley, Guinnane, 1994) just as traditional collateral does. Riskier borrowers may be attracted to the 12 month loans with lower cosigner requirements than safer borrower types. Alternatively, borrowers who take the 12 month loans with fewer cosigners may take on riskier projects or expend less effort on ensuring project success relative to those borrowers with more cosigners. Further, unlike traditional collateral, cosigners may also promote repayment by providing a borrower with insurance if she experiences a shock (Rai and Sjöström, 2004). In all three cases (adverse selection, moral hazard and insurance), we would expect an increase in defaults for loans with lower cosigner requirements.

Since we identify the effectiveness of cosigners in promoting repayment by using a discontinuity in the cosigner requirement at a loan-duration-threshold, the methods developed for regression-discontinuity (RD) design seem the natural fit. The variable that determines treatment in our context, loan duration, is discrete and so any RD estimation must be parametric. Lee and Card (2008) suggest an econometric procedure to account for the uncertainty in parametrization for such RD designs – and we follow their procedure. There is one important difference between our approach and RD design, however. In an RD design, there should be no incentive to sort around the treatment threshold, while in our context, there is an incentive for riskier types of borrowers to choose shorter-duration loans with fewer cosigners. While the incentive to sort around the treatment threshold is a nuisance in RD design, the role of cosigners in inducing borrowers to self-select around the threshold is precisely what this study intends to capture. So while we utilize aspects of the RD methodology, our empirical estimates include the selection effects of cosigning.

We contribute to a empirical debate on "social collateral", i.e. the use of local information and enforcement to induce repayment among borrowers who have no traditional collateral of their own. Cosigned loans are related to group loans popular in microfinance (Bond and Rai, 2008): both types of lending are based on the use of social collateral to promote repayment. The cosigner in a typical cosigned loan is typically a non-borrower; a group of borrowers cosign each other's loans in a group loan. There is substantial debate about the effectiveness of social collateral in group loans. For instance, Gine and Karlan (2008) find that some circumstances where group loans are no more effective at reducing defaults than individual loans. One reason why social collateral may be effective in our study but not in Gine and Karlan (2008) is that the latter abstract from selection – and hence cannot address the role of social collateral in selecting safer borrowers. Recent empirical work has also investigated if the strength of social connectedness reduces default rates in group loans (Ahlin and Townsend 2007, Karlan 2007, Wydick 1999). In contrast, our paper can be seen as investigating if the quantity of social collateral, as measured by the number of cosigners, reduces defaults. We do not have data nor exogenous variation on the social ties between the cosigner and borrower.

Plan for the Paper

The paper proceeds as follows. In Section 2 we provide background on the non-bank financial institution in South India and on our dataset. In Section 3 we outline our empirical strategy. We discuss our results in Section 4 and conclude in Section 5.

2 Data and Institutional Background

This study uses data on Rotating Savings and Credit Associations (commonly referred to as Roscas). Roscas match borrowers and savers but do so quite differently from banks. In this section we provide some background on how the Roscas in our study operate. We pay particular attention to who holds the default risk and how loans are secured by the salaries of cosigners. We also describe the sample of Rosca borrowers that we will use in our subsequent empirical analysis.

Rules

Roscas are financial institutions in which the accumulated savings are rotated among participants. Participants in a Rosca meet at regular intervals, contribute into a "pot" and rotate the accumulated contributions. So there are always as many Rosca members as meetings. In random Roscas, the pot is allocated by lottery and in bidding Roscas the pot is allocated by an auction at each meeting. Our study uses data on the latter.

In the bidding Roscas we study participants contribute a fixed amount to a pot every month. 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 an interest dividend. The winning bid can be thought of as the price of capital: higher winning bids imply smaller loans and higher interest rates. 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. We illustrate these rules with a numerical example:

Example (Bidding and Payoffs) *Consider a* 3 *person Rosca which meets once a month and each participant contributes* \$10. *The pot thus equals* \$30. *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,* $30-12+4-10$*). In the second month, when there are* 2 *eligible bidders, suppose the winning bid is* \$6. *And in 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's Net Payoff	*12*	*-8*	*-10*
Second Recipient's Net Payoff	*-6*	*16*	*-10*
Last Recipient's Net Payoff	*-6*	*-8*	*20*

The first recipient is a borrower: he receives \$12 *and repays* \$8 *and* \$10 *in subsequent months, which implies a* 30% *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* 67% *monthly rate. The intermediate recipient is partially a saver and partially a borrower.*

In what follows, we shall often refer to the winning bid or the "repayment burden" relative to the pot size. The winning bid in the above example in round 1 is \$12 or 40 percent of the pot size. We define the repayment burden as the total repayment owed (i.e. the sum of contributions less dividends for a Rosca winner). The repayment burden for the round 1 borrower in the above example is \$18 or three-fifth of the pot. The repayment burden for round 2 winner is \$10 or one-third of the pot. We calculate the default rate as the fraction of the repayment burden that is overdue at the end of the Rosca. So, for instance, if the Rosca borrower in round 1 failed to make his round 3 repayment of \$10 (but did make the round 2 repayment of \$8), his default rate would be $\frac{10}{18}$ or 56 percent.

The Sample

The bidding Roscas we study are large scale and organized commercially by a non-bank financial firm. The data we use is from the internal records of an established Rosca organizer in the southern Indian state of Tamil Nadu.[3] Our sample consists of all Rosca groups of 25 month duration that were started in 2001. There were 247 such Roscas started in 2001 at four different contribution levels. Of these, the most common were those with a Rs. 400 monthly contribution and pot size of $25 \times 400 =$ Rs. $10,000$. We shall refer to the four different contribution levels (Rs. 400, 1000, 2000 and 4000) as the denominations of Roscas in our sample.

In these bidding Roscas participants do not have social ties in contrast with the personalized Roscas studied elsewhere. The firm that organizes the Roscas takes on the default risk. If a participant fails to make a contribution, the organizer will contribute funds on his/her behalf. In this way, a round 18 borrower who fails to contribute in round 19 will not reduce the pot available to the other Rosca participants in round 19. In exchange the organizer receives a commission of 6 percent of the pot in each round. The Rosca organizer is also a special Rosca member who receives the entire first pot (at a zero bid) and makes contributions thereafter.

Every Rosca participant (other than the first and last winner) acts as both a borrower and a saver. For instance, the round 18 winner contributes for 17 months, takes a loan,

[3] Bidding Roscas are a significant source of finance in South India, where they are called chit funds. Deposits in regulated bidding Roscas were 12.5% of bank credit in the state of Tamil Nadu and 25% of bank credit in the state of Kerala in the 1990s, and have been growing rapidly (Vaidyanathan and Shriram, 2000). There is also a substantial unregulated chit fund sector.

and then repays for the remaining 8 months of the Rosca. In what follows, however, we shall refer to the observations in our sample as Rosca borrowers to focus attention on their repayment risk. The round 18 borrower will have a lower repayment burden (sum of contributions due net of dividends from rounds 19 to 25) than, say, a round 5 borrower.

Each observation in our sample refers to a borrower, i.e. the winner of a Rosca auction, in one of the 25 month Roscas that were started in 2001. We exclude Rosca winners in the first round and in the last two rounds (rounds 24 and 25) from our sample of borrowers since they have no repayment risk. Clearly the first round winner, the organizer, cannot default on itself. The last round winner has no repayment burden (no future contributions due). The penultimate round winner has one repayment due but in practice this repayment is deducted from the sum awarded.

Descriptive statistics for the 5434 Rosca borrowers in our sample are in Table 2. The winning bid is 16.2 percent of the pot on average for these borrowers representing the fraction of the pot that the borrower is willing to forego to other participants in order to borrow. The repayment burden or the total undiscounted outstanding repayments is 46.7 percent of the pot on average. Precisely half the borrowers win pots in the second half of the Rosca (i.e. on or after round 13). The dummy variable *late round* indicates whether a Rosca borrower took a loan in the second half.

Defaults refer to overdues at the maturity of the loan (at the end of the Rosca). 61.4 percent of the borrowers had non-zero overdues – and this dummy variable measure is referred to as default incidence in what follows. The default rate for each Rosca borrower is calculated as the amount outstanding at the end of the Rosca as a fraction of the repayment burden. The mean default rate in our sample is 10.3 percent (Table 2).[4]

[4] We are interested in defaults (or missed contributions) for Rosca participants after they have won the pot. In some cases Rosca participants may drop out before winning the pot because they fail to make contributions – and they are replaced by other participants.

Cosigners and Enforcement

As we have mentioned above, the firm that organizes the Roscas takes on the risk of default. Rather than asking for physical collateral, the organizer requires auction winners to provide cosigners before releasing the loans. Cosigners are required to be salaried employees with a minimum monthly income that depends on the Rosca denomination[5]. This is because the organizer has a legally enforceable claim against their future income as collateral for the loan.

The loan officer who is an employee of the firm that organizes the Roscas, typically has some discretion in deciding on the number of cosigners required for each loan. In the middle round of each Rosca, however, the cosigner requirement is subject to a guideline issued publicly by the head office of the firm that organizes the Roscas to all Rosca participants. This guideline stipulates a relaxation of the cosigner requirement in the middle round. It states that Rosca borrowers will be required three cosigners for winners of auctions up to the middle round of a Rosca, but only two cosigners for winners of later auctions. The rationale is that later borrowers have fewer contributions due and hence are lower risks than earlier borrowers. Loan officers told us that they do not view this guideline as hard-and-fast. Instead, they see it as a "rule of thumb" that allows them to relax the cosigner requirement for borrowers in the second half of the Rosca relative to borrowers in the first half.

We use three measures of the cosigner requirement to adequately capture the guidelines issued to loan officers: the number of cosigners, the incidence of one or more cosigners, and the incidence of three or more cosigners. The average number of cosigners attached to a loan in our sample is 0.717 with considerable variation (Table 2). 38 percent of the borrowers have one or more cosigners – and 10.5 percent had three or more cosigners. If the guideline was followed to the letter then exactly half the borrowers would have three or

[5] We did not have access to cosigner salaries – a variable which would have given us a better measure of the "total" collateral pledged by cosigners. We return to this issue when we interpret our results in Section 4.

more cosigners. In section 4 we shall show that the guideline is indeed followed in spirit for a subgroup of borrowers, i.e. the cosigner requirement is relaxed for round 13 borrowers relative to round 12 borrowers.

The loan officer may also verify the auction winner's income before releasing the loan. For instance, a self-employed person will be asked for tax returns or bank statements while a salaried employee will be asked for an earning record. This verification occurs in 29.4 percent of the cases (see Table 2). Verification is a form of costly screening on the part of the loan officer – because it takes time and effort. In effect, loan officers can push a person who has won the pot but is of dubious repayment quality to later rounds by such screening.[6]

Our field conversations with loan officers indicate that they use a variety of characteristics of the borrower to decide on the number of cosigners required and whether or not to verify the borrower's occupation. For instance, the winning bid is sometimes seen as an indication of the repayment prospects. A Rosca participant who has a history of making contributions on time (in the months before he wins the auction) is looked on favorably. Moreover, the loan officer may have access to information on the borrower through social networks. The researcher may observe some of these characteristics (e.g. the winning bids) but not others, such as the history of on-time contributions and informal unrecorded opinions that the loan officer has gathered about the borrower.

Occupation verification is an indicator of the loan officer's soft information on a borrower's likelihood of default that is not directly observed by the researcher. From Table 2, it is clear that the occupation-verified borrowers are treated quite differently from those whose occupation is not verified. The number of cosigners required of occupation-verified borrowers is three times as high – and similar orders of magnitude apply to the incidence

[6] If the income verification process turns up questionable information, the loan officer may ask for additional cosigners. In the data we only observe the eventual number of cosigners that was required – we do not observe if there was an upward revision in the cosigner requirement. If the winner of the pot is unable to provide sufficient cosigners, then the pot is re-auctioned at a subsequent Rosca meeting. These re-auctions happen infrequently and are not recorded explicitly as re-auctions in the dataset.

of at least one or at least three cosigners. There is little difference in repayment performance between these two subsamples, however. This could reflect the effectiveness of the additional cosigner requirement on those borrowers perceived to be riskier.

For those borrowers whose occupation is verified, the different sectors of the economy in which they are employed are described in Table 3. Self-employed borrowers are the single largest subgroup. Of those whose occupation is not verified, approximately half are investment companies. We will conduct all subsequent analysis separately for the verified and non-verified borrowers to allow for the possibility that the relaxation in the cosigner requirement affects the two groups differently.

The defaults we measure reflect payments made by the borrower to the Rosca organizer – and some of these may indeed be financial help that the borrower has received from cosigners – but not payments collected directly from the cosigners by the organizer. To understand why this is so, it is useful to describe the long and costly collection process.[7] When a borrower misses an installment, then the organizer sends a legal notice to the borrower (after 5 months), another legal notice to borrower and cosigners (after 6 months) and takes them to court (at 12 months if the amount is still overdue). The court begins to collect money from the cosigners approximately 27 months after the missed installment, and remits collection proceeds to the Rosca organizer around 4 years after the missed installment. The court also collects a 12 percent per year interest penalty on overdues. Our field interviews indicate that the Rosca organizer pushes through with this long costly collection process to make its collateral threat credible.

Loan officers confirmed that they never collect money directly from cosigners through the long legal process, but only receive funds collected from cosigners through the court at the very end of the four-year process. Our measure of default is based on overdues at the end of a Rosca. The earliest possible borrower (in February 2001) may indeed have missed repayments in March 2001, twenty-two months before the end of the Rosca.

[7] Visaria (2006) finds that legal reforms that improve loan collection in India have substantial effects on repayment and interest rates.

But it is impossible for the organizer to have collected repayments from cosigners within those twenty-two months (since it takes at least four years). We are thus assured that our default measure is based only on repayment by the borrower herself, not on money collected from the cosigners. This feature will allow us to distinguish whether cosigners promote repayment or are simply an ex-post hedging device.

3 Empirical Strategy

Identification

Our empirical strategy is based on the rule of thumb that allows loan officers to relax the cosigner requirement for borrowers in the middle of a Rosca. The identifying assumption is that loan terms such as the winning bid and the repayment burden change continuously from round to round but the cosigner requirement changes discontinuously.

To illustrate, consider a 25 round Rosca in which the loan officer is allowed to ask for fewer cosigners in round 13 relative to round 12. Our empirical approach will be to compare the default rates for round 13 borrowers with those of round 12 borrowers holding other loan terms constant. In other words, our test is whether round 13 loans are more likely to default compared with observationally identical round 12 loans. Our null hypothesis is that cosigners do not induce repayment by borrowers and so round 13 borrowers are just as likely to default as round 12 borrowers holding other loan terms constant. Notice that the lender may indeed collect funds directly from cosigners through the legal process — and that possibility is consistent with our null hypothesis.

We should note one important issue of interpretation at the outset. Even if we find that relaxing the cosigner requirement reduces repayment in round 13 relative to round 12, we will not be able to distinguish why this might have occurred. In other words, an increase in defaults could arise if the reduction in cosigners either (a) gave round 13 borrowers incentives to make riskier project choices or (b) gave riskier types the incentive to wait to take loans in round 13 rather than round 12 or (c) reduced the insurance provided by cosigners to borrowers in round 13 relative to round 12. Our null hypothesis is simply that cosigners are ineffective in simultaneously (a) preventing moral hazard, (b) screening bad risks, and (c) providing insurance. So if we reject the null, we can conclude that cosigners are effective in one or more of these three channels but cannot distinguish which one.

In this section, we first show why identification is difficult in the absence of exogenous variation in the cosigner requirement. We then discuss how the relaxation in the cosigner requirement allows us to test if there is a causal relationship between the number of cosigners and defaults.

We start with some notation. In any Rosca loan, the debt incurred equals the sum of net repayments due from the Rosca winner who receives the pot at date t. Denote this repayment burden by R_t. Let the default rate, i.e. the fraction of R_t that is unpaid at the end of the Rosca be denoted y_t. Let b_t be the winning bid at which the pot is obtained in round t. The winning bid is a measure of the price of capital.

In what follows we shall be careful about what dimensions of the borrower type are (not) observed by the researcher and by the lender. We shall define three measures x_t, z_t and θ_t of information about the riskiness of the round t borrower that may/not be observed by the lender or the researcher. The variable x_t represents publicly observed information. For instance, the lender and the researcher both observe the Rosca denomination and the loan terms, b_t and R_t; borrowers may reveal their riskiness by taking unattractive loan terms. The variable z_t denotes the riskiness of the round t borrower observed by the lender and not by the researcher (i.e. the "soft information" described in the introduction). For instance, the lender may have local information on borrowers – or may have some sense of their reliability by whether or not their previous contributions to the Rosca have been timely. Let θ_t be the riskiness unobserved by both the lender and researcher, i.e. θ_t represents information that is truly private. For convenience, this information structure is summarized in the following table.

	Observed by Lender	Observed by Researcher
x_t	Yes	Yes
z_t	Yes	No
θ_t	No	No

The lender's choice of how many cosigners c_t to require of the borrower will depend on all the information observed by the lender:

$$c_t = c(t, R_t, b_t, x_t, z_t) + v_t, \tag{1}$$

where v_t is a random error term with mean zero. For instance, the number of cosigners required is likely to be nondecreasing in the debt R_t, in the price that the borrower is willing to pay b_t, and in the borrower's riskiness z_t. In general, a default y_t will depend on the loan terms, on the cosigners required and on the risk characteristics of the borrower both observed and unobserved by the lender:

$$y_t = y(t, R_t, b_t, c_t, x_t, z_t, \theta_t) + u_t, \tag{2}$$

where $E(u_t|t, R_t, b_t, c_t, x_t, z_t, \theta_t) = 0$.

Our null hypothesis is that cosigners are ineffective at reducing defaults by the borrower. Since we measure defaults as payments collected from the borrower and not from the cosigners, cosigners may be very useful as a source of funds for the lender, even when our null is true.

Consider the regression relating defaults and the cosigner requirement:

$$y_t = D_y(t, \alpha_y) + \beta c_t + a_1 R_t + a_2 b_t + a_3 x_t + u_t, \tag{3}$$

where α_y is a vector of parameters, D_y is a (continuous) polynomial in t capturing the effect of t on y. When we estimate (3) by OLS, the estimation suffers from an omitted variable problem: z_t is not in the set of explanatory variables. So, under the null of ineffective cosigning (which implies $\frac{\partial \theta}{\partial c} = 0$), we would estimate $\beta > 0$ if $\frac{\partial c}{\partial z} > 0$. In other words, cosigners are positively correlated with default rates because riskier borrowers are asked for more cosigners than safer ones are and the riskiness z is unobserved by the researcher. The null hypothesis – that cosigners do not induce borrowers to repay – may be true despite the positive estimate of β.

Our approach to solve this problem is to exploit the discontinuity in the cosigner assignment rule at the middle round (the institutional details were discussed in section 2). We maintain the assumption that the functions in (2) and (1) are continuous in all arguments. Let the dummy variable $late_t$ denote rounds after the middle with the relaxed cosigner requirement, i.e. all rounds $t \geq 13$. We may then write the cosigner requirement as:

$$c_t = c(t, R_t, b_t, x_t, z_t, late_t) + v_t \tag{4}$$

Notice, moreover, that, conditional on c_t, y_t is not a function of $late_t$ as only the cosigner rule changes discontinuously at the middle round.

We will test if there is a trend break in the cosigner requirement in the middle round by estimating

$$c_t = D(t, \alpha_c) + \gamma \ late_t + d_1 R_t + d_2 b_t + d_3 x_t + v_t. \tag{5}$$

The OLS estimate of γ in (5) will capture the sum of two effects: first the direct effect of $late_t$ on c_t and, second, the indirect effect of selection on z_t:

$$\widehat{\gamma} = \frac{\Delta c}{\Delta late} + \frac{\partial c}{\partial z}\frac{\Delta z}{\Delta late} \tag{6}$$

A relaxation in the cosigner requirement would imply $\frac{\Delta c}{\Delta late} < 0$. If observably riskier borrowers wait until the cosigner relaxation to borrow, then $\frac{\Delta z}{\Delta late} > 0$, and since the lender is likely to ask observably riskier borrowers for more cosigners, $\frac{\partial c}{\partial z} > 0$, this indirect effect will be positive. If the indirect effect around the middle round is sufficiently strong, then we may estimate $\gamma = 0$. In what follows, we show that for a certain subset of riskier borrowers, this is indeed what happens.

We will test if there is a corresponding trend break in defaults in the middle round by estimating:

$$y_t = D(t, \alpha_y) + \delta \; late + a_1 R_t + a_2 b_t + a_3 x_t + u_t, \tag{7}$$

The OLS estimate of δ in (7) will capture the sum of two effects:

$$\widehat{\delta} = \frac{\partial y}{\partial c}\frac{\Delta c}{\Delta late} + \frac{\partial y}{\partial (z+\theta)}\frac{\Delta (z+\theta)}{\Delta late} \tag{8}$$

Under the null hypothesis there are no moral hazard/insurance or selection effects, i.e $\frac{\partial y}{\partial c} = 0$ and $\frac{\Delta(z+\theta)}{\Delta late} = 0$. So the null is $\gamma < 0$ and $\delta = 0$.

As deviations from our null hypothesis, we can think of several possibilities. If cosigners reduced defaults by preventing moral hazard or by providing insurance, then $\frac{\partial y}{\partial c} < 0$ and so the effect of a relaxation in the cosigner requirement $\frac{\Delta c}{\Delta late} < 0$ would be to increase defaults in the middle round. If cosigners prevented defaults by attracting safer borrowers, then riskier borrowers would wait till after the middle round, $\frac{\Delta(z+\theta)}{\Delta late} > 0$, and since riskier borrowers are more likely to default $\frac{\partial y}{\partial(z+\theta)} > 0$, this would increase defaults in the middle round as well. In both cases then, we'd expect $\widehat{\delta} > 0$.

Our empirical strategy may resemble regression discontinuity methods — but there is one important difference. If the discontinuity in the number of cosigners was unanticipated, then we would expect no selection on either θ or z around the middle round. Borrowers who took loans at similar terms just before and just after the median round would be "as good as randomly assigned." We could then estimate the treatment effect of cosigners on repayment (through preventing moral hazard or providing insurance) by using the $late_t$ dummy as an instrument for the number of cosigners in regression (3). But in practice the relaxation in the cosigner requirement in the middle round is public information. We therefore cannot rule out the possibility that riskier types will delay borrowing till just after the middle round. This form of selection may result in an upward trend break in defaults – and arguably is an effect of cosigners that we wish to capture.[8] So we do not use the instrumental variable technique (or equivalently fuzzy regression discontinuity methods; see

[8] In related research we find evidence that adverse selection is indeed a concern in these markets (Klonner and Rai, 2007).

Imbens and Lemieux, 2008) to isolate the treatment effect of cosigners on defaults. Instead we shall interpret the coefficient δ in regression (7) as the combined treatment and selection effect of cosigners on defaults provided $\gamma < 0$.

One way in which loan officers may respond to the relaxation allowed in the number of cosigners in the middle round of Roscas is by asking for each of the fewer cosigners to pledge more salary as collateral. As we mentioned in Section 2, the salary information on cosigners was not available from the Rosca organizer – and so we have no way of directly testing whether there was such a substitution (from quantity to total salary of cosigners). That said, asking for more salary per cosigner after the middle round and provided that a higher cosigner salary causes higher repayment by the borrower, our estimates of the causal effect δ in (7) would be biased downwards. So if anything, our estimated causal effects are lower bounds.

Implementation

As we discussed in section 2 our sample consists of 247 Roscas of 25 month durations with four different denominations. To implement specification (3), which relates defaults to the cosigner requirement, we shall estimate the following:

$$y_{kit} = \eta_{kt} + \beta c_{kit} + a_1 R_{kit} + a_2 b_{kit} + a_3 x_{kit} + u_{kit} \tag{9}$$

where y_{kit} is the default measure for the borrower in round t of Rosca i of denomination k, c_{kit} is the cosigners required, R_{kit} is the repayment burden, b_{kit} is the winning bid and the controls x_{it} are dummies for the 18 branch locations of the Rosca organize and 12 dummies for occupational categories (described in Table 3). These controls are included in all subsequent regressions as well.

Next, to investigate the causal link between cosigners and defaults in specifications (5) and (7), we will estimate the following equation for the cosigners required,

$$c_{kit} = \sum_{s=0}^{S} \alpha_{ks} t^s + \gamma \ late_t + d_1 R_{kit} + d_2 b_{kit} + d_3 x_{kit} + v_{kit} \tag{10}$$

where t denotes the round and i denotes the Rosca group, k denotes the Rosca denomination and S is the order of the polynomial. In other words, we allow for a different polynomial function of degree S for each of the four denominations.

In our setting the treatment assignment depends on a discrete variable (the round in which the loan was taken). Since the cosigner relaxation occurs in round 13 (compared with round 12), it is impossible to compare default rates for borrowers just above and just below the threshold round. If, in contrast, the treatment-determining variable was continuous, there would be observations arbitrarily close to the threshold available at least as the sample size grows large. From those, the precise shape of the regression function around the threshold (and thus the discontinuity itself) could be estimated consistently by nonparametric methods. In our discrete case, however, the discontinuity in default rates has to be estimated by assuming a parametric form for the regression function. Any particular parametric form is only an approximation of the true regression function, however. Even as the number of observations becomes large, the regression function around the discontinuity will be estimated with an error.

Lee and Card (2008) model these specification errors as random and suggest a procedure to select the appropriate parametrization, i.e. the order of the polynomial in (10). We implement their procedure as follows. To determine the degree of the polynomial which is appropriate, S, we conduct a likelihood ratio test of (10) against

$$c_{kit} = \eta_{kt} + d_1 R_{kit} + d_2 b_{kit} + d_3 x_{kit} + u_{kit}.$$

As we use rounds 2 to 23 of each Rosca, the resulting chi-square statistic has $22 \times 4 - (4S + 1) = 87 - 4S$ degrees of freedom. We then choose the smallest value of S that fails to reject our likelihood ratio specification test at the 10 per cent level.

We use the same procedure to determine the order of the polynomial for the default equation,

$$y_{kit} = \sum_{s=0}^{S} \alpha_{ks} t^s + \delta \ late_t + a_1 R_{kit} + a_2 b_{kit} + a_3 x_{kit} + u_{kit}. \tag{11}$$

Lee and Card (2008) also show that statistical inference will account for the specification errors in parametrization by clustering the standard errors by the treatment assignment variable. We therefore cluster the standard errors obtained from (10) and (11) by t to account for potential remaining specification error of the polynomial vis-a-vis the unobserved, "true" form of $D(t, \cdot)$ in (5) and (7). Finally, we estimate all equations, including those with dichotomous or censored dependent variables, by OLS because the theory on regression discontinuity with specification error does not readily extend to probit and tobit models.

4 Results

In this section we present our main empirical findings. Loans that have a higher cosigner requirement initially are more likely to go into default ex post. Despite this positive correlation between cosigners and defaults, however, there is a negative causal link. We find that there is a reduction in cosigners in the middle round for those borrowers whose occupation is not verified – and this reduction is associated with an increase in defaults for those borrowers around the middle round.

We first investigate the reduced-form relationship between the number of cosigners attached to a loan and defaults based on specification (9) in Tables 4 and 5. The incidence of defaults is the dependent variable in Table 4, while the default rate is the dependent variable in Table 5. For all three measures of the cosigner requirement – and for both the occupation-verified and the non-verified subsamples – there is a strong and significant positive relationship between cosigners required and defaults. For instance, the point estimate of 0.076 in column 1 of Table 4 implies an increase in default probability of roughly one-eighth for each additional cosigner attached to the loan. Put differently, doubling the number of cosigners will on average increase the incidence of defaults by 5 percent. An analogous pattern arises when default rate is the dependent variable (Table 5). The magnitude of this positive correlation between defaults and cosigners does not differ significantly across subgroups in our sample.

We next turn to whether a discontinuous decrease in the cosigner requirement in the middle round causes a discontinuous increase in defaults in the middle round. Recall from section 3 that we expect a trend break in the cosigner requirement, $\gamma < 0$ in specification (10), if there is a reduction in the number of cosigners as specified by the Rosca guidelines – and an increase in defaults, $\delta > 0$ in specification (11), as a consequence.

Is there a trend break in cosigners required? The OLS estimates in Table 6 are based on specification (10) for the pooled sample and for the occupation-verified and non-verified subsamples for each of the three cosigner measures. The estimated coefficient γ on $late_{it}$ is negative and significant for those borrowers who are perceived to be safer (occupation not verified). The trend break in the cosigner requirement for the non-verified subsample is substantial: the point estimate of -0.163 in column 2, for instance, is more than a third of the average number of cosigners for this subsample (0.426 from Table 2). Similar orders of magnitude define the downward trend break for the incidence of one or more cosigners and for the incidence of three or more cosigners around the middle round for this subsample.[9] There is no significant effect for the riskier borrowers (occupation verified) nor for the pooled sample. Recall from section 3, that we might expect the lender not to relax the cosigner requirement for riskier borrowers to prevent them from waiting to take loans in round 13. Table 6 also reveals other determinants of the cosigner requirement. Occupation-verified borrowers are asked to pledge roughly a third more cosigners than the average borrower (column 1). Higher winning bids are associated with higher cosigner requirements: a ten percentage point increase in the winning bid results in 0.36 more cosigners required on average (column 1). The winning bid appears to be a much stronger signal to the lender

[9] To check whether the thirteenth round of a Rosca is the appropriate break point, we also estimate equation (10) for the subsample of non-verified borrowers with alternative specifications of the *late*-dummy. In particular, we use alternative breaks occuring in the 10th, 11th, 12th, 14th, 15th and 16th round, respectively, and calculate the resulting R^2-statistics. In each of these specifications, we use the same polynomial orders as in columns 2, 5 and 8 of Table 6. The results are in Table A1. For the number of cosigners and the cosigner incidence, the R^2-statistic is maximized for a trend break in round 13 and for our third cosigner measure, the 13th round break is still a weak maximizer of the R^2-criterion. We take this as empirical support for our identifying assumption that loan officers apply the the company's published cosigner rule in the form of a trend break at the middle round (round 13) of a Rosca.

for borrowers who are deemed riskier (the point estimate of the coefficient on winning bids in column 3 is more than twice the point estimate in column 2).

Is there a trend break in defaults? The OLS estimates in Table 7 are based on specification (11). There is a significant upward jump in default incidence for the non-verified borrowers but not for the occupation-verified borrowers. Put differently, the estimated coefficient δ on $late_{it}$ is negative and significant for those borrowers who are perceived to be safer and the effect is large: the point estimate of 0.079 is one eighth of the average default incidence for nonverified borrowers. Tables 6 and 7 together show that a reduction in the number of cosigners of a little less than a third results in an increase in the incidence of default of a little more than ten percent. This is a substantial causal effect of cosigners on defaults of borrowers perceived to be safer. (We cannot of course tell what the effect of cosigners was on those borrowers whose occupation was verified because they were perceived to be riskier.) The results using the default rate measure are less conclusive possibly because there is less variation in this measure relative to default incidence.

In Table 8 we ask if there is a discontinuous change in the winning bids around the middle round. If cosigners are costly (in terms of their monitoring or selectivity), then riskier borrowers may be willing to pay a premium in round 13 for a relaxation in the cosigner requirement – implying a upward trend break in winning bids around the middle round. On the other hand, those unaffected by the cosigner relaxation would have an incentive arbitrage away any discontinuous differences in winning bids. Occupation-verified borrowers who have little incentive to wait till round 13 would bid up the price of a loan in round 12. The estimates in columns $1-3$ of Table 8 are suggestive of the latter story.

We also find in column 4 that there is a relaxation in occupation (and income) verification after the middle round. This is consistent with our earlier evidence (Table 6) that such borrowers perceived by the loan officer to be riskier do not enjoy a relaxation in the cosigner requirement – and hence have little incentive to wait till round 13. Borrowers perceived to be safer would rather wait for the cosigner relaxation in round 13 than take loans in round 12 – and hence we would expect a drop in occupation verification, or equivalently a drop in the lender's perceived riskiness of borrowers. In sum, it is consistent to observe both a discontinuous decrease in riskiness (and hence occupation verification) but no discontinuous change in the winning bids.

Finally, note that the polynomial order for each regression reported in Tables 6, 7 and 8 are determined by the likelihood ratio test described in Section 3, and standard errors are clustered by round.

5 Conclusion

In this paper we investigate the use of cosigners as collateral using data from South India. We show that the number of cosigners is positively correlated with defaults – presumably because borrowers who are high default risks are asked for more cosigners. This is very similar to the positive correlation finding in the empirical collateral literature. We go further to investigate whether there is a causal link between the number of cosigners required on a loan and the subsequent default probability. We use a rule-of-thumb relaxation in the number of cosigners required on shorter duration loans to isolate this causal effect. This relaxation is orthogonal to any soft information about the borrower privately observed by the loan officer – and hence allows us to isolate the effect of reducing the number of cosigners on defaults.

Our findings are broadly consistent with models in which ex-ante riskier borrowers are asked for more cosigners and cosigners reduce defaults ex-post. One such model that has both the positive correlation and the negative causation between collateral and defaults is by Boot, Thakor and Udell (1991). In their model the collateral is provided by borrowers – but the same results would apply if collateral were provided by cosigners instead. Borrowers differ in terms of observed riskiness and are subject to moral hazard. Lenders ask observably riskier borrowers for more collateral (positive correlation) – yet collateral also has an incentive effect (negative causal effect). Simpler models which just have a positive correlation between cosigners and defaults but no causal link – or a negative causal link but no correlation – are not consistent with what we find. Models in which cosigners are merely a source of funds for the lender ex-post are also inconsistent with our results.

Finally, our paper points to the usefulness of cosigners – but we cannot with the available data distinguish between the channels through which cosigners operate. In other words, do cosigners select safer types of borrowers – or induce safer project choices – or do they insure borrowers against bad luck? We leave these interesting issues for future research.

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Table 1. Rosca Characteristics

Contribution (Rs.)	Pot Value (Rs.)	Number of Groups	Percentage in Sample
400	10,000	94	38.06
1,000	25,000	65	26.32
2,000	50,000	62	25.10
4,000	100,000	26	10.53

Notes: “Number of Groups” is the number of distinct Rosca groups in the sample

Table 2. Descriptive Statistics

Sample:	*All*				*Occupation not verified*				*Occupation verified*			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Winning Bid Relative to Pot	0.162	0.092	0.050	0.300	0.158	0.089	0.050	0.300	0.171	0.097	0.050	0.300
Repayment Burden Relative to Pot	0.467	0.225	0.074	0.885	0.465	0.230	0.077	0.885	0.472	0.215	0.074	0.860
Late Round (Incidence)	0.500	0.500	0	1	0.504	0.500	0	1	0.491	0.500	0	1
Borrower Occupation Verified by Lender (Incidence)	0.294	0.456	0	1	0.000	0.000	0	0	1.000	0.000	1	1
Number of Cosigners	0.717	1.057	0	6	0.426	0.873	0	5	1.414	1.132	0	6
Cosigner (Incidence)	0.380	0.485	0	1	0.233	0.423	0	1	0.730	0.444	0	1
Three or more Cosigners (Incidence)	0.105	0.306	0	1	0.057	0.232	0	1	0.219	0.414	0	1
Default (Incidence)	0.614	0.487	0	1	0.606	0.489	0	1	0.633	0.482	0	1
Default Rate	0.103	0.152	0	1	0.090	0.141	0	1	0.133	0.173	0	1
Observations	5434				3834				1600			

Notes: Repayment Burden is the sum of net contributions (required contributions less dividends) due from a Rosca winner in round t in rounds t+1, t+2...T, where T is the last month of the Rosca. Default rate refers to amount outstanding relative to liability at the termination of the Rosca.

Table 3. Occupational Characteristics of Borrowers

Borrower Occupation	Frequency	Relative Frequency (%)
Services	150	2.76
Education	217	3.99
Banking and Law	175	3.22
Government	75	1.38
Health	85	1.56
Manufacturing	271	4.99
Self-employed	328	6.04
Agriculture	29	0.53
Retired	256	4.71
Housewife	97	1.79
Investment Company	1,903	35.02
Not Verified	1,848	34.01

Table 4. Regression Analysis of Default Incidence

Dependent Variable: Default Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sample:	*all*	*non-verified*	*verified*	*all*	*non-verified*	*verified*	*all*	*non-verified*	*verified*
Number of Cosigners	0.076***	0.077***	0.082***						
	(0.011)	(0.016)	(0.018)						
Cosigner (Incidence)				0.152***	0.171***	0.127***			
				(0.023)	(0.031)	(0.031)			
Three or more Cosigners (Incidence)							0.132***	0.141***	0.130***
							(0.024)	(0.038)	(0.039)
Winning Bid Relative to Pot	0.724***	0.730***	0.906	0.800***	0.735***	1.118*	0.923***	0.870***	1.229**
	(0.255)	(0.241)	(0.559)	(0.266)	(0.256)	(0.544)	(0.248)	(0.252)	(0.513)
Repayment Burden Relative to Pot	0.593	0.733	-0.525	0.529	0.673	-0.560	0.618	0.702	-0.293
	(0.693)	(0.706)	(1.624)	(0.704)	(0.730)	(1.622)	(0.703)	(0.717)	(1.609)
Occupation Verified (Incidence)	-0.059*			-0.059*			-0.048		
	(0.032)			(0.032)			(0.033)		
Observations	5434	3834	1600	5434	3834	1600	5434	3834	1600
R-squared	0.232	0.288	0.211	0.231	0.289	0.204	0.225	0.282	0.201

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Standard errors in parentheses.

All specifications include dummies for 22 Rosca rounds, 12 occupation categories, 4 Rosca denominations, and 18 branch locations.

Table 5. Regression Analysis of Default Rate

Dependent Variable: Default Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sample:	*all*	*non-verified*	*verified*	*all*	*non-verified*	*verified*	*all*	*non-verified*	*verified*
Number of Cosigners	0.030***	0.031***	0.036***						
	(0.005)	(0.007)	(0.008)						
Cosigner (Incidence)				0.053***	0.057***	0.051***			
				(0.011)	(0.015)	(0.014)			
Three or more Cosigners (Incidence)							0.060***	0.069***	0.066***
							(0.011)	(0.016)	(0.014)
Winning Bid Relative to Pot	0.259***	0.292***	0.277	0.299***	0.307***	0.377**	0.334***	0.345***	0.412**
	(0.062)	(0.063)	(0.170)	(0.063)	(0.066)	(0.164)	(0.063)	(0.067)	(0.152)
Repayment Burden Relative to Pot	0.178	0.389	-0.167	0.155	0.363	-0.174	0.191	0.382	-0.064
	(0.340)	(0.243)	(0.741)	(0.349)	(0.245)	(0.784)	(0.335)	(0.241)	(0.751)
Occupation Verified (Incidence)	0.003			0.004			0.007		
	(0.011)			(0.011)			(0.012)		
Observations	5434	3834	1600	5434	3834	1600	5434	3834	1600
R-squared	0.128	0.134	0.160	0.122	0.130	0.147	0.119	0.125	0.149

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Standard errors in parentheses.

All specifications include dummies for 22 Rosca rounds, 12 occupation categories, 4 Rosca denominations, and 18 branch locations.

Table 6. Analysis of the Lender's Cosigner Rule

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable:	*Number of Cosigners*			*Cosigner Incidence*			*Three or more Cosigners (Incidence)*		
Sample:	all	non-verified	verified	all	non-verified	verified	all	non-verified	verified
Late Round (Dummy)	-0.105	-0.163***	-0.129	-0.058*	-0.062***	-0.057	0.003	-0.027**	0.039
	(0.065)	(0.052)	(0.140)	(0.030)	(0.017)	(0.069)	(0.022)	(0.010)	(0.048)
Winning Bid Relative to Pot	3.632***	2.434***	5.064***	1.336***	1.068***	1.713***	0.601***	0.347**	0.731***
	(0.385)	(0.398)	(0.483)	(0.197)	(0.190)	(0.301)	(0.138)	(0.132)	(0.176)
Repayment Burden Relative to Pot	-0.247	-1.199	3.076	0.337	-0.163	1.997***	-0.310	-0.447	-0.134
	(0.835)	(0.930)	(1.912)	(0.323)	(0.305)	(0.597)	(0.313)	(0.358)	(0.740)
Occupation Verified (Incidence)	0.228***			0.115***			0.046***		
	(0.034)			(0.017)			(0.016)		
Polynomial Order	4	8	4	4	5	4	10	9	13
Observations	5434	3834	1600	5434	3834	1600	5434	3834	1600
R-squared	0.569	0.496	0.549	0.554	0.521	0.297	0.331	0.242	0.457
Chi-Square	68.81	68.14	85.05	81.76	78.64	77.80	59.07	53.74	38.27
Degrees of Freedom	71	55	71	71	67	71	47	51	35
P-Value	0.164	0.110	0.122	0.180	0.156	0.271	0.111	0.370	0.323

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Standard errors, clustered by Rosca round, in parentheses.

All specifications include dummies for 12 occupation categories, 4 Rosca denominations, and 18 branch locations.

Table 7. Analysis of the Cosigner Rule and Defaults.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:		*Default Incidence*			*Default Rate*	
Sample:	all	non-verified	verified	all	non-verified	verified
Late Round (Dummy)	-0.011	0.079***	-0.052	-0.014*	0.016*	-0.036
	(0.020)	(0.027)	(0.066)	(0.008)	(0.009)	(0.029)
Winning Bid Relative to Pot	0.987***	0.829***	1.319**	0.362***	0.319***	0.450***
	(0.245)	(0.231)	(0.497)	(0.062)	(0.061)	(0.146)
Repayment Burden Relative to Pot	0.564	0.465	-0.389	0.168	0.392**	-0.077
	(0.681)	(0.673)	(1.621)	(0.338)	(0.182)	(0.755)
Occupation Verified (Incidence)	-0.038			0.011		
	(0.033)			(0.012)		
Polynomial Order	5	3	4	5	2	5
Observations	5434	3834	1600	5434	3834	1600
R-squared	0.211	0.266	0.153	0.099	0.097	0.093
Chi-Square	64.64	69.88	80.69	61.86	83.36	78.48
Degrees of Freedom	67	75	71	67	79	67
P-Value	0.559	0.645	0.202	0.655	0.347	0.159

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Standard errors, clustered by Rosca round, in parentheses.

All specifications include dummies for 12 occupation categories, 4 Rosca denominations, and 18 branch locations.

Table 8. Cosigner Rule, Winning Bids and Borrower Screening.

	(1)	(2)	(3)	(4)
Dependent Variable:	*Winning Bid Relative to Pot*			*Occupation Verified*
Sample:	all	non-verified	verified	all
Late Round (Dummy)	-0.002	0.001	-0.004	-0.050*
	(0.003)	(0.004)	(0.004)	(0.029)
Repayment Burden Relative to Pot	-1.618***	-1.549***	-1.635***	0.118
	(0.350)	(0.349)	(0.366)	(0.342)
Occupation Verified (Incidence)	-0.002			
	(0.002)			
Winning Bid Relative to Pot				-0.153
				(0.152)
Polynomial Order	6	6	5	4
Observations	5434	3834	1600	5434
R-squared	0.872	0.868	0.889	0.564
Chi-Square	51.87	52.11	70.78	83.63
Degrees of Freedom	63	63	67	71
P-Value	0.841	0.834	0.353	0.145

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Standard errors, clustered by Rosca round, in parentheses.

All specifications include dummies for 12 occupation categories, 4 Rosca denominations, and 18 branch locations.

Table A1. Goodness of Fit of Alternative Late Round Definitions

	(1)	(2)	(3)
	Dependent Variable:		
Late Round Definition	Number of Cosigners	Cosigner Incidence	Three or more Cosigners
10	0.4953	0.5202	0.2421
11	0.4953	0.5203	0.2421
12	0.4953	0.5203	0.2422
13	0.4959	0.5210	0.2422
14	0.4955	0.5206	0.2421
15	0.4956	0.5203	0.2421
16	0.4953	0.5205	0.2422

Notes: each cell displays the R-Squared statistic from a regression with only non-verified borrowers. In each regression the Late Round dummy is equal to zero for rounds earlier than the value in the "Late Round Definition" column, and equal to one otherwise. Columns 1, 2 and 3 of this table correspond to columns 2, 5 and 8 of Table 6, respectively.