

Working paper

# Term Structure of Debt and Entrepreneurship

Experimental  
Evidence from  
Microfinance

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# Term Structure of Debt and Entrepreneurship: Experimental Evidence from Microfinance

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## Abstract

Financiers across the world structure debt contracts to limit the risk of entrepreneurial lending. But debt structures that reduce risk may inhibit enterprise growth, especially among the poor. Using a field experiment we quantify the short- and long-run trade-offs associated with the classic microfinance debt contract. We contrast the classic contract which requires that repayment begins immediately after loan disbursement with a contract that provides a two-month grace period before repayment begins. The shift to a grace period contract increased short-run business investments and long-run profits, implying average return to capital of over 8% per month. However, we also observe a significant increase in the variance of profits and a tripling of default rates. In this manner, early initiation of repayment reduces risk to financiers but also reduces the potential impact of microfinance on microenterprise growth and household poverty.

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# 1 Introduction

Micro-entrepreneurs across the world rely on short-term debt to finance investments (Daley-Harris, 2006). Increasingly, a key source of such debt is lending by microfinance institutions (MFIs). There are currently an estimated 130-190 million borrowers worldwide and outstanding microfinance loans stood at more than \$43 billion in 2008 (Gonzalez, 2010). Yet emerging empirical evidence suggests limited impact of MFI activity on the average income growth of micro-entrepreneurs (Banerjee et al., 2009; Karlan and Zinman, 2009), despite evidence of high returns to capital in small-scale enterprises in developing countries (de Mel et al., 2008).

This paper studies whether the immediate repayment obligations of the classic MFI contract – widely held to be important for reducing default – inhibit entrepreneurship by making high return but illiquid investments too risky. To do so we exploit a field experiment conducted in collaboration with a large MFI in Kolkata, India. We use multiple surveys and MFI transactions data to evaluate the short and long-run impacts of relaxing the liquidity demands imposed by the classic “Grameen Bank” contract early in the loan cycle.

Clients in the control group initiated repayment two weeks after receiving their loan, as is standard practice in microfinance, while those assigned to treatment received a two-month grace period before repayment began. The latter contract more closely resembles the small business loan structure in rich countries. Once repayment began, all clients repaid at an identical frequency. To examine the economic impact of debt structure, we track clients’ business investments during the loan-cycle, their loan repayment behavior one and a half years later and their profits and income three years after loan disbursement.

The economic profile of our study clients matches the typical profile of the urban poor in low-income countries. On average, clients report per capita household earnings of under two dollars a day and the majority engage in microenterprise activity in the informal service sector. The two most common activities are running a convenience store and selling clothes.<sup>1</sup>

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<sup>1</sup>This is comparable to other settings. For instance, using representative household surveys Banerjee et al. (2009) report that in Peru, 69% of under \$2 a day urban households operate a non-agricultural business. In Indonesia, Pakistan, and Nicaragua, they report numbers between 47-52%

The average household business has two employees and MFI debt is a key mechanism for financing working capital needs and making business investments. Health and business shocks are common, and clients' state both as important causes for business closures. Surveys suggest that likely reasons for this include the absence of comprehensive health insurance and an inability to smooth shocks by liquidating inventory and assets. The median client states that she would incur a loss of 25% if she has to liquidate her business stock within a day and only 30% of the clients state that they would consider selling products or assets at a discount in order to meet the demands of such a shock.

We use a simple model of financial contracting to demonstrate that in such a setting introducing a grace period in the debt contract can make high-return but illiquid investments viable. This, in turn, increases the average return on available investments and, therefore, expected business profits. If relatively illiquid investments are riskier (or, more generally, increase the expected variance of household income by reducing short run ability to deal with shocks), then we may observe higher default even as average investment returns increase. Put differently, by encouraging less risky investment choices, immediate repayment obligations may simultaneously limit default *and* income growth.<sup>2</sup>

Our experimental evidence strongly supports these predictions. We find that both business investment and repayment behavior are sensitive to the introduction of a grace period: Microenterprise investment is approximately 6.5% higher and the likelihood of starting a new business is more than twice as high among clients who receive the grace period contract relative to those on the classic contract. Furthermore, business profits and household income are on average 30% and 17% higher nearly three years after receiving the loan.

At the same time, grace period contracts are associated with higher default. Half a year after the loan due date, grace period clients are more than three times as likely to have defaulted on their loan. Data on the variability of business profits and business practices suggests that clients' undertook riskier business practices. The variability of profits after

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<sup>2</sup>In theory, early repayment may also discourage risky investments by improving loan officers' ability to monitor borrower activities early on in the loan cycle. We ignore this channel in the analysis since loan officers in our study (hired, trained and supervised by our research team) do not undertake any monitoring activities during loan meetings.

three years is 130% higher for grace period clients. These clients also report more risk-taking in business practices: grace period clients report greater willingness to extend credit to customers through loans and pre-orders, and provide a significantly wider array of goods and services suggesting they are willing to reduce their access to liquid funds and experiment with product and client diversification.

While there is a growing empirical literature on the impact of microfinance on income and consumption of the poor, to the best of our knowledge, this is the first paper to demonstrate how immediate repayment obligations distort investment in microenterprises financed through microcredit. The lack of even observational evidence on this question reflects the fact that MFIs almost universally follow this practice. A small and predominantly theoretical literature examines the role of repayment frequency in reducing default in MFIs, but focuses on channels other than investment choice (see, for instance, Fisher and Ghatak (2010)).<sup>3</sup>

Our paper is related to the corporate finance and financial contracting literatures on optimal debt structure. The idea that the structure of debt contracts influences entrepreneurial risk-taking behavior exist in many corporate finance models (see for example, Tirole (2005) or Ghatak and Guinnane (1999) for an application to micro-credit in particular). A unique feature of our model is that, unlike much of the micro-credit literature, we assume that riskier investment yield higher returns. Therefore, the incentives of a default-averse MFI are no longer aligned with maximizing expected returns. This leads to a contractual choice under which clients forego higher return projects in order to minimize short-run risk, consistent with the empirical patterns observed in the data. As mentioned earlier, the contractual form underlying lending to very small business loan applicants in rich countries provides a good benchmark for comparison. Despite similar risk profiles of the client base,

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<sup>3</sup>On the empirical side Feigenberg et al. (2010) demonstrate that more frequent meeting can improve clients' informal risk-sharing arrangements and, therefore, long-run ability to repay. Selection issues inhibit causal interpretations of existing non-experimental studies of how greater repayment flexibility affects default, and may explain the mixed findings: Armendariz and Morduch (2005) reports that more flexible repayment is associated with higher default in Bangladesh, while McIntosh (2008) finds that Ugandan MFI clients who choose more flexible repayment schedules are less likely to be delinquent.

the typical small business loan contract in developed countries is significantly more flexible than a typical MFI contract.<sup>4</sup> Consistent with the trade-offs we model here, default rates on Small Business Administration loans in the US are between 13-15% compared to 2-5% on typical MFI loans Glennon and Nigro (2005).

Section 2 describes the experimental intervention and the basic analytical framework. Section 3 describes the data and the nature of entrepreneurship among our study clients. Section 4 discusses our findings and Section 5 uses our estimates to compute the returns to capital. Section 6 concludes.

## 2 Background

Our study was conducted with Village Financial Services (VFS), a MFI that makes individual-liability loans to women in low-income neighborhoods of Kolkata. In this section, we describe the intervention and then entrepreneurship among VFS clients. Finally, motivated by our case studies on entrepreneurship, we develop a simple model of financial contracting and identify testable predictions for our experimental intervention.

### 2.1 Experimental Design

Between March and December 2007 we formed 169 five-member loan groups giving us a sample of 845 clients. Each client received an individual-liability loan, and loan sizes varied from Rs. 4,000 ( $\sim$ \$90) to Rs. 10,000 ( $\sim$ \$225) with a modal loan amount of Rs. 8,000. The standard VFS debt contract required repayment through fixed installments starting two weeks after loan disbursement.

After group formation and loan approval but prior to loan disbursement, repayment schedules were randomly assigned at the group level in a public lottery. Treatment status

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<sup>4</sup>For instance, flexible repayment options are available on Small Business Administration (SBA) loans in the U.S., and typically negotiated on a loan-by-loan basis. Payments are typically via monthly installments of principal and interest. There are no balloon payments, and borrowers may delay their first payment up to three months with prior arrangement. For details, see for instance <https://www.key.com/html/spotlight-quantum-health.html>.

was assigned within batches of 20 groups at a time, with batch assignment determined by the timing of group formation. No clients dropped out of the experiment between randomization and loan disbursement.

Eighty-four groups were assigned the contract with a grace period and 85 groups were assigned to the regular contract with repayment starting two weeks after loan disbursement. Other features of the loan contract were held constant across the two groups, including interest charges. Once repayment began, all clients were required to repay fortnightly over the course of 44 weeks. Repayment occurred in a group setting at a neighborhood meeting conducted every two weeks by a loan officer in one group member's home (on this, also see Feigenberg et al. (2010)).

However, since clients with a grace period had longer debt maturity (a total of 55 as opposed to 44 weeks before their full loan amount was due) and faced the same total interest charges, they also faced a slightly lower effective interest rate on the loan, although the potential income effect of this difference is minimal given that interest rates are relatively low (12% annually for the control group) and loan sizes are small.<sup>5</sup>

## 2.2 Entrepreneurship in Kolkata

### 2.2.1 Summary Statistics

The summary statistics in Table 1, which are taken from our baseline survey (described in more detail in Section 3.1), provide a portrait of our study clients. The majority of clients are literate and married, and the average client has two children living at home. Consistent with the type of clients targeted by many MFIs, over three-quarters of households in the sample ran some kind of microenterprise at the time of the baseline survey. Of these, roughly 80% report that the female client closely manages and can answer detailed questions about at least one household business. Based on the more detailed survey on household business activities that we conducted in 2010, virtually all households in the sample (97%) are engaged

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<sup>5</sup>Holding the interest rate constant across treatment arms would have implied ~\$21 in interest charges as opposed to the ~\$18 all clients are charged.

in some type of business activity around the time they were given a loan through our study (“Has Business (broad measure)”).<sup>6</sup> In Figure 1, we show the distribution of businesses at baseline: clothing sellers and skilled service work are the two largest categories.

The rate of shocks experienced by households is high: 60% report experiencing a shock to household income over the past month and 42% of clients report having missed days of work due to a shock within the last 30 days.<sup>7</sup> Access to savings and informal sources to finance shocks and entrepreneurial activities is relatively limited. Only 16% of clients report borrowing from non-VFS sources in the previous year and only 33% report having any savings. Paralleling this, clients report a high rate of business closure – over 35% of businesses that were active at baseline are reported as shut three years later. Roughly a third of these (11.5% of businesses ) were closed due to illness of a household member.

### 2.2.2 Case Studies

Before presenting a formal model of debt structure, we use two case studies to illuminate how a grace period contract affected client business decisions. We conducted in-depth interviews with a sari seller and a tailor – the two predominant occupations in our sample – who had been randomized into the grace period treatment. Both business owners were second-time borrowers from VFS and their businesses had been in operation for at least 3 years.

When asked directly how the grace period had influenced their loan expenditure, both respondents said that the two-month delay had given them the security to invest the entire loan amount into their businesses as opposed to setting aside a portion for initial repayment installments. Both respondents affirmed that, while they had saved a portion of their previous VFS loan (which had no grace period) to pay their first few installments, a two-month delay provided a sufficient time buffer to invest the full loan amount and expect a return that would arrive quickly enough and be large enough to at least cover the first

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<sup>6</sup>The difference in reported rates of business activity as measured in the baseline versus follow-up surveys is due to additional effort we put into capturing all possible forms of microenterprise ventures and self-employment in the follow-up, which we believe had been underestimated at baseline.

<sup>7</sup>Household events include illness, birth, death, and weather (flood).



installment. They said that expanding their investment increased short-run profits, and also allowed economies of scale due to increasing volume. For instance, the sari-seller explained that because she was able to invest the full amount of the loan, she was able to take advantage of larger discounts from her wholesaler.

Variability in demand was a concern for both entrepreneurs. Over 50% of the sari seller's clients bought on credit and repaid in small monthly installments. On average, she could sell 3,000 Rs. worth of merchandise for 3,800-4,500 Rs. However, during her low season, which was typically a non-consecutive third of the year, she earned as little as 300 Rs. per month. Her monthly payments on her 10,000 Rs loan was 500 Rs. She felt that the grace period gave her a buffer against default in the case that she encountered a low month because she would be able to collect a sufficiently large amount from investing the full loan amount in the subsequent month to meet her loan payments.

Typically, repayment requirements during a month of low sales soon after taking the loan (when she had invested her full loan amount) would require her to liquidate part of her stock just to be able to repay her first installment. The sari seller explained that, if she were forced to liquidate, she may be able to sell a stock of 3,000 Rs in 2 weeks for at most 3,500 Rs, although liquidating during a low season month would certainly mean selling saris at a loss. Additionally, liquidating would reduce earnings in subsequent months, putting her at a greater risk of default. The tailor gave a similar account of the grace period reducing his fear of being unable to make a payment during a low season.

Both subjects also indicated some amount of willingness to take on greater entrepreneurial risk as the amount invested increased. For instance, in addition to increasing the stock of saris she was already selling, the sari seller chose to expand the variety of saris she was offering. In the case of the tailor, the VFS loan was invested in a sewing machine as well as raw materials to expand into the readymade market. This expansion had prompted him to establish connections in Assam, a neighboring state, where he occasionally sold his ready-made merchandise. Prior to the second loan, the tailor had operated his business with a borrowed sewing machine or sewing by hand. As a secondary effect, the tailor explained

that the grace period made him feel less pressure so he found that he had worked fewer hours per day during the first two months after disbursal.

## 2.3 A Model of Debt Structure and Investment Choices

Motivated by these patterns in microenterprise investment behavior, we develop a simple model of how debt structure influences client investment and repayment behavior. In line with our experimental design, we model the grace period as delaying the start of repayment and increasing the period over which a client repays the same absolute amount of debt. Delaying the start of repayment improves a client's ability to take on less liquid investments (*portfolio* effect). This, combined with an increase in total repayment time, makes it easier for a client to accumulate the income needed for repayment (*income* effect).<sup>8</sup> Both effects suggest that, relative to the canonical contract, a grace period contract may allow a client to undertake more profitable business investments.

We assume illiquid investments carry significant risk. For instance, if a client has a sudden need for money she may be forced to sell her investment at a loss. Further, illiquid investments are naturally longer term investments, and if returns are modeled as a random walk with positive drift, a longer time horizon will increase variance.

MFI loans are (physical) collateral-free and the typical penalty imposed by MFIs for default is exclusion from future lending. We, therefore, assume that the cost of default is independent of debt size and that the bank cannot seize assets in case of default. Below we show that, under these assumptions, moving to a grace period contract alters a client's investment choices so that her expected income is higher but so is default.

### 2.3.1 Economic Environment

The economy lasts three periods  $t = 0, 1, 2$  and is populated by a continuum of MFI clients,  $i \in (0, n)$ . At  $t = 0$  the client receives a loan of size  $B$  and the debt contract specifies

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<sup>8</sup>Differences in implicit interest rates (due to longer contract term induced by grace period) have no direct implication for repayment timing since clients pay a fixed interest amount regardless of when they repay.

repayment in two installments,  $P_1$  at  $t = 1$  and  $P_2$  at  $t = 2$  such that  $P_1 + P_2 = P$ . A client has a utility function  $u_i(c_0, c_1, c_2) = c_0 + c_1 + c_2 - Default_i D_i$  if  $c_0, c_1, c_2 \geq 0$  and  $u(c_0, c_1, c_2) = -\infty$  otherwise.  $c_t$  is time  $t$  consumption and  $D_i$  is the utility penalty for default, and  $Default_i$  is an indicator equal to one if the client chooses to default and zero otherwise.  $D_i$  is distributed over the client population according to the continuously differentiable distribution function  $F(\cdot)$  with corresponding density  $f(x) \equiv F'(x) > 0 \forall x \in [0, \infty]$  and  $f(x) = 0$  for  $x < 0$ .

At  $t = 0$  the client divides loan amount  $B$  across two investment opportunities:

1. An *illiquid, risky* investment that pays off  $R_g$  with probability  $p_g$  and  $R_b$  with probability  $1 - p_g$  after two periods for each unit invested. We normalize  $R_b$  to be zero.
2. A *liquid* investment that pays off  $R_L$  after one period for each unit invested.

The return from the liquid asset exceeds payment need to repay the loan ( $R_L^2 B \geq P$ ) and the expected return from the illiquid investment exceeds the liquid investment  $p_g R_g > R_L^2$ .

We are interested in comparing investment choices under two debt contracts: a *regular* contract where  $P_1 > 0$  and  $P_2 = P - P_1$  and a *grace period* contract where  $P_1 = 0$  and  $P_2 = P$ . Further, we assume that the liquidity premium from the illiquid asset is large enough so that:

$$p_g R_g - R_L^2 > (R_L - 1) p_g R_g P_1 \quad (1)$$

The condition ensures that the “income effect” due to the grace period contract requiring a lower present value of payments is not too large. As will become clear later, the key decision faced by clients is whether to set aside money in the liquid asset to make their loan payments for sure or to invest that money in the illiquid asset. Default considerations aside, the income effect implies that clients with the grace period face a lower cost of setting aside both payments. If this effect is large enough, then the grace period will lead clients to invest *less* in the illiquid asset since setting aside both payments is less costly. Condition 1 insures that the relative attractiveness of the illiquid asset to the liquid asset is great enough that the income effect does not dominate. Stated equivalently, it insures that  $R_L$  is small enough.

### 2.3.2 Debt Structure and Investment Choice

First, under a grace period contract ( $P_1 = 0$  and  $P_2 = P$ ) the client chooses between investing everything in the risky asset or leaving enough in the liquid asset to ensure repayment. Her expected utility from these two alternatives are :

1. Invest  $B$  in the risky asset:

$$p_g(BR_g - P) - (1 - p_g)D_i \quad (2)$$

2. Invest  $B - P/R_L^2$  in risky asset (and rest in liquid asset):

$$p_gR_g(B - P/R_L^2) \quad (3)$$

Combining equations (2) and (3) shows that client  $i$  will reduce investment in the risky asset to  $B - P/R_L^2$  if and only if:

$$D_i > \frac{p_g}{1 - p_g}P\left(\frac{R_g}{R_L^2} - 1\right) \equiv D_{bn}^{gp} \quad (4)$$

That is, as long as  $p_g$  and  $R_g$  are high enough relative to  $R_L$ , she will choose the risky investment and with probability  $(1 - p_g)$ , default at  $t = 2$ .

Next, under a regular contract ( $P_1 > 0$  and  $P_2 = P - P_1$ ) the client's expected utility associated with investment choices are:

1. Invest  $B$  in the risky asset:

$$p_gR_gB - D_i \quad (5)$$

2. Invest only enough in the liquid asset to pay the first installment:

$$p_g(R_g(B - P_1/R_L) - P_2) - (1 - p_g)D_i \quad (6)$$

3. Invest enough in the liquid asset to pay the first and second installments:

$$p_g R_g (B - P_1/R_L - P_2/R_L^2) \quad (7)$$

Comparing the pay-offs above with each other, we can define cut-offs:

$$D^{bf} \equiv \frac{p_g}{1 - p_g} (R_g/R_L^2 - 1) P_2 \quad (8)$$

$$D^{bn} \equiv p_g R_g (P_1/R_L + P_2/R_L^2) \quad (9)$$

$$D^{fn} \equiv \frac{R_g P_1}{R_L} + P_2 \quad (10)$$

Setting aside money for  $P_1$  and  $P_2$  is preferred to setting aside money for just  $P_1$  if and only if  $D_i > D^{bf}$ . Setting aside money for both is preferred to setting aside money for neither if and only if  $D_i > D^{bn}$ , and setting aside money for the first only is preferred to setting aside money for neither if and only if  $D_i > D^{fn}$ . Based on the cut-offs, we see that for  $D_i$  low enough, it is optimal to set aside no money. Further, for  $D_i$  high enough, setting aside both payments is preferred.

**Claim 1** *Investing enough in the liquid asset to ensure only the first payment is never optimal if  $P_1$  is large enough such that*

$$\frac{P_1}{P_2} > \frac{p_g R_g - R_L^2}{R_L R_g (1 - p_g)} \quad (11)$$

*In this case, clients switch from setting aside no money for either payment to setting aside money for both payments at  $D^{bn}$ .*

The proof is in the Appendix. For  $P_1$  small enough that condition 11 does not hold, as  $D_i$  increases from 0 to  $\infty$  the borrower will shift from optimally investing all her money in the risky asset to setting aside enough money for the first payment and finally to setting aside enough money to pay both payments for sure. The corresponding cut-offs are  $D^{fn}$  and  $D^{bf}$  with  $D^{fn} < D^{bf}$ .

### 2.3.3 Comparative Statics

Under the maintained assumptions given above, we can characterize how, for a given  $D_i$ , how client investment differs across debt contracts:

**Claim 2:** *If  $P_1$  is relatively low (Equation 11 is reversed) moving from a regular to grace period contract will cause clients with:*

- (i)  $D_i \in [D_{fn}, D_{bf}]$  to switch from investing enough in the liquid asset to make the first loan payment for sure to investing nothing in the liquid asset.*
- (ii)  $D_i \in [D_{bf}, D_{bn}^{gp}]$  will switch from investing enough in the liquid asset to repay the full loan amount for sure to investing nothing in the liquid asset.*
- (iii) Small default costs ( $D_i < D_{bf}$ ) or large default costs ( $D_i > D_{bn}^{gp}$ ) will not change their investment behavior.*

See appendix for proof.

**Claim 3** *If  $P_1$  is relatively high (Equation 11 holds) the grace period will cause clients with*

- (i)  $D_i \in [D^{bn}, D_{bn}^{gp}]$  to switch from investing enough in the liquid asset to repay the full loan amount for sure to investing nothing in the liquid asset.*
- (ii) Small default costs ( $D_i < D_{bn}$ ) or large default costs ( $D_i > D_{bn}^{gp}$ ) will not change their investment behavior.*

See appendix for proof.

To summarize, relative to a grace period contract (with no immediate payment requirements), a regular contract (with immediate payment requirements) will lead some clients to switch from paying neither installment to paying both and others from paying neither installment to paying just the first. As size of the first payment ( $P_1$ ) increases, setting aside enough for the first payment alone will be dominated by the other options. In this case, immediate payment requirements will cause a switch from paying neither installment to paying both (with the caveat that this relies on the income effect being relatively small). Importantly, borrowers will not switch down to paying a smaller fraction of the loan under the early payment contract. These results are summarized in Figure 2 and Figure 3.

### 2.3.4 Testable Predictions

We use these results to derive predictions about the impact of the grace period on profits (level and variance) and default:

**Prediction 1** *Moving from the regular to grace period contract will increase average client profits and the variance of profits.*

The proof is in the Appendix. The intuition is straightforward. A client who moves to the grace period contract will increase her illiquid asset investment. This investment has higher expected return for the borrower not only because the social return ( $p_g R_g$ ) is assumed higher than the return on the liquid asset, but also because in the case of default, the borrower does not repay the loan. The variance of profits increases under the grace period because variance is increasing in the amount invested in the risky, illiquid investment.

**Prediction 2** *Moving from the regular to grace period contract increases default.*

The proof is in the Appendix. Default occurs when the borrower does not set aside the second installment and the investment fails, which is more likely to happen under the grace period contract

### 2.3.5 Some Comments

Our experimental design required clients on both the grace period and regular contracts to make payments every two weeks. The key difference is that grace period clients started repaying eight weeks after early payment clients. In the model, we abstract from the multiple payments. However, in bringing the predictions of the model to the data, it is important to calibrate the approximate size of  $P_1$  relative to  $P_2$ .  $P_2$  is most clearly interpreted as the sum of all payments required after the grace period concludes. That is,  $P_2$  is set equal to all payments made after 10 weeks have passed since loan disbursement.  $P_1$  corresponds to all payments made before the 10 week mark.

A more realistic model would break  $P_2$  into 22 separate payments for grace period clients and 18 separate payments for regular clients and break  $P_1$  into four separate payments for regular clients. However, once the grace period ends, the decision problem of clients on

the grace period and regular contract are essentially the same; the only difference being the relative size of payments left to make. For this reason, we combine all 22 and 18 payments into one payment  $P_2$ .<sup>9</sup>

While we do not model the optimal choice of debt contract, existing evidence suggests that MFIs are significantly default averse. An important reason is that MFIs face significant regulatory constraints on the interest rates they can charge.

## 3 Data and Empirical Strategy

### 3.1 Data

Our data is assembled from multiple sources. We conducted baseline surveys with clients as they entered the study between April and August 2007. The survey gathered background information on household business activities, socio-economic status, and demographic characteristics. One limitation is that 76% of surveys were conducted after loan disbursement, although on average only 2.8 weeks later.<sup>10</sup> In Panel A, Table 1 we report variables that are not endogenous to contract type such as client education and loan size. An important variable is the indicator variable for whether the household had any microenterprise activity at the time of entering our study (“Has business”) which we constructed using baseline information on the duration of existing household business activities.<sup>11</sup> Panel B of Table 1 reports relevant but potentially endogenous variables. Column (3), Table 1 reports average differences across regular and grace period contract clients for baseline characteristics.

In Panel A treatment and control groups are imbalanced in only 1 out of 12 baseline characteristics (literacy), with the difference statistically significant at the 10% level. How-

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<sup>9</sup>Similar results to claims 1 and 2 hold if we break  $P_1$  up into four separate payments. The only difference is that each payment has a different discount factor.

<sup>10</sup>The reason for this delay was that baseline surveying had to take place between group formation and loan disbursement, and because new groups were formed on a rolling basis that was not spread evenly over time, during periods of peak formation, it was difficult to reach all clients within this short interval.

<sup>11</sup>It is possible that we miss business activities that closed between loan disbursement and administration of the baseline survey, but we expect this to be minimal since the average lag is only two weeks.



ever, the point estimates of the difference is small and a joint test of significance (chi-squared) of mean differences across all Panel A variables indicates that our randomization produced a balanced sample.<sup>12</sup> To confirm that small differences in treatment arm balance are not biasing the experimental results, we estimate regressions with and without the controls listed in Panel A, Table 1.

Outcome variables were collected from several data sources. The first endline survey was completed between January and November 2008 by 93% of clients (on average, one year after loan disbursement).<sup>13</sup> We use this survey, which contained a detailed loan use module, to study differences in short-run investment behavior. Clients were asked to describe the allocation of their VFS loan across the following expenditure categories: business, human capital (health and school), housing repair, food expenditure, savings, relending and other.

To evaluate long-run outcomes we also conducted a detailed business survey between April and July 2010, almost three years after loan disbursement. Of the 845 clients entering our intervention we administered long-run surveys to 773 clients, or 91% of the sample. We observe no significant difference in survey response between treatment and control groups. Column 4 of Table 1 shows that the sample remains balanced even after accounting for attrition at the follow-up survey stage.<sup>14</sup> This survey provides detailed data on microenterprise profits and scale (for up to three businesses), and household income. It also includes information on client business practices.

Finally, to study delinquency and default, we tracked client repayment behavior using two sources. First, we used VFS administrative data in which repayment date and amount paid were recorded by loan officers on a continuous basis in clients' passbooks and then compiled into a centralized bank database. We have data on all clients through January,

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<sup>12</sup>For the randomization check, the  $p$  value of joint significance is computed by jointly estimating a system of seemingly unrelated regressions consisting of a dummy variable indicating assignment to the grace period treatment, with standard errors adjusted for correlation within loan groups. The joint test also includes loan officer dummies.

<sup>13</sup>This is slightly longer than the duration of the baseline due to delays in tracking clients. The minimum time between baseline and follow-up was 10 months – the duration of the loan cycle – and the maximum time was 16 months, with a mean time between baseline and follow-up of 12 months.

<sup>14</sup>Ten percent of clients were interviewed in November 2010 because they could not be tracked during this initial stage.

2010, by which date at least 52 weeks had passed since the loan due date for all loan groups.

As a check on VFS administrative data, we also collected repayment data from loan officers. Each loan officer was required to keep a log book on meeting activities for the purpose of our experiment; this recorded date of meeting, number of clients present, and names of clients who repaid at the meeting. Although the measures differ slightly, this alternative measure gives the same approximate default rate in the full sample as the VFS administrative data (4.9% compared with 5.4%).

Since some clients repay their loans long after the due date, we present results for different lengths of delinquency. Our preferred measure is 52 weeks overdue, the longest period for which we observe all clients in the sample, since it comes the closest to approximating permanent differences in default.<sup>15</sup>

### 3.2 Empirical Strategy

Randomization of contract type across groups implies that a comparison of average outcomes across clients assigned to different contracts has a causal interpretation. We estimate:

$$y_{ig} = \beta G_g + B_g + \delta X_{ig} + \epsilon_{ig} \quad (12)$$

where  $y_{ig}$  is the outcome of interest for client  $i$  in group  $g$ , and  $G_g$  is an indicator variable that equals one if the group was assigned to the grace period contract. All regressions control for stratification batch ( $B_g$ ). Throughout, we report regressions with and without the controls ( $X_{ig}$ ) listed in Panel A of Table 1 and loan officer fixed effects. All regressions correct standard errors for clustering within loan groups, the unit of treatment assignment.

No client dropped out after assignment to contract schedule. Hence the Intent to Treat (ITT) estimates are the average treatment effects of being on a grace period contract.

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<sup>15</sup>There are no explicit penalties according to duration of delinquency but it is widely understood that the degree of delinquency influences approval rates and amounts of future loans.

## 4 The Economic Impact of Debt Structure

In this section we first document how introducing a grace period influenced the timing of loan repayment obligations and then estimate its impact on investment decisions in the short-run and income, profits, and default in the long-run.

### 4.1 First Stage Estimates

In Table 2, we describe the first stage effect of our experimental manipulation on client repayment schedules. In this, and all subsequent, tables Panel A reports regressions without controls and Panel B regressions with controls. In column (1) the outcome variable is the number of days lapsed between loan disbursement and first repayment meeting. All clients in a group receive their loans on the same day and date of their first repayment meeting is announced at this point. Our data for both outcome variable comes from a compilation of VFS transactions data and the data collected by loan officers at each group meeting. Consistent with the grace period contract stipulating a period of eight weeks before the first payment is due, column (1) shows that grace period clients made their first loan installment an average of 52 days after the clients on the regular contract, or approximately two months later.<sup>16</sup> Column (2) uses data collected by loan officers during group meetings to show that, once repayment starts, the average time lapsed between two consecutive meetings is identical across the two contracts (14 days). We calculate this average over the first 120 days, starting with the first repayment meeting.

### 4.2 Loan Use and New Business Formation

Next we examine whether the term structure of the debt contract influenced loan use. Figure 4 shows average spending in seven broad categories separately for grace period and regular

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<sup>16</sup>The results for the dependent variable loan disbursement to repayment date are very similar. In practice, clients often choose to repay the loan before it is actually due, although they are prohibited from repaying full before five months after loan disbursement. Separate estimates (unreported) show that clients do not choose to repay early at a significantly higher rate when offered the grace period.

contract clients. The largest category was business spending: 75% of clients spent part of their loan on business expenses and, on average, a client spent 80% of her loan on business-related activities. The second largest category was home repairs. Relative to clients on a regular contract, grace period clients appear to expand business spending and reduce spending on house repairs.

In Figure 5, we decompose business spending into three components: inventory and raw material, business equipment and others. The difference in business spending across clients on regular and grace period contracts appears to be driven by differences in spending on inputs, made up of inventory purchases and raw materials. This category includes the three most common categories of business spending: saris, wood, and sewing materials. Clients typically describe these inputs as relatively illiquid; the median client in our sample states that she would incur a loss of 25% if she has to liquidate her business stock in a day. These results are consistent with the prediction that grace period clients increase spending on illiquid investments. Raw materials, for instance, are valuable if clients can find a market for the finished product, but if demand is uncertain, it may take several months to realize the returns from the investment. Furthermore, raw materials cannot be liquidated at cost once they have been transformed, which makes them a riskier investment.

In Table 3, we investigate these differences by estimating equation (12). Panel A and B report the coefficients from regressions with and without controls respectively. Columns (1)-(7) examine differences in spending across categories. We observe significantly higher business spending among the grace period clients. The average client on the grace period contract spends roughly 6.5% (Rs. 401) more on business items, which is accompanied by a significant reduction in spending on house repairs of Rs. 285 (column 2) and a significant but relatively small decline in spending on food (Rs. 28, column (6)). We observe no changes in spending on education and health (human capital), savings and lending to others ("relending").

Finally, we examine propensity to start a new business around the time of receiving the loan (column 8). The outcome variable of interest is an indicator variable that equals one

if a client reported starting a new business within a month of receiving the loan.<sup>17</sup> Overall, the rate of new business formation is low - in the control sample only 2.4% of clients start new businesses within the two-month period.

Consistent with business spending patterns, grace period clients are significantly more likely to start new businesses. Column (8) shows that the likelihood of starting a new business is doubled among grace period clients. Over 5% of households in this group start new microenterprises, and the difference in rates of business formation is statistically significant at the 5% level with or without controls. Figure 6 shows the breakdown of new business types. All new businesses were clothing sellers or some other type of vendor.

In addition to being a key measure of entrepreneurship, observing a difference in the rate of business formation also provides a consistency check on our business spending results. That is, one concern with changes in reported spending behavior is that being on the grace period may have changed mental accounting but not actual expenditures. Specifically, clients may report spending more of their loan on investments without having significantly increased investments. Since business creation was measured independently of how a client reported spending her loan, it is not subject to the same criticism.

### 4.3 Long-run business outcomes

Next, in Table 4 we use the three-year follow-up data to study long-run differences in micro-enterprise profits and household income. Both profits and income were measured with single survey questions: “Can you please tell us the average weekly profit you have now or when your business was last operational?” and “During the past 30 days, how much total income

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<sup>17</sup>For about two-thirds of clients who were given the baseline survey 4-6 weeks after receiving the loan, this variable is measured very close to the time of new business formation so is not subject to significant recall error. For the remainder of clients who were administered baseline surveys before or less than 4 weeks after receiving the loan, we construct a comparable measure of new business activity within a month of the loan using the baseline survey combined with the follow-up data collected three years after loan disbursement. Hence, for these clients, the new business indicator is measured with significantly more error. Importantly, the timing of the baseline survey was balanced across treatment arms. Furthermore, the result is robust to excluding clients surveyed fewer than 4 weeks after loan disbursement. See data appendix for an exact description of how this variable was constructed.

did your household earn?” To address the concern of noise in survey responses to questions that require a high level of aggregation, we report regressions with the full sample (odd columns) and regressions with a trimmed sample. In trimming we exclude outliers of more than 0.5% of the cumulative distribution of each variable (in all cases, only four observations are dropped).

Columns (1) and (2) show that household income is an estimated 18% higher for grace period clients three years after loan disbursement ( $\sim 2$  years after the loan was due). As shown in columns (3)-(4), this appears to be driven by a change in household business profits, as we would expect. Households that were on a grace period contract report 29-53% higher weekly profits, which alone corresponds to an 4-7% increase in household income.

In columns (5)-(6) we see that, not only are the level of profits higher for grace period clients in the long-run, but so is the variance. After excluding the 5 outlier observations, the variance in profits is more than twice as high for grace period clients as it is for those on the regular contract. In all Table 4 regressions, results are almost identical in magnitude and significance with or without controls. Likewise, trimming outliers influences statistical significance only when the outcome is variance of profits.

Tables 5 and 6 examine whether the increase in business profit reflects larger business scale and changes in business practices. Consistent with the profits results, columns (1)-(4) of Table 5 show that microenterprise activities in grace period households are around 50% larger in terms of assets and inventory. The untrimmed estimates (which include the four outliers that are in the top 0.5% of the distribution) are almost twice as large. Additionally, while the average household in the control group has only 2.53 workers employed in household businesses, the average grace period household has 2.83 workers, although the difference is not statistically significant (column 5). The fact that scale of business operations adjusts more rapidly than size of the microenterprise workforce is consistent with the fact that informal enterprises are likely unable to perfectly substitute outside for in-family labor, and are thus constrained in terms of increasing number of workers.<sup>18</sup>

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<sup>18</sup>All results in Table 5 other than liquidating business assets to make loan payments are robust to the inclusion of control variables.

Column (6) of Table 5 shows that, in addition to having larger and more profitable businesses in operation, grace period clients are significantly less likely to report a business closure between the time of loan disbursement and the three-year follow-up. 39% of control group clients report a business closure, as opposed to only 32% of grace period clients. While this result may at first seem at odds with grace period clients experiencing higher variance of profits (Table 4), since we only observe the profits of surviving business activities at the three-year follow-up, it is consistent with a scenario in which grace period clients are less likely to shut down businesses that are not earning a sufficiently high profit in the short run in order to meet loan repayment obligations.

Indeed, when we regress the treatment indicator on a dummy for whether a client reports having ever sold goods or services at a discount in order to meet loan repayment obligations (Column 7), we find that grace period clients are significantly less likely to report such activity relative to regular contract clients (the significance of this estimate, however, is sensitive to the inclusion of controls; the t-statistic falls to 1.5 with the full set of controls). We interpret this set of findings as further evidence that introducing a grace period relaxes binding constraints on maintaining business operations in the face of fluctuations in demand or productivity. In other words, clients on a grace period contract feel less need to liquidate inventories when faced with a shock to household income in order to meet repayment obligations early on in the loan cycle. Alternatively, they may be more reluctant to do so because they have greater difficulty liquidating business assets at cost due to differences in the nature of business investments they have undertaken.

Finally, Table 6 provides direct survey evidence that introducing a grace period influenced clients' long-run propensity to undertake risky business behaviors. Over 40% of the clients in our sample state that they are willing to sell to clients on credit. Offering merchandise on credit is a risky business investment in that it increases business scale but entails substantial risk and is a completely illiquid investment. In columns (1) and (2) we observe that grace period subjects are 9 percentage points more willing to advance goods or services on credit more often and to a greater fraction of their clients. In columns (3) and (4)

we also see that grace period clients state a higher willingness to let clients pre-order items. Pre-ordering services arguably makes a business more vulnerable to hold-up and, therefore, constitutes another risky but potentially high return business practice. Although these differences in business behavior are consistent with the previous results on variance in profits, one important caveat in interpreting the Table 6 results is that it is not possible to identify whether higher willingness to undertake risky business behaviors is a direct consequence of having a grace period or an indirect consequence of grace period clients having larger and more profitable businesses.

#### 4.4 Loan Repayment

Our empirical estimates suggest that introducing a grace period increases variance of profits and willingness to undertake risky business activities. We next investigate whether the grace period contract also increases default. Figure 7 graphs the fraction of clients who have not repaid in full relative to the date of first installment. The vertical bars indicate the loan due date and 8 weeks after the loan was due. We observe a clear difference in the fraction of grace period clients who have repaid in full four months past the due date.

To test for the statistical significance of these patterns, in Table 7 we estimate regressions of experimental assignment on default using three default measures available: whether the client repaid within 8, 24, and 52 weeks of the loan due date (defined as the date when the final installment was due). In all cases we observe a robust difference in default patterns between the delay and no-delay clients. Delay clients are, on average, between 6 to 8 percentage points more likely to default than non-delay clients. Twenty-four weeks after the loan was due, 2% of the non-delay clients and 9% of the delay clients have failed to repay. Including controls in the regressions has very little impact on the point estimates. Even after one year, the experimental difference is roughly the same (columns 3).

One potential channel through which a grace period may increase default is by reducing clients' fiscal discipline by not putting them in the habit of making regular payments from the start of the loan cycle, or leading them to believe that prompt payment has fewer



consequences so increasing strategic default. However, were either of these the true mechanism, we would expect to see immediate differences in propensity to make loan payments. That is, differences in habit-formation would presumably be the most stark at the onset of regular repayment when the grace period subjects have just had two months off, and likewise, strategic default should be concentrated early on in the loan cycle when the benefit of defaulting is highest. In contrast, the results in columns (4), (5) and (6) indicate that grace period clients were just as likely to make their first and their first half of loan payments, and just as likely to repay at least half of the loan. These patterns indicate that the grace period contract did not simply increase strategic default or differences in delinquency early in the loan cycle, which boosts confidence in our interpretation that default results reflect differences in the degree of risk-taking in business investments and associated variance in profits and income.

## 5 Taking Stock: Returns to Capital

To compare our results more precisely to the literature on small business returns to capital, we follow de Mel et al. (2008) and compute the returns to capital implied by our parameter estimates. Using the long-run impact of the grace period contract on business capital and monthly profits from Table 4, the implied returns to capital are between 8.5% and 12% per month. The return to capital is simply the difference in monthly profits between treatment and control divided by the difference in business capital. These returns are 1.5 to 2 times higher than de Mel et al. (2008)'s estimates of 5.5%. They are, however, much lower than the returns of 20-33% per month estimated by McKenzie and Woodruff (2008) for Mexican enterprises.

As de Mel et al. (2008) discuss, there are many reasons why these estimates may not correspond to the marginal return to capital. Returns to capital may not be linear, may be heterogeneous across the population and correlated with the impact of the treatment on capital. Other inputs to the business (such as labor supply) may have changed at the

same time as capital investment changed. Importantly, as highlighted by our model, the grace period clients will not only invest more in their business but may shift towards less liquid, higher return activities. The estimates above include this composition effect. Not only do grace period clients have more capital at endline, the capital that they do have may be more productive. Therefore, while the returns estimated here are within the ballpark of other estimates, one possible explanation for why our estimated returns are higher than de Mel et al. (2008) and Dupas and Robinson (2009) returns of 5-6% per month for similar entrepreneurial activity is that the early payment requirements lead clients on the regular contract to shift to a capital stock with a lower over all return.

To see that this effect could be quite large given our estimates, suppose that grace period clients earn the unconstrained optimal return on capital of 5.5% as estimated by de Mel et al. (2008). The profit differential is  $\pi_{gp} - \pi_e = .055K_{gp} - r_e K_e$ , where  $K_i$  denotes the capital stock for grace period and early payment clients, and  $r_e$  denotes the return to capital for early payment clients. Assuming  $K_e = 45,000$  and  $K_{gp} = 17,000$  and that the differential in monthly profits is  $\pi_{gp} - \pi_e = 1700$  as we estimate for the trimmed sample, the implied return on the early payment client's capital stock is 3.8%. This implies a yearly return differential of  $(1.055^{12} - 1.038^{12}) = 33\%$ . These lower implied returns for clients under the standard MFI loan contract are perhaps not surprising in light of the evidence presented in Banerjee et al. (2009) that the profit and income generation of standard MFI loans appears to be quite low.

Although this exercise suggests that the liquidity constraints underlying the early payment contract could lead to large differences in the returns to capital stock, it is important to emphasize that the caveats discussed by de Mel et al. (2008) apply to these results. In particular, in the above we made heavy use of the assumption of linear returns to capital. We also cannot rule out that the returns to capital for our sample are simply higher than the returns for the samples studied by de Mel et al. (2008) and Dupas and Robinson (2009).

## 6 Conclusion

Our findings suggest that introducing flexibility into MFI debt contracts in the form of a grace period presents a trade-off for banks and clients. On the one hand, average levels of default and delinquency rise when clients are offered a grace period contract. This basic finding supports the predominant view among micro-lenders that requiring partial early repayment is critical to maintaining low rates of default among poor borrowers. On the other hand, our findings are consistent with a model in which delayed repayment encourages more profitable, though riskier, investment. The relatively high returns to capital suggest that default aversion on the part of MFIs may come at the cost of significantly lower entrepreneurial activity.

Our findings also speak to the current ongoing debate on microfinance regulation. There has been significant discussion about the need to cap interest rates when lending to the poor. However, such interest rate caps are likely to go hand-in-hand with MFIs adopting debt structures aimed at minimizing default. Our results suggest that the cost in terms of reduced entrepreneurship may be high.

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## 7 Appendix

### 7.1 Theory

**Proof of Claim 1** The investment payoffs for a client on the regular contract are:

1. Invest everything in the risky asset

$$p_g R_g B - D$$

2. Invest only enough in the liquid asset to pay the first installment

$$p_g(R_g(B - P_1/R_L) - P_2) - (1 - p_g)D$$

3. Invest enough in the liquid asset to pay the first and second installments

$$p_g R_g (B - P_1/R_L - P_2/R_L^2)$$

which yield cut-offs for the default cost:

$$D_{bf} \equiv \frac{p_g}{1 - p_g} (R_g/R_L^2 - 1) P_2 \quad (13)$$

$$D_{bn} \equiv p_g R_g (P_1/R_L + P_2/R_L^2) \quad (14)$$

$$D_{fn} \equiv \frac{R_g P_1}{R_L} + P_2 \quad (15)$$

There are two possible orderings of the cut-offs above that do not admit any logical contradictions. Either  $D_{fn} < D_{bn} < D_{bf}$  or  $D_{bf} < D_{bn} < D_{fn}$ . Under the first ordering, for  $D < D_{fn}$ , the borrower will optimally invest all her money in the risky asset. For  $D \in [D_{fn}, D_{bf}]$ , it is optimal to set aside money for just the first installment, and for  $D > D_{bf}$  it is optimal to set aside money for both installments.

Under the second ordering, it is never optimal to set aside money for the first installment only. Under this ordering, the investor switches from setting aside money for neither installment to setting aside money for both installments when  $D$  crosses  $D_{bn}$ . The second

ordering holds if and only if  $D_{fn} > D_{bn}$  or

$$\frac{P_1}{P_2} > \frac{p_g R_g - R_L^2}{R_L R_g (1 - p_g)}$$

which is the condition given in the text defining the cut-off value for  $P_1$ .

**Proof of Claim 2** For small enough  $P_1$  Equation 11 is reversed, and as shown in the proof of Claim 1, we will have  $D_{fn} < D_{bn} < D_{bf}$ . Since  $D_{bf} < D_{bf} + (\frac{R_g}{R_L^2} - 1) \frac{p_g}{1 - p_g} P_1 = D_{bn}^{gp}$  for  $P_1 > 0$ , Claim 2 follows by definition of the default cut-offs  $D_{fn}$ ,  $D_{bn}$ ,  $D_{bf}$  and  $D_{bn}^{gp}$ . Figure 1 presents the result graphically.

**Proof of Claim 3** As  $P_1$  increases, Equation 11 will eventually hold. Once it does, as shown in the proof of Claim 1, we will have  $D_{bf} < D_{bn} < D_{fn}$ . Under this ordering, the investor switches from setting aside money for neither installment to setting aside money for both installments when  $D$  crosses  $D_{bn}$ . Therefore, we must show that  $D_{bn}^{gp} > D_{bn}$  or equivalently:

$$p_g R_g \left( \frac{P_1}{R_L} + \frac{P_2}{R_L^2} \right) < p_g R_g \frac{P_1 + P_2}{R_L^2} + \frac{p_g}{1 - p_g} P \left( \frac{p_g R_g}{R_L^2} - 1 \right)$$

Assumption 1 ensures that this inequality holds. Figure 2 presents the result graphically.

**Proof of Predictions 1 and 2** We wish to show that the probability of default, variance of profits and level of profits are all larger for the pool of clients on the grace period contract as compared with the early payment contract. Let  $g_{gp}(x)$  denote the default probability, variance or profit for a client on the grace period contract with default cost  $D = x$ . And let  $g_e(x)$  denote the default probability, variance or profit for a client on the contract requiring early payment. We wish to show that

$$\int_0^\infty g_{gp}(x) f(x) dx > \int_0^\infty g_e(x) f(x) dx$$

Note that for any integrable functions  $g_1(x)$  and  $g_0(x)$  with  $g_1(x) \geq g_0(x) \forall x$  with strict inequality for all  $x$  in some non-empty interval  $[x_l, x_h]$ :

$$\int_0^\infty g_1(x)f(x)dx > \int_0^\infty g_0(x)f(x)dx$$

All that remains is to show that  $g_{gp}(x) \geq g_e(x) \forall x$  with strict inequality for all  $x$  in some non-empty interval  $[x_l, x_h]$  for each of default probability, variance and profit.

Consider first the probability of default, so that  $g_{gp}(x)$  is the probability that a client with a grace period contract and default cost  $D = x$  defaults, and  $g_e(x)$  is the probability that a client with positive early payment obligation defaults. For clients with a grace period contract, the probability of default is  $1 - p_g$  if no payments are set aside and 0 otherwise. For clients with a contract requiring early payment, the probability of default is 1 if neither payment is set aside,  $1 - p_g$  if only the first payment is set aside and 0 if both payments are set aside. It then follows from Claims 1 and 2 that  $g_{gp}(x) \geq g_e(x) \forall x \geq 0$  and that it holds with strict inequality for  $x \in [D_{bf}, D_{bn}^{gp}]$  if  $P_1$  is small (Equation 11 does not hold) and holds with strict inequality for  $x \in [D_{bn}, D_{bn}^{gp}]$  if  $P_1$  is large enough (Equation 11 holds).

Next, let  $g_{gp}(x)$  and  $g_e(x)$  denote the level of profits. We define profit as revenue from investments made net of loan payments. All results continue to hold with if we normalize profit by subtracting the investment size  $B$ . A client who invests the full loan in the illiquid asset will receive expected profits  $p_g(R_g B - P)$  regardless of the contract she faces. This pay-off is larger than the expected profit for a client on an early payment contract who either chooses to set aside the first payment ( $p_g(R_g(B - \frac{P_1}{R_L}) - P_2)$ ) or both payments ( $p_g R_g(B - \frac{P_1}{R_L} - \frac{P_2}{R_L^2})$ ). Finally, profits for a grace period client who sets aside both payments ( $p_g R_g(B - \frac{P}{R_L^2})$ ) are greater than profits for an early payment client who sets aside both payments.

Using Claims 1 and 2, we have that  $g_{gp}(x) \geq g_e(x) \forall x \geq 0$  and that it holds with strict inequality for  $x \in [D_{fn}, D_{bn}^{gp}]$  if  $P_1$  is small (Equation 11 does not hold) and holds with strict inequality for  $x \in [D_{bn}, D_{bn}^{gp}]$  if  $P_1$  is large enough (Equation 11 holds). Note that the profit differential is widened by the fact that default is a utility cost and therefore because the grace period clients default default more, comparing profits rather than pay-offs widens

the gap between grace period and early payment clients.

Finally, note that the variance of profits is simply given by  $p_g(1 - p_g)(R_g I)^2$  where  $I$  is the amount invested in the illiquid asset. This shows that the variance of profits is strictly increasing in the amount invested in the illiquid asset. Claims 1 and 2 show that the amount invested in the illiquid asset under the grace period contract is greater than or equal to the amount invested under the early payment contract with strict inequality for cost of default  $x \in [D_{fn}, D_{bn}^{gp}]$  if  $P_1$  is small (Equation 11 does not hold) and cost of default  $x \in [D_{bn}, D_{bn}^{gp}]$  if  $P_1$  is large enough (Equation 11 holds). Therefore, it follows that the variance of profits under the grace period and early payment contracts satisfy the same conditions, which is what we set out to prove.

## 7.2 Data

### 7.2.1 Survey: Design and Attrition

Depending on time of enrollment and previous loan history clients received one of three different versions of the baseline survey. We were unable to survey 15 clients (1.7%) at the baseline. Two endline surveys were conducted, the first one year after loan disbursement and the second three years after loan disbursement. We were unable to survey 45 clients (5.3%) in the first endline survey and 89 (10.5%) in the long run endline survey (we administered the full survey to 763 clients and an abbreviated survey to 13 additional clients. In all cases attrition was balanced across treatment and control groups.

### 7.2.2 Variable definition

Notes to the Tables provide variable definitions. Here we provide further details for specific outcomes where variable construction was more complicated.

**New Business** Households were designated as having started a new business if they started a business in the period of up to 30 days prior and 6 months after the loan group formation. We relied on two sources of data. As discussed in Section 3.1 a high proportion of baseline



surveys were administered after the loan disbursement. Hence, the baseline data provides a first source of information.<sup>19</sup> Using the answers to the question on business formation, we determined if a household had started a new business in the designated time period relative to the date of their loan group formation. For clients whose baseline surveys were administered either before or within 30 days after loan disbursement, we supplemented our data with information from the long run endline survey, which also asked about the dates of business creation and closing for each business.

**Has Business** Has Business refers to whether a household was operating a business at the time of loan disbursement. To measure this we use both the baseline surveys and the Long Run Endline survey (which included retrospective questions) to construct a narrow and a broad measure of business activity. The narrow Has Business measure only uses the baseline survey, where we asked the respondent about any enterprises owned or operated by a member of the household. We counted the number of enterprises reported by each respondent, excluding any businesses that would be considered a new business (i.e. was started within 30 days of loan disbursement). The broad Has Business measure uses clients answers to retrospective question on the Business Income survey. Respondents were asked whether within or XX days before receiving the relevant loan household members engaged in any non-salaried activity for which they received compensation (Investigators were trained and encouraged to ask about the full array of non-salaried activities undertaken by household members). This additional probing by investigators resulted in a broader measurement of household enterprises.

**Delinquency and Default** Our default measure come from the VFS administrative records. Matching between VFS records and study clients was conducted based on branch name, date of loan disbursement, loan disbursement amount, group name, and client name. All 845 clients were matched. We present four measures of default in the paper defined as those clients who have not repaid their loan amount  $X$  weeks after the full loan was due, or  $44 + X$

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<sup>19</sup>The baseline survey asked clients who had never been surveyed before about the businesses that the household owned at that time. They were also asked about how long the business had been operating. Clients who had been surveyed earlier (as part of the study reported in Feigenberg et al. (2010)) were asked only about businesses started within the past year and how long these businesses had been in operation.

weeks after the first payment where  $X$  is 8, 24, and 52. Due to holidays and issues outlined below 44 weeks after the first meeting may not correspond to the exact due date. As a check on the VFS administrative records, loan officers were required to keep a record of payments at each group meeting. Based on consulting with loan officers, we also computed a separate measure of default. This measure differs slightly but it is not biased towards more or fewer reported defaults.<sup>20</sup>

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<sup>20</sup>Using the most recent administrative records available to us, we are able to measure default rates at 30 weeks past the due date for the entire sample. At 30 weeks past the due date, the administrative records indicate default rates at 4.9% compared with 5.4% for the measure reported by loan officers.

Table 1: Randomization Check

Client-level variable	Control (1)	Treat (2)	Diff (2)-(1) full sample (3)	Diff (2)-(1) surveyed sample (4)	N of full sample Control/ Treat (5)	N of surveyed sample Control/ Treat (6)
<b>Panel A: Controls for subsequent specifications (where indicated that controls included)</b>						
1 Age	34.5080 (0.408)	33.7990 (0.413)	-0.7523 (0.57)	-0.7059 (0.5894)	425/416	387/380
2 Married	0.9110 (0.014)	0.8640 (0.017)	-0.0475** (0.0223)	-0.0358* (0.0216)	425/416	387/380
3 Literate	0.8750 (0.016)	0.8240 (0.019)	-0.0508* (0.0278)	-0.0654* (0.0342)	425/418	387/381
4 Muslim	0.0070 (0.004)	0.0220 (0.007)	0.0130 (0.0116)	0.0132 (0.0123)	425/418	387/381
5 Years of Education	6.6090 (0.172)	6.4880 (0.195)	-0.1156 (0.335)	-0.1184 (0.3116)	413/409	376/375
6 Household Size	4.0680 (0.069)	4.1800 (0.071)	0.1111 (0.1043)	0.1034 (0.1331)	425/418	387/381
7 Household Shock	0.6070 (0.024)	0.6320 (0.024)	0.0211 (0.0618)	0.0157 (0.0622)	420/410	384/376
8 Has a Business (Narrow definition)	0.7720 (0.02)	0.7850 (0.02)	0.0131 (0.0406)	0.0093 (0.0426)	423/415	386/380
9 Owns Home	0.8160 (0.019)	0.8090 (0.019)	-0.0045 (0.0344)	-0.0041 (0.0335)	408/403	374/370
10 Has Financial Control	0.8380 (0.018)	0.8250 (0.019)	-0.0091 (0.0391)	-0.0212 (0.0355)	399/394	364/359
11 Loan Amt 4000 RPS	0.0120 (0.005)	0.0140 (0.006)	0.0025 (0.0102)	0.0028 (0.0112)	425/420	387/382
12 Loan Amt 5000 RPS	0.0470 (0.01)	0.0380 (0.009)	-0.0093 (0.0186)	-0.0046 (0.0199)	425/420	387/382
13 Loan Amt 6000 RPS	0.2890 (0.022)	0.2310 (0.021)	-0.0579 (0.0436)	-0.0617 (0.0427)	425/420	387/382
14 Loan Amt 8000 RPS	0.5670 (0.024)	0.5810 (0.024)	0.0162 (0.0506)	0.0102 (0.0508)	425/420	387/382
15 Loan Amt 9000 RPS	0.0000 (0)	0.0050 (0.003)	0.0047 (0.0047)	0.0052 (0.0052)	425/420	387/382
16 Loan Amount 10000	0.0820 (0.013)	0.1310 (0.017)	0.0461 (0.0368)	0.0507 (0.0371)	425/420	387/382
Joint Test p-value			0.1229	0.2611		
<b>Panel B: Additional summary statistics</b>						
17 Has a Business (Broad definition)	0.9680 (0.010)	0.9730 (0.009)	0.0045 (0.0144)	0.0049 (0.0145)	343/328	343/328
18 Waged work	0.200 (0.400)	0.2040 (0.403)	0.0045 (0.033)	0.029 (0.0345)	425/416	387/380
19 Has Savings	0.3200 (0.467)	0.3390 (0.474)	0.0193 (0.0376)	0.0196 (0.0389)	425/418	387/381
20 Lost workdays due to shock (broad measure of shock)	0.419 (0.494)	0.3900 (0.488)	-0.0414 (0.0562)	-0.0697 (0.0593)	255/200	229/182
21 Spent money due to shock (broad measure of shock)	0.443 (0.497)	0.4300 (0.496)	-0.0137 (0.0548)	-0.0244 (0.0560)	255/200	229/182
22 Had Non-VWS loan in past year from baseline	0.16 (0.367)	0.1240 (0.330)	-0.0381 (0.0338)	-0.0342 (0.0336)	425/418	387/381
23 Manages HH business	0.784 (0.411)	0.7980 (0.401)	-0.0009 (0.0380)	-0.0084 (0.0381)	344/328	339/325

**Notes:**

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

- (1) Columns (1) and (2) report means with standard deviations in parentheses. Column (3) reports test of differences of means across columns (1)
- (2) N in columns (5) and (6) refers to the number of non-missing observations for each variable.
- (3) Joint Test is the Chi-Sq. Statistic, which is computed by jointly estimating a system of seemingly unrelated regressions consisting of a dummy for no delay/delay with standard errors adjusted for within loan group correlation. The Joint Test includes loan officer dummies, which are not shown here. Joint-test results reported at bottom of Column (3) is for the entire sample while those reported at the bottom of Column (4) is for the
- (4) Household shock in row 7 is a dummy for whether household has experienced any of the following events in the last 30 days: birth, death, heavy
- (5) Has a Business (Narrow definition) in row 8 is a dummy for whether household reported having at least one business in operation at baseline, excluding businesses formed during the 30 days prior to loan group formation and businesses formed after loan group formation.
- (6) Has Financial Control in row 11 is a dummy for whether client answered "yes" to the following question: "If a close relative like your parents or siblings fell sick and needed money would you be able to lend money to that relative, if you had the extra money?"
- (7) Table 1 omits the residual category of loan size 7000 RPS.
- (8) Has a Business (Broad definition) in row 17 is a dummy for whether according to the business start and end dates reported by clients in the Business Income survey, the client would have had at least once business open at the time of the loan disbursement. In the Business Income
- (9) Rows 20 and 21 reference any negative shocks the household reports in the last 30 days including birth, death, heavy rain/flood, or illness. Since not all of the baseline survey versions asked about illness, we only include the clients who took the survey which included illness in the section about shocks for these rows.
- (10) Row 22 is a dummy variable measuring whether client had non-VWS loan in past year from a baseline survey. This is drawn from both the first intervention baseline and the second intervention baseline.
- (11) Row 23 is a dummy variable measuring whether client answered that she was involved in the managing of and can answer detailed questions about at least one business that the household owns.

All variables listed in Panel A are included in each regression in Tables 2-9 specified as including controls. Variables listed in Panel B are not used as controls.

Table 2: Impact of Grace Period on Time to Repayment

	Disbursement to first repayment	Days Between Meetings
	(1)	(2)
<i>Panel A</i>		
Grace Period	51.79*** (1.502)	0.277 (0.261)
Controls Used	No	No
<i>Panel B</i>		
Grace Period	51.27*** (1.388)	0.309 (0.250)
Controls Used	Yes	Yes
Observations	845	6502
Control Mean	14.64 (0.983)	14.33 (0.215)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

- (1) Column (1) shows impact of grace period on the number of days from loan disbursement to first repayment. Column (2) shows impact of grace period on the number of days between each group meeting for the first 120 days since the first loan repayment meeting.
- (2) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

Table 3: Impact of Grace Period on Loan Use and Business Formation

	Business	Home Repairs	Human Capital	Money for Relending	Savings	Food Consumption	Other Expenditures	Whether new business created 30 days prior to 6 months after group formation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A</i>								
Grace Period	400.7** (187.2)	-285.2** (143.7)	-30.49 (86.28)	-54.31 (72.40)	6.193 (47.92)	-27.86* (15.70)	-6.074 (74.81)	0.0288** (0.0145)
Controls Used	No	No	No	No	No	No	No	No
<i>Panel B</i>								
Grace Period	407.5** (194.1)	-289.9* (153.9)	-37.19 (85.83)	-58.63 (71.96)	20.70 (48.63)	-27.58* (15.32)	-4.388 (71.50)	0.0283** (0.0142)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	784	784	784	784	784	784	784	830
Control Mean	6134.4 (165.3)	531.4 (118.2)	229.5 (69.41)	210.8 (60.52)	117.6 (33.22)	26.64 (15.64)	191.5 (61.09)	0.0238 (0.00791)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

- (1) Columns (1)-(7) show the impact of grace period on how much of the loan (RPS) clients report spending in each category. Column (8) reports the effect of the grace period on whether a household reported having started a business in the time frame of 30 days prior and 6 months after the group was formed.
- (2) Clients were asked about the loan they received in this intervention. Some of the clients who went on to the next intervention answered about the next loan. So all regressions include a dummy for whether the sum of loan use expenditures matched the 3rd intervention loan instead of the 2nd intervention loan.
- (3) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

Table 4: Impact of Grace Period on Long Run Income and Profits

	Log of monthly HH income		Average Weekly Profits		Variability of Average Weekly Profits (Tens of Thousands)	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A</i>						
Grace Period	0.177** (0.0798)	0.169** (0.0793)	869.9** (384.1)	450.0** (176.8)	4595 (3860)	449*** (149)
Trimmed	No	Yes	No	Yes	No	Yes
Controls Used	No	No	No	No	No	No
Observations	749	745	752	748	752	748
<i>Panel B</i>						
Grace Period	0.198** (0.0792)	0.192** (0.0780)	849.0** (333.3)	483.2*** (178.8)	3778 (3066)	421*** (142)
Trimmed	No	Yes	No	Yes	No	Yes
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes
Observations	749	745	752	748	752	748
Control Mean	9.317 (0.0527)	9.305 (0.0534)	1586.9 (121.8)	1513.8 (102.7)	5400 (1985)	345 (494)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

- (1) Columns (1)-(6) show the impact of grace period on business profits and household income. Columns (2), (4), and (6) shows the regressions on a trimmed sample, which excludes the top 0.5% of outcome values. Columns (1) and (2) are constructed using the question "During the past 30 days, how much total income did your household earn?". Columns (3) and (4) are constructed using the question "Can you please tell us the average weekly profit you have now or when your business was last operational?". Columns (5) and (6) are obtained by calculating the square distance of each household from the mean of profits used in columns (3) and (4) conditional on having received the grace period or not.
- (2) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

Table 5: Impact of Grace Period on Business Size

	Raw Materials and Inventory		Equipment		Number of Employees	At Least One Business Reported as Closed Between Loan Disbursement and Follow-Up	Sold Goods or Services at a Discount to Make Loan Payment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A</i>							
Grace Period	4991.5** (2165.3)	3143.5** (1555.0)	24866.3** (10638.7)	14767.4** (6529.4)	0.301 (0.304)	-0.0647* (0.0328)	-0.0219* (0.0127)
Trimmed Controls Used	No No	Yes No	No No	Yes No	No No	No No	No No
Observations	765	761	765	761	755	770	752
<i>Panel B</i>							
Grace Period	5358.2** (2339.1)	3718.2** (1611.0)	28889.8** (11484.5)	17098.8** (6607.4)	0.282 (0.290)	-0.0662* (0.0337)	-0.0158 (0.0121)
Trimmed Controls Used	No Yes	Yes Yes	No Yes	Yes Yes	No Yes	No Yes	No Yes
Observations	766	762	766	762	751	766	764
Control Mean	6586.2 (953.8)	6083.8 (851.3)	29144 (4811.8)	26557.3 (3987.1)	2.534 (0.180)	0.386 (0.0243)	0.0468 (0.0112)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

(1) Columns (1)-(4) show impact of grace period on total value (RPS) of raw materials, inventory, and equipment clients report having in all of their businesses in operation at the time of the survey. Column (5) reports impact of grace period on the total number of employees client report having in all of their businesses at the time of their survey (including themselves). Column (6) reports the impact of the grace period on whether clients reported having sold their goods or services at a discount to make a loan payment. Column (7) shows whether a client reported having closed a household business that was operating at the time of loan disbursement. Any seasonal businesses, we counted it as a business currently in operation.

(2) Columns (2) and (4) run the regression on a trimmed sample, which excludes the top 0.5% of outcome values.

(3) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

Table 6: Impact of Grace Period on Business Behavior

	Customers Buy on Credit	Percent of Customers that Buy on Credit	Customers Pre- Order Goods or Service	Percent of Customers that Pre-Order Goods or Services	Number of Goods and Services Business Provides
	(1)	(2)	(3)	(4)	(5)
<i>Panel A</i>					
Grace Period	0.0962*** (0.0364)	5.589** (2.421)	0.101*** (0.0360)	4.882* (2.906)	5.789** (2.625)
Controls Used	No	No	No	No	No
<i>Panel B</i>					
Grace Period	0.116*** (0.0369)	6.204*** (2.370)	0.113*** (0.0359)	5.751* (2.963)	6.614** (2.948)
Controls Used	Yes	Yes	Yes	Yes	Yes
Observations	769	769	769	769	769
Control Mean	0.432 (0.0270)	20.65 (1.601)	0.395 (0.0236)	23.65 (1.981)	5.571 (0.476)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

- (1) Columns (1)-(5) show the impact of grace period on whether clients report that they had customers who bought from them on credit and what percent of their customers bought on credit (Columns (1)-(2)), whether clients report that they had customers who pre-ordered goods or services from them and what percent of their customers pre-ordered (Columns (3)-(4)) and the total types of goods or services clients offered to their customers (Column (5)).
- (2) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.



Table 7: Impact of Grace Period on Default

	Full loan not repaid within 8 weeks of due date	Full loan not repaid within 24 weeks of due date	Full loan not repaid within 52 weeks of due date	Repaid at least 50 Percent of the Loan	Made the First Half of Loan Repayments on Time	Made First Payment
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A</i>						
Grace Period	0.0851** (0.0336)	0.0670** (0.0275)	0.0643** (0.0252)	-0.0138 (0.0157)	-0.0282 (0.0540)	0.0238 (0.0247)
Controls Used	No	No	No	No	No	No
<i>Panel B</i>						
Grace Period	0.0839** (0.0332)	0.0649** (0.0266)	0.0636** (0.0252)	-0.0152 (0.0162)	-0.0219 (0.0535)	0.0239 (0.0238)
Controls Used	Yes	Yes	Yes	Yes	Yes	Yes
Observations	845	845	845	845	845	845
Control Mean	0.0424 (0.0142)	0.0212 (0.0101)	0.0165 (0.00899)	0.988 (0.00774)	0.501 (0.0427)	0.953 (0.0231)

*Notes:*

\* significant at 10% level \*\* significant at 5% level \*\*\* significant at 1% level

(1) Columns (1)-(4) report the impact of grace period on default rates, as measured at increasing number of weeks after due date. Columns (5) and (6) report whether clients paid at least fifty percent of their loan balance (updated as recently as January 2010) and whether they were able to make their first loan payment on time. All outcomes are constructed using administrative and group meeting data.

(2) Regressions include stratification fixed effects, and standard errors are clustered by loan group correlation. Regressions in Panel B also include all controls presented in Panel A of Table 1 and loan officer fixed effects. In cases when a control variable is missing, its value is set to zero and a dummy is included for whether the variable is missing.

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