How do flexible microfinance contracts improve repayment rates and business outcomes? Experimental Evidence from India[*]

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Abstract

How can financial innovations be offered in presence of information frictions without increasing credit risk? We address this question through a randomized experiment with 799 microfinance clients in India. In treated branches, borrowers select between the standard rigid microfinance contract and a more expensive innovative contract designed to mitigate irregular business cash flows through repayment flexibility. In control branches, customers are only offered the standard contract. Offering a menu of contracts that vary in price and flexibility improves business outcomes without deteriorating repayment rates. These effects are driven by a positive self-selection of financially sophisticated borrowers into the flexible contract.

Keywords: Microfinance, Repayment Flexibility, Borrowers' Selection, Contract Design
JEL Codes: O12, O16, C93, D91

1 Introduction

Small and micro businesses are characterised by irregular cash flows that negatively affect their investments and profitability (Minton and Schrand, 1999). In developing countries, the negative impact of income volatility on business growth is further exacerbated by the limited access to financial products and services to cope with business risk (Beck et al., 2000; Beck et al., 2009). Nevertheless, business growth remains low even when poor microentrepreneurs can avail of financial instruments and services (Banerjee et al., 2015; Crépon et al., 2015). A likely explanation for this puzzling evidence is the lack of innovative financial products: microfinance loans are typically too small to carry out business sustainably (Banerjee and Duflo, 2014); they also demand frequent repayments (De Aghion and Morduch, 2007; Bauer et al., 2012) that poorly account for the irregularity of small businesses' income realisations (Fafchamps, 2013).

In this paper, we study an innovative microfinance product designed to mitigate the negative impact of irregular cash flows among a sample of Indian microentrepreneurs through the provision of repayment flexibility at the borrower's discretion. A growing literature on financial innovation in developing countries shows that adapting contract terms to entrepreneurial needs and business characteristics positively affects production decisions and business growth (Field et al., 2013; Czura, 2015; Battaglia et al., 2017; Bari et al., 2021; Cole et al., 2017; Casaburi and Willis, 2018). Yet, financial institutions operating in these countries rarely offer financial innovations (Bruhn et al., 2017). The limited supply of tailored financial products is often caused by the lack of information infrastructures, such as credit bureaus. Financial innovation has been found to increase credit risk (Subrahmanyam et al., 2014); these effects may be further exacerbated by information asymmetries (Lin et al., 2013), especially if the way innovative contracts are offered does not account for borrowers' risk or lack of financial sophistication.

We show that an optimal way for lenders to offer this innovative flexible contract is by introducing a menu of contracts that include both the flexible contract and the standard, microfinance contract with a "rigid" repayment schedule, the former product being more expensive than the latter.

Building on information-based theories of security design (Myers and Majluf, 1984; DeMarzo, 2005), our hypothesis is that offering a financial innovation like repayment flexibility as a more expensive contract option triggers a positive self-selection of borrowers into the repayment schedule that best suits their characteristics. This in turn mitigates the adverse selection problem lenders face and that undermines the realization of the full potential of financial innovations in imperfect financial markets.

We test this hypothesis through a Randomized Controlled Trial (RCT) set up in the Indian state of Uttar Pradesh, and carried out in partnership with a local Microfinance Institution, Sonata Microfinance Ltd. (Sonata hereafter). In this context, cash-flow fluctuations across the year heavily affect borrowers' economic activities and put a strain on their repayment ability.[1] In a randomly subset of Sonata branches (the "treatment group") individual-lending borrowers[2] were offered a menu of contracts that includes the flexible, more expensive contract and the rigid, and cheaper, contract. In the control group, borrowers were only offered the rigid contract. The RCT allows us to study the causal impact of providing a financial innovation through a menu of contracts on borrowers' repayment rates and business outcomes.

We find that the provision of an expensive financial innovation designed to mitigate irregular business cash flows has a positive impact on business growth: business sales and profits are significantly higher in the treatment than in the control group. We also find evidence of increased liquidity in treatment: treated borrowers are significantly more likely to repay their loan in advance and significantly less likely to request additional funding to Sonata during the loan cycle. Finally, using Sonata's administrative data on borrowers' repayments, we observe similar default rates across the treatment and control group. This indicates that offering repayment flexibility as a more expensive contract does not harm repayment rates hence benefits both borrowers and lenders.

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[1]At baseline, borrowers report on average 2.5× higher profits in the best month of their business activity compared with profits in the worst month (17,600 Rs versus 7,600 Rs).

[2]Traditionally, microfinance loans have been granted to groups of female borrowers who were jointly responsible for the loan repayment. Yet, Microfinance Institutions (MFIs) are increasingly providing men with individual loans. In line with this, our sample only consists of male borrowers.

Taken together, these findings validate our hypothesis that the contract pricing enhances an effective self-selection of borrowers. However, it could also be argued that the effects we identify may not be driven by the treatment mitigating the adverse selection problem lenders face at the time of the loan offer; rather, it could be the nature of the contract (flexible versus rigid) to influence borrowers' behavior ex post. While it is certainly possible that the treatment also affected borrowers' characteristics and investment choices (Fischer, 2013; Field et al., 2013), the study of borrowers' selection into the flexible versus the rigid contract reveals that the subset of borrowers that opted for the flexible contract is ex ante significantly different from those who chose the rigid contract, and in the expected direction. Borrowers with larger business fluctuations at the start of the study were more likely to choose the flexible contract. This indicates that the flexible contract has a higher value for borrowers whose business is plagued by irregularities to a higher extent. The menu of contracts mitigates adverse selection along several borrowers' characteristics that are key to successful repayment behavior: better formal accounting skills, time-consistency and being worried about making financial decisions, all indicators of self-awareness, positively and significantly predict the take up of the flexible contract.

We further dig into the mechanisms underlying our main results. Heterogeneity analysis indicates that our treatment effects are precisely driven by borrowers who were more likely to take up the flexible contract, and in particular by microentrepreneurs with better financial accounting skills: compared with individuals who at baseline reported drafting a budget for their business activity only sporadically, they report higher sales and larger inventory – the main margin of investment among our sample borrowers.

Our paper offers three main contributions. First, it shows that the inclusion of a financial innovation like repayment flexibility within a menu of contracts is effective at mitigating the adverse selection problem lenders face in imperfect capital markets. Second, it uncovers the mechanisms through which this financial innovation can improve repayment rates and business outcomes: financially sophisticated borrowers, who are more likely to select into the costlier contract, take advantage of repayment flexibility and of the implicit additional liquidity that comes with it to

4

increase investment, which translates in better business outcomes without deteriorating repayment rates. Last, by establishing a causal link between the provision of repayment flexibility to mitigate cash flow volatility, borrowers' selection, business performance and repayment rates, our findings indicate that, when information frictions are binding, credit allocation can be improved through well-designed financial innovations.

Our paper contributes to several strands of the literature. By investigating how opaque borrowers reveal information about themselves through their contract choice, our paper relates to the studies on the role of information asymmetries in credit markets (Karlan and Zinman, 2009; Adams et al., 2009; Dobbie and Skiba, 2013). We complement in particular the work of Hertzberg et al. (2018) and Cespedes (2019) by studying how borrowers' contract choices are informative of their characteristics in a low-income setting.

Our research adds to the growing literature on the role of financial innovations in microfinance contracts (Field et al., 2013; Barboni, 2017; Battaglia et al., 2017; Czura, 2015; Cole et al., 2017; Casaburi and Willis, 2018; Lane, 2018) by providing empirical evidence of how flexible microfinance contracts can be designed to improve business outcomes without harming repayment rates. In contrast with Battaglia et al., 2017, the menu of contracts we study, in which repayment flexibility is traded off with price, makes borrowers reveal their type and the value they attribute to financial innovations (Gamba and Triantis, 2008), triggering a screening mechanism based on contract choice.

Our evidence also adds to the literature that explores the role of access to finance as a catalyst to entrepreneurship and business growth in developing countries (Beck et al., 2000; De Mel et al., 2008; McKenzie and Woodruff, 2008). Our paper also complements recent studies on selection in credit markets (Beaman et al., 2015; Crépon et al., 2020) by showing that returns to capital are higher for borrowers who select into innovative financial products.

Finally, our paper provides evidence of borrowers' sophistication in financial contracts choice. Our findings align with Bauer et al. (2012)'s work showing that impatient microfinance borrowers from

Indian Self-Help Groups strongly prefer the standard rigid contract to discipline their present bias. We add to Bauer et al. (2012)'s paper by showing that these effects also hold for individuals who borrow larger, individual loans. More broadly, our paper contributes to the household finance literature examining how financial products with innovative features that account for customers' behavioral characteristics can improve the efficiency of financial markets, both in developing (Ashraf et al., 2006; John, 2020; Brune et al., 2016; Sprenger and Stavins, 2010; Fischer and Ghatak, 2010) and developed countries (Beshears et al., 2015).

2 Selection into repayment flexibility

This section outlines a simple theoretical framework to guide our experimental design and analysis. As shown by Akerlof (1970) in his seminal work, information frictions in financial markets, which in low-income countries result from the absence of credit scoring and rigorous borrowers' screening techniques, create an adverse selection problem for the lenders that is exacerbated when financial innovations are introduced (Field et al., 2013; Subrahmanyam et al., 2014; Beck et al., 2016).

To mitigate the credit risk generated by the provision of financial innovations like repayment flexibility, it may be optimal for lenders to offer a menu of contracts that varies in repayment flexibility and price. This menu of contracts holds the potential to enhance a separating equilibrium à la Rothschild and Stiglitz (1976) where borrowers would reveal their type through their contract choice. This can alleviate information asymmetries as long as the pricing structure succeeds in screening out borrowers that are unsuitable for financial innovations.

Following this intuition, we implement and evaluate a randomized intervention that allows us to assess whether offering borrowers a choice between a standard, rigid contract (i.e., with fixed, monthly repayments), and a more expensive, flexible one (i.e., with the option to waive repayments), triggers a positive selection which improves business performance without increasing default rates. Selection in microfinance contracts through flexible repayment schedules has received little attention. The

only exception we are aware of is Barboni (2017), who looks at borrowers' selection into rigid and flexible contracts upon their ability of correctly evaluating future cash-flows.

The innovative financial product we study in this paper is designed to mitigate the negative effects of business income volatility on borrowers' business outcomes. Hence borrowers with irregular cash flows should be more likely to take up this contract if they expect the economic and financial gains from mitigating business irregularities to outweigh the costs paid for this financial innovation. Borrowers' contract choice is also driven by concerns for default, which they want to avoid. In the context we study, lenders take action against a defaulting borrower mainly by turning down their future loan requests. For microentrepreneurs, the cost of being denied access to further credit from their current lender is very high. Clients must borrow for several loan cycles with the same lender before being allowed to borrow larger loans, as also shown by early work in microfinance (Tedeschi, 2006). This makes loan default costly not only because it hampers borrowers' access to future credit, but also because it depreciates the value of their current lending relationship (Petersen and Rajan, 1994).[3] Assuming that agents are self-aware, the type of contract they will demand depends on their ability to repay. We therefore expect impatient or "overoptimist" borrowers (Landier and Thesmar, 2008; Bauer et al., 2012) to prefer the standard contract to a higher extent. Conversely, financially educated borrowers are expected to take up the flexible contract. In fact, financially sophisticated agents have been shown to make more profitable investments (Clark et al., 2017) and to take more risk (Bianchi, 2018).

In the next section, we provide details on the characteristics of the flexible contract, as well as on the experiment we set up to test how this innovative financial product can be offered without increasing credit risk.

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[3]Even if the absence of credit bureaus makes borrowing from other lenders relatively easy in theory for a defaulting borrower, this is quite complicated in practice. For the reasons mentioned above, when borrowers switch to a different lender, it will take them many loan cycles before being able to borrow large amounts of money.

3   Setting and Methods

Our partner financial institution, Sonata, is based in Lucknow (capital city of Uttar Pradesh) and operates throughout India with a network of 478 branches (data from 2019). Like most Indian Microfinance Insitutions (MFIs), Sonata offers both group and individual loans. While group loans are typically for generic use (consumption, business, emergency), individual loans are borrowed for business purposes, hence they are for larger amounts and are also costlier than group loans. Individuals taking up these loans either hold a microentrepreneurial activity or plan to set up one through the loan.

3.1   The flexible contract

At the outset of the project, all Sonata loans (both group and individual) had monthly repayment schedules and no flexible contract had ever been offered. Sonata was considering introducing a flexible loan within their individual-lending segment to help borrowers cope with liquidity problems caused by business cash flow irregularities. Repeated discussions with loan officers and existing customers helped identify the main sources of business fluctuations across the year: religious festivals ("peak" season), which in India can last for several weeks; and two types of "lean" season: the months following the festivals, and the monsoon season.

Building on these insights, the product team at Sonata designed a contract that would give borrowers the possibility to waive repayments during the loan cycle and to exercise this option (labelled "repayment holiday") when it was most needed. The rationale behind the provision of the repayment holiday was to help borrowers purchase additional inputs in view of the peak season, or smooth consumption during the lean season without dissaving or incurring in additional debt. Hence, the repayment holiday was set to three continuous months, in order to cover either the festival season or the lean season, or part of both. To be eligible to exercise the repayment holiday, borrowers had to successfully repay at least three monthly loan instalments after loan disbursal. Once this condition had been satisfied, they could avail of the repayment holiday at any time, provided they

8

gave Sonata a one-month notice.

The individual loans Sonata offers have a maturity of twenty-four months hence the flexible contract allowed for two repayment holidays to be used over the entire loan maturity, one every year of maturity.[4] However, due to a software issue in their Management Information System (MIS), Sonata was not able to offer a repayment holiday during the second year of the contract to *any* customer who had chosen the flexible contract at the beginning of the study. We discuss the implications of the lack of the second repayment holiday in detail in the next sections, also drawing from customers' feedback at the end of the study (section 4.6).

Figure 1 graphically represents the flexible and the rigid contract offered by Sonata. The figure plots the outstanding amount of the loan over the number of instalments to be repaid by borrowers.
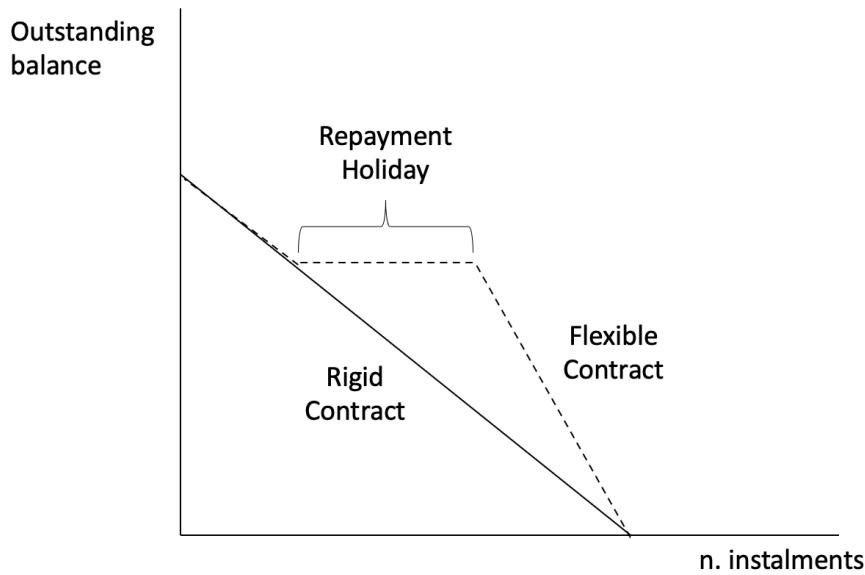
Figure 1: **Flexible contract versus rigid contract.** This figure plots a comparison between the flexible and the rigid contracts in terms of outstanding balance over the total number of instalments. It shows an "interruption" in repayments during the repayment holiday, which also translates into a larger amount to be repaid in fewer instalments at the end of the repayment holiday.

In the standard, rigid contract, borrowers have to repay equal instalments (which include capital plus interests) on a monthly basis until maturity. The flexible contract, in contrast, allows borrow-

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[4]Borrowers still have the possibility of repaying the loan in advance if they want to.

ers to suspend payments during the loan cycle. At the end of the repayment holiday, repayments resume and the residual outstanding amount is spread over the remaining instalments. As a result, the size of the instalments after the repayment holiday is larger than before the repayment holiday. The flexible contract can be thought of as a line of credit (Sannikov, 2007; Aragón et al., 2019; Lane, 2018): by skipping repayments, borrowers are implicitly provided with more liquidity, which they may use to mitigate the negative effects of cash flow volatility.

Since the flexible contract has been shown to carry a higher default risk for the lender (Field et al., 2013, Czura, 2015), it would be a more expensive product than the standard, rigid contract, which Sonata offers at an interest rate 24%. During the contract design phase, several factors were considered in assessing how much the interest rate of the flexible contract should have been to entice suitable borrowers into repayment flexibility, including default rates and additional administrative and legal costs for Sonata to set up the new contract. The price difference between the two financial contracts had also to be set in compliance with the guidelines of the Reserve Bank of India (RBI), who has extensively ruled on interest rate caps and differentials in the microfinance sector (Ferrari et al., 2018). Also informed by the results from a set of lab-in-the-field experiments where we elicited borrowers' willingness-to-pay for flexible, as opposed to a rigid, microfinance contracts (Barboni, 2017), the price of the flexible contract was finally set at 26%, 2 percentage points higher than the rigid contract, which was also the interest rate cap typically set for microfinance individual loans.[5]

Figure A1 in the Appendix shows how the flexible contract worked in practice.[6] In the figure, the repayment pattern of the standard, rigid monthly repayment loan is compared with that of the flexible contract. In this example, both loans have the same size (38,000 Rs, approximately 500 USD, the average loan size for Sonata), and borrowers start repaying with a monthly schedule, irrespective of the chosen contract. However, borrowers end up paying different instalments each

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[5]Although the 26% rate ceiling was officially removed before the start of the project and replaced with a more flexible cap, Sonata acknowledged that there was a strong view among customers that any rate above 26% was still considered too high at the time of the study. See https://economictimes.indiatimes.com/news/economy/finance/rbi-removes-26-interest-rate-cap-on-mfi-loans/articleshow/30004542.cms?from=mdr

[6]A very similar image was shown to treated borrowers to help them understand the characteristics of the flexible contract.

month depending on the chosen contract: customers choosing the flexible option have a larger instalment, as the 26% interest rate instead of the 24% interest rate applies from the first repayment. After the first three months, the repayment holiday can be exercised at any time. During the repayment holiday, flexible borrowers had to pay a small "flexibility fee".[7] Once the repayment holiday was over, monthly repayments resumed, and the residual loan balance was spread across the remaining months. At the time of the contract offer, borrowers were also told that if they decided to exercise the repayment holiday again during the second year of their maturity, they must have done so before the 21st month. This was to avoid instalments that would have become too large for the borrowers in the very last months of the loan cycle. The way it was conceived and designed, the structure of the flexible contract ensures that the Net Present Value of the flexible financial product, if borrowers do not default, is always higher than the rigid contract for the lender – the higher cost of the flexible contract precisely takes into account the higher credit default associated with financial innovations.

3.2 Experimental design

Informed by the predictions of the theoretical framework discussed in Section 2, we partnered with Sonata to evaluate the impact of offering the flexible loan through a menu of contracts. Twenty-eight branches of Sonata in the state of Uttar Pradesh were selected for the experiment, either in urban or peri-urban areas.[8] To maximize statistical power, branches were paired by the researchers according to geographic location and observable characteristics of the catchment population, and then treatment was randomly assigned within each pair.

Figure 2 illustrates the experimental protocol: both in the treatment and the control, microentrepreneurs approached a branch of Sonata to obtain a twenty-four month individual loan, offered by Sonata with a rigid repayment schedule and at a standard interest rate of 24%.[9] Once borrow-

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[7]This was calculated as being approximately 1% of the total borrowed amount. This amount was set in compliance with the Reserve Bank of India's guidelines for administrative fees (Ferrari et al., 2018). Indeed, since Sonata requires borrowers to repay their loan through bank transfer, the main purpose of the flexibility fee was to additionally compensate for potential repayment delays deriving from borrowers cancelling their direct transfers to Sonata during the repayment holiday months.

[8]Around 9% of Sonata's total branches at the beginning of the study.

[9]Before Sonata designed the flexible contract, this was the only uncollateralised business loan offered by

ers' eligibility for an individual loan had been ascertained, Sonata loan officers in treated branches offered customers the opportunity to choose between the rigid contract and the newly available flexible contract of the same loan size, offered at an interest rate of 26%. Customers in control branches were only offered the individual loan with a rigid repayment schedule at 24%. The flexible contract was not publicly marketed in order not to bias credit demand. Branches' catchment areas span several kilometers, and borrowers typically approach the closest bank branch to their place of residency or business location: the extent of spillover effects (e.g., customers going to another branch having heard a flexible contract was offered there) was quite unlikely, also because the flexible contract was only offered for a limited amount of time given the scope of the study.

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                    ┌──────────────────────────────────┐
                    │  799 borrowers across 28 branches │
                    └──────────────────────────────────┘
                          /                      \
Control group                              Treatment group
┌────────────────────────────┐     ┌────────────────────────────┐
│ Only standard, rigid        │     │       Choice between:       │
│ contract at 24%             │     │ standard, rigid contract    │
│                             │     │   at 24%                    │
│                             │     │ flexible contract at 26%    │
├────────────────────────────┤     ├────────────────────────────┤
│ Number of borrowers: 410    │     │ Number of borrowers: 389    │
├────────────────────────────┤     ├────────────────────────────┤
│ Number of branches: 14      │     │ Number of branches: 14      │
└────────────────────────────┘     └────────────────────────────┘
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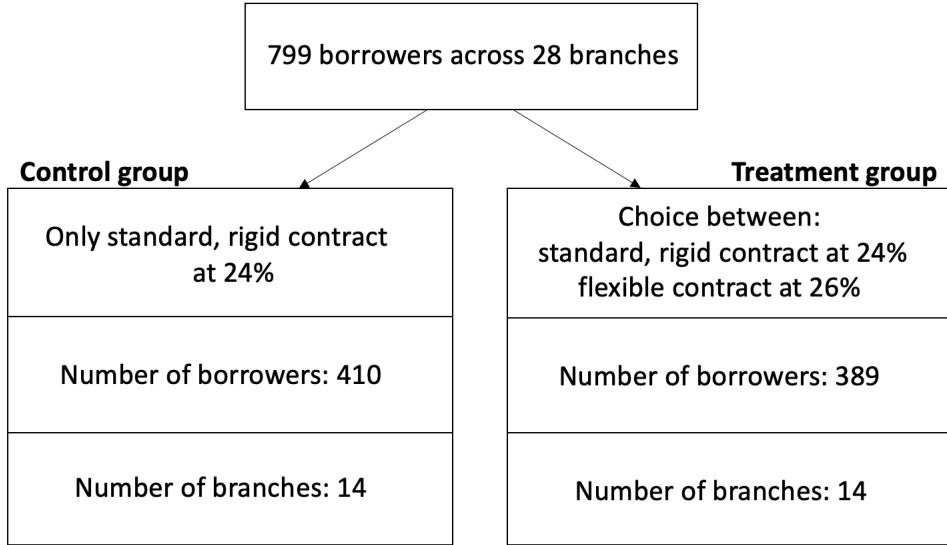
Figure 2: **Experimental protocol** This figure shows the experimental design and the type of contracts, number of subjects involved, and number of branches in the treatment versus the control group.

We followed 799 borrowers across a period of 24 months: 410 in the control and 389 in the treatment group. These figures represent the universe of individual lending customers accepted at Sonata's branches during the months we carried out the baseline hence they are fully representative of the first-time individual-lending clients' segment. All subjects were microentrepreneurs who took up

Sonata. The standard, individual business loan carries the same interest rate, irrespective of their size.

the loan to make an investment for their business activity.[10] These borrowers had already borrowed from Sonata as group lending borrowers. This is a common feature of individual lending borrowers: Sonata, as all Indian MFIs, follows an "upgrading" process of their clients from group to individual loans, whereby customers take three to four group loans and have to successfully repay them before becoming eligible for individual loans. This process can be thought of as providing borrowers with dynamic incentives in the form of larger group loan size (Tedeschi, 2006). Important for our setting, these borrowers had never taken individual loans before, nor benefited from repayment flexibility.[11]

3.3 Data

Loan disbursal began in May 2016 and continued until December 2016 accompanied by a simultaneous comprehensive baseline survey. An extensive follow-up survey was carried out from May 2017 to July 2017, on average eight months after the baseline, when the average borrower had repaid approximately one-third of their loan. All loan cycles under study were concluded by early 2019. Endline data collection was conducted between June 2019 and August 2019.

All survey rounds contained questions on business performance, loan usage, and investment, among others. At baseline, we also asked questions to measure borrowers' behavioral characteristics including financial literacy, aspirations, locus of control, personality traits. Two sets of lottery games were also played to elicit both time and risk preferences. Their protocols are detailed in Section B in the Appendix. These data were complemented by repayment information from Sonata, together with data on whether and when borrowers who had opted for the flexible repayment schedule used the repayment holiday.

Of the 799 individuals we interviewed at baseline, we were able to re-interview 789 at midline, and 761 at endline, with an implied attrition of 1.2% and 4.8%, respectively.[12]

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[10]Individual loans are *strictly* business loans and are larger in size compared with group loans. Sonata collects detailed data on the loan purposes and verifies them.

[11]This implies that borrowers' preference for repayment flexibility was driven solely by their circumstances and characteristics, and not by any learning from previous experiences with flexible loans. This condition is further ensured by the fact that, to the best of our knowledge, no MFI in India was offering a flexible contract that provided borrowers with a repayment holiday option at the time we started the intervention.

[12]Attrition is balanced across treatment and control for both midline and endline data collection, as shown

4   Empirical Approach and Results

We evaluate the impact of offering a menu of contracts on repayment rates and business outcomes by estimating the following regression through Ordinary Least Squares:

$$y_{ibp} = \alpha + \beta T_{bp} + \delta_{bp} + x'_{ib} + \epsilon_{ibp} \tag{1}$$

where y_{ibp} is the outcome of interest (e.g., repayment performance; business outcomes) for individual i in branch b, belonging to pair p. Table A7 contains a detailed description of the variables we use to estimate treatments. T_{bp} is a binary variable for the treatment assigned to the branch b - whether borrowers were only offered the standard rigid contract ($T_{bp} = 0$) or, instead, both contracts at different prices ($T_{bp} = 1$). δ_{bp} are branch-pair fixed effects to account for randomization strata. Standard errors are clustered at the unit of randomization, i.e., at the branch level (Abadie et al., 2017).[13] The vector x_{ib} contains household-level controls measured at baseline. Our coefficient of interest is β, which is the average intent-to-treat (ITT) effect of the menu of contracts. In light of the randomized design, the key assumption for causal identification is that treatment status is orthogonal to ϵ_{ibp}.

Table 1 provides an overview of the characteristics of our entire sample at baseline. The businessperson in the household was targeted to be interviewed and, when they were not available, we resorted to the person in the household who had the most extensive knowledge of the business activity. The households in our sample consist on average of six members, they are predominantly Hindu, and with the heads of the household being 41 years old, on average. Households are fairly educated: only 15% of the sample reports the head of the household has only completed primary

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in Table A2 in the Appendix. Migration, lack of interest in participating in the survey, as well as a subject's death were among the reasons we were not able to re-interview those borrowers. A few months after loan disbursement, Sonata's loan officers found that 12 borrowers (1.5% of the original sample) had actually taken a loan for somebody else. In order to avoid any potential endogeneity, we kept these subjects in the sample but re-coded their business outcomes to 0.

[13]Given potential concerns for the relatively small number of clusters in our experiment, we also show p-values from wild cluster bootstrap (Cameron et al., 2008; Roodman et al., 2019).

school, while less than 6% reports no schooling at all. In terms of income and assets, 47% of the households report owning land, at baseline. Average household income in the past twelve months is about 216,000 INR ($\approx$ 3,000 USD). Average total business sales reported for the last month are approximately 13,000 INR ($\approx$ 200 USD), suggesting that business income represents a very large part of households' total income. In terms of occupations, all borrowers are micro-entrepreneurs engaged in small-business activities that predominantly entailed producing and/or selling goods and services. The most frequent business categories in our sample are owning a grocery or fruits and vegetables store (20% of the sample); owning a shop and other types of business (18%) and being a dairy farmer (16%). At baseline, less than one in five households have an outstanding formal loan beside the one from Sonata.[14] The average size of the loans borrowed from Sonata was 38,000 INR ($\approx$ 600 USD). This is significantly higher than standard group-lending loan size, which usually ranges between 10,000 INR and 20,000 INR ($\approx$ 150 USD-300 USD).

Table A1 in the Appendix indicates that the treatment and the control groups were balanced at the start of the intervention hence the randomization has worked effectively.

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[14]Indian regulation of Microfinance Institutions does not allow microfinance borrowers to hold more than two or three outstanding loans from MFIs. This may contribute to explain the relatively low formal borrowing rate in our target population.

Table 1: Summary statistics

Variable	N	Mean	SD	p10	p50	p90
A. Demographic Characteristics						
Household Size	799	6.05	2.43	4	6	9
Age of the Head of the Household (Years)	799	41.36	10.73	28	40	55
Is non-Hindu	761	0.104	0.305	0	0	1
Belongs to scheduled caste	761	0.208	0.407	0	0	1
B. Education of Head of the Household						
Household head is unschooled (1=Yes)	787	0.057	0.232	0	0	0
Household head has only attended primary school (1=Yes)	787	0.152	0.360	0	0	1
Financial Literacy: Knows how to make a budget (1=Yes)	799	0.652	0.477	0	1	1
C. Income and Assets						
Household Income in the last 12 months	799	215,806.4	138,969	86,000	180,000	400,000
Household owns land (1=Yes)	799	0.468	0.499	0	0	1
D. Business Outcomes and Characteristics						
Total Business Sales in the last 30 days	799	12,698.14	12,897.09	2,000	10,000	25,000
Difference in profits (best/worst month)	787	9,756.32	9,566.61	2,000	8,000	18,000
Type of Business						
Manufacturer / Artisan / Tailor	799	0.150	0.357	0	0	1
Seller / Trader / Contractor	799	0.160	0.367	0	0	1
Dairy / Meat / Poultry	799	0.162	0.369	0	0	1
Grocery / Fruits and Vegetables	799	0.203	0.402	0	0	1
Business / Shop / Hotel	799	0.176	0.381	0	0	1
Transport	799	0.070	0.255	0	0	0
Services	799	0.059	0.235	0	0	0
Labor	799	0.014	0.117	0	0	0
Other	799	0.005	0.071	0	0	0
E. Borrowing and Saving						
Has formal loans other than Sonata's loan (1=Yes)	799	0.160	0.367	0	0	1
Has informal loans	799	0.100	0.996	0	0	0
Total formal borrowed (last 12 months)	799	8,148.85	26,926.65	0	0	25,000
Total informal borrowed amount (last 12 months)	799	145.38	1,529.08	0	0	0
Loan amount received from Sonata	799	38,346.35	6,603.12	32,150	35,900	49,200
Total savings amount	799	13,929.77	16,678.94	2,164	8,000	32,000

Note: Summary statistics for the entire sample of 799 borrowers that were recruited at baseline. Household income, business sales, as well as total formal and informal borrowed amount have been topcoded at 3 standard deviations from the mean. See Table A7 in the Appendix for detailed variable definitions.

4.1 Treatment Effects on Loan Repayment

Our main hypothesis is that offering a financial innovation like repayment flexibility as a more expensive contract option triggers a positive self-selection of borrowers into the repayment schedule that best suits their characteristics. This in turn mitigates the adverse selection problem faced by the lender. We test this hypothesis by first looking at treatment effects on repayment rates: if the

16

contract pricing works effectively, we should observe repayment rates in the treatment group to be at least as good as in the control group. Table 2 presents the estimated average treatment effects of providing a menu of contracts on loan repayment completion.

Table 2: Treatment Effects on Repayment Rates, Early Loan Repayments and Top Up Loan Requests

	N	Mean of dep. var. control group	Household covariates included?		p-value wild bootstrap	p-value rand. inference
			with LASSO	All		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Has fully repaid by the due date	792	0.890	-0.0004 (0.030)	-0.005 (0.030)	0.988	0.843
Has fully repaid before the due date	789	0.300	0.094 (0.018)***	0.104 (0.021)***	0.000	0.003
Has requested a loan top up	761	0.080	-0.056 (0.011)***	-0.056 (0.010)***	0.001	0.001

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. *Has fully repaid by the due date* is a dummy that takes the value of one if, at the end of the loan cycle, the borrower has fully repaid their loan, and zero otherwise. *Has fully repaid before the due date* is a dummy that takes the value of one if the borrower has completed their loan repayment before the initially-stated loan closing date. *Has requested a loan top up* is a dummy that takes the value of one if the borrower reports, at the end of the loan cycle, to have requested a loan top up from any formal borrowing sources (MFIs including Sonata, Non-Banking Financial Companies, etc.). Both *Has fully repaid by the due date* and *Has fully repaid before the due date* variables have been constructed using administrative data from Sonata. *Has requested a loan top up* is a self-reported information from the research team's survey data collection. Column (2) reports the mean of the dependent variable for the control group. Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in brackets below coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications).

Information on loan repayment was obtained from Sonata's customer-level administrative data and refer to the whole loan cycle. Almost 90% of borrowers in the control group completed the repayment of their loan by the due date (i.e., within 24 months), as shown in Column 2.[15] Column 3 and 4 of Table 2 report Intention-To-Treat coefficients, estimated with branch-pair dummies, and including a set of household characteristics (which in column 3 are selected through double LASSO procedure, Belloni et al., 2014).[16] Average repayment rates are not statistically different between

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[15]Sonata, as most Indian Microfinance Institutions, does not have a clear-cut definition of defaulting borrowers. Customers who do not complete their loan repayment by the due date are classified into different default categories, based on whether they are either within three months late, or above three months late.

[16]The full list of controls includes: household size; age and education of the head of the household; religion; caste; land ownership; sector of business activity; amount borrowed from Sonata (top coded at 3 standard deviations from the mean). All these outcomes were measured at baseline except for the level of education of the head of the household and religion and caste that were measured at midline (education) and endline (religion and caste). While we do not see any reason for our intervention to have changed religion and caste – which, particularly in the Indian context, can be reasonably assumed to be time-invariant, we also believe that the level of education of the household head (who on average is more than 40 years old), which was measured after just eight months on average from baseline, should have not been affected by our study.

the treatment and control group, indicating that offering the flexible loan through a menu of contracts does not increase default. Adding the full set of controls has little effect on the estimates, consistent with the random assignment of borrowers to the treatment and control groups. Column 5 reports p-values obtained from wild cluster bootstrap (Cameron et al., 2008); column 6 reports p-values obtained from randomization inference (RI). Through RI, we assess the probability that the treatment effects observed could be drawn from 1,000 alternative random assignments (Gerber and Green, 2012; Heß, 2017). We find similar results to those shown in column 3 and 4 where significance levels refer to robust standard errors clustered at the branch level.

As Sonata gives borrowers the opportunity to close their loan ahead of the due date, we estimate equation 1 also for early repayment completion. We observe that almost one in three borrowers in the control group have repaid their loan before the due date (i.e., in less than 24 months). Assignment to the contract menu treatment significantly increases the likelihood of an early loan closure by 10 percentage points (+33% of a control mean of 30%, column 4). This result is also robust to wild bootstrap of standard errors and randomization inference.

Taken together, these results show, on the one hand, that offering both schedules simultaneously at different prices limits the extent of credit risk the introduction of financial innovation is typically associated with (Subrahmanyam et al., 2014; Field et al., 2013; Czura, 2015). On the other hand, evidence that borrowers in the treatment group are significantly more likely to repay before the due date indicates that the design of the flexible loan has achieved the desired effect of increasing liquidity availability for treated borrowers.

To confirm this latter finding, we study treatment effects on an additional indicator of borrowers' need for liquidity: top-up loans. Top-up loans are offered by Microfinance Institutions alongside with standard loans, and typically consist of a one-shot extra credit, at the same interest rate of the current loan. The terms of the top-up loan depend on the borrower's request, the size of the loan previously borrowed, and also on the borrower's repayment performance. Treatment effects on top-up loans are shown in Table 2. Borrowers in the treated branches are 70% less likely to

request a loan top up from formal financial institutions, including Sonata, the ITT coefficient being statistically significant and of the same magnitude after including baseline controls.

In line with our hypotheses, this result indicates that borrowers in the treatment group are in lower need of additional credit compared with borrowers in the control group: the flexible contract seems to provide the extra liquidity that borrowers may otherwise seek with a top-up loan.[17] Yet, one may argue that borrowers that were offered a menu of contract may seek extra credit from other borrowing sources, either formal or informal. Table A3 in the Appendix shows no significant treatment effects on total formal and informal outstanding borrowed amounts, both at midline and at endline (column 5, the most restrictive hence our preferred specification). This finding confirms that borrowers in the treatment group are in lower need of additional credit. At the same time, it suggests that borrowers value the ex-ante committed provision of extra liquidity embedded in this financial innovation more than the additional credit they could potentially receive through standard loans. This result, on the one hand, suggests that borrowers may be uncertain about getting additional credit through standard channels. On the other hand, it provides additional evidence of the suitability of the flexible contract to meet the business and financial needs of our target population.

One last consideration emerging from Table 2 relates to the fact that no repayment holiday was provided in the second year by Sonata. Qualitative interviews with borrowers indicate that customers who opted for the flexible contract were certainly annoyed by Sonata's behavior (and rightly so, given the built-in commitment of flexibility in the contract). Sonata promised to reimburse treated borrowers at the end of the loan cycle.[18] Section 4.6 presents results from feedback questions we asked borrowers at endline to gauge their overall experience with Sonata – on average, we do not find significant differences in terms of customer satisfaction and trust across the treatment and the control group, suggesting that the lack of the repayment holiday in the second year did not cause major distress. At the same time, we still observe similar repayment rates across treatment and control group, suggesting that the beneficial effects of providing this financial innovation are

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[17]The dependent variable here represent any loan top up from any formal financial institution.

[18]Sonata did not undertake any action to reimburse borrowers during the study, implying that the effects we observe are not biased by their behavior.

long-lasting.

4.2 Business Outcomes

We turn to the study of the treatment effects on business performance. As we discussed in section 2, our hypothesis is that the menu of securities offered in the treatment group should lead borrowers to reveal their type through contract choice (Rothschild and Stiglitz, 1976). Since the flexible loan was designed to mitigate cash flow volatility, we expect borrowers to be more likely to take up this financial product if their business is subject to income irregularities, and as long as they expect repayment flexibility to increase their profits.

Using administrative data from Sonata, we first look at the usage of the repayment flexibility option. One in three borrowers (120 out of 389, 31%) in the treatment group took up the flexible contract. Of these, 56% used the repayment holiday in the first year of their contract, indicating that borrowers perceived the repayment holiday precisely as an option to be exercised in case of need (Battaglia et al., 2017). The timing of the use of the repayment holiday is shown in Figure 3.
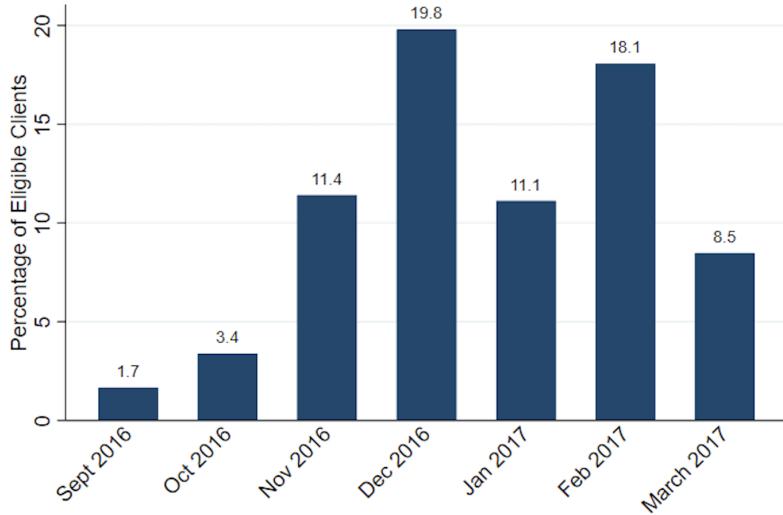

Figure 3: **Share of eligible customers using the first repayment holiday, by month** This figure shows the share of borrowers that, in each month of the first year of their loan, exercised the repayment holiday being eligible for it (i.e., they had already repaid three months in individual instalments)

Figure 3 plots the share of eligible borrowers[19] exercising the repayment holiday, by calendar month.[20] Most of the borrowers who took up the flexible contract opted for waiving repayments between November 2016 and February 2017. These months correspond to both the festival (November and December) and the lean season (January and February).[21] Figure 3 indicates that borrowers used the flexible contract during periods in which their need for liquidity was more pronounced, either because there is higher demand for their products and services (festival season) or because the lower demand following the peak business season makes it more difficult to meet debt repayment and expenditures (lean season).

Since borrowers opting for the flexible contract used it to mitigate business irregularities, as Figure 3 suggests, we should also observe improved business performance in treatment compared to control group, where borrowers could not benefit from a financial instrument specifically designed to smooth cash flow volatility. We estimate business outcomes at midline and endline, separately. This allows us to show both the short-term (i.e., after approximately 10 months) and the medium-term (i.e., after 24 months) impacts of providing a menu of contracts. Our outcomes of interest include business revenues and profits: we mainly focus on the level of total business sales in the last month and last week, as reported by borrowers; business profits are measured as business revenues minus costs.[22] These business outcomes refer to the business activity for which borrowers took up the business loan from Sonata. Results for business outcomes are shown in Table 3.

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[19]Borrowers were eligible to use the repayment holiday once they had completed the three compulsory monthly repayments We subtract from the pool of eligible borrowers in each month those who exercised the repayment holiday in the previous month.

[20]Given the study timeline, September 2016 is the first month that eligible borrowers in our sample could have started using the repayment holiday.

[21]In November 2016, the Indian demonetization happened. This was a big shock for the entire Indian economy, with immediate although relatively short-term negative consequences on a number of economic outcomes. It is possible that borrowers who have used their repayment holiday in December 2016 may have done so to mitigate the negative effects of demonetization. However, we do not observe *every* borrower using the repayment holiday right after the demonetization, or in January 2016. This supports the idea that the effects of demonetization were not persistent, as also shown by Chodorow-Reich et al. (2020)

[22]We include the following cost categories: input costs; rent of land and cost of storage; utilities; wages/salaries; travels to meet suppliers; marketing; renovation of business premises; cleaning and maintenance costs; rent on machinery and equipment; minor repairs. While we report profits both at midline and endline, it must be noticed that costs were imprecisely estimated at midline. More details on how we measured costs and profits are discussed in table A7.

Table 3: Treatment Effects on Business Outcomes

Dependent Variable	N	Mean of dep. var. control group	Household covariates included?		p-value wild bootstrap	p-value rand. inference
			with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Midline						
Monthly Sales	781	24,423.94	3,447.75 (2092.69)*	4,120.49 (2131.92)*	0.287	0.099
Weekly Sales	778	5,941.36	1,482.35 (537.90)***	1,542.27 (593.80)**	0.087	0.019
Monthly Profits	781	22,345.70	3,705.62 (2204.97)*	4,120.49 (2131.92)*	0.255	0.106
Panel B: Endline						
Monthly Sales	761	22,769.97	5,870.51 (1905.54)***	5,181.47 (1910.07)**	0.062	0.051
Weekly Sales	761	5,476.14	798.64 (601.79)	690.91 (634.56)	0.434	0.360
Monthly Profits	761	-5,684.297	8014.38 (3039.76)***	7,286.80 (3160.44)**	0.069	0.053

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Monthly sales refer to business sales in the last 30 days; Weekly sales refer to business sales in the last 7 days. Monthly profits are computed as monthly sales minus monthly costs. Column (2) reports the mean of the dependent variable for the control group. Note that costs at midline were imprecisely elicited; this explains the (large) difference between average level of profits at midline and endline shown in column (2). Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in brackets below coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications). All outcomes are top-coded (+3 standard deviations from the mean). Profits are also bottom-coded (-3 standard deviations from the mean).

Panel A reports results from estimating equation 1 with midline data; Panel B with endline data. We include in our estimation household covariates, which in column (3) are selected through double LASSO procedure.

Borrowers in the treatment group report higher weekly and monthly sales than those in the control group, the difference between treatment and control being statistically significant both at midline and at endline. The estimated coefficients for weekly sales at midline and monthly sales at endline are positive and statistically significant after we bootstrap standard errors, as shown in column 5 and 6, respectively. Monthly and weekly sales at midline in the treatment group are approximately 17% and 26% higher than those in the control group, respectively (Panel A, Column 4); monthly sales at endline are 23% significantly higher in treatment group (Panel B, Column 4). These findings are in line with the magnitude of the results found by other studies focusing on financial innovations (Battaglia et al., 2017; Bari et al., 2021). We then look at profits and find evidence of statistically

higher profits at endline.[23] While the business activities of borrowers in control group operate on average in loss (the mean of the dependent variable for control group is about minus 5,700 Rs), borrowers in the treatment group do break-even, on average, and realise positive and significantly higher profits than the control group. This suggests that they run their business more efficiently.

Results from Table 3 show that the flexible contract allows borrowers to carry out higher-revenues and more profitable business activities. This is consistent with the view that this financial innovation helps borrowers mitigate the negative effects of cash flow volatility, for instance by allowing them to purchase additional inputs in view of the business peak season, translating into higher sales. Findings from Table 3 also speak to a positive selection of borrowers into the flexible contract, further corroborating our hypothesis that the menu of contracts offered by Sonata in treated branches successfully screened out less entrepreneurial borrowers.

Finally, figure 4 plots the cumulative distribution function (CDF) of weekly sales by treatment status, at midline. The graph shows a clear separation of CDFs, and with a shift to the right. Weekly sales are consistently larger in the treatment than in control group, further corroborating the average treatment effects reported in Table 3.

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[23]Some categories of monthly costs we include in the computations of profits at endline were not elicited at midline. This explains why the mean of profits at midline (shown in Panel A, column 2) is substantially higher than at endline. See also table A7 for variables definition.
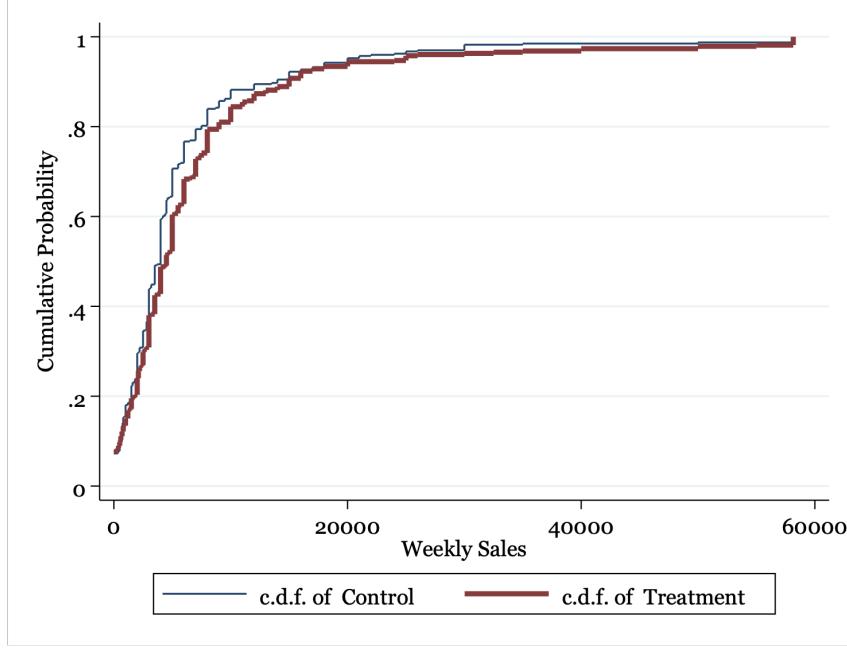
Figure 4: **CDF, weekly sales (midline)** This figure plots the cumulative distribution function (CDF) of weekly sales by treatment status, at midline.

4.3 Disentangling the Selection Mechanism

Our analysis of repayment rates and business outcomes validates our hypothesis that offering a menu of contracts that vary in price and flexibility mitigates the adverse selection problem lenders face when financial innovations are introduced. In this section, we look in greater detail at borrowers' selection. We focus on the treatment branches and use the extensive data collected at baseline to study which characteristics predict borrowers' choices for the flexible contract vis-à-vis the standard rigid contract. Our theoretical framework suggests that borrowers should select into the contract that best suits the characteristics and their ability to repay. In light of the treatment effects on repayment rates and business performance, we expect borrowers with higher cash-flow volatility and higher potential to run their business profitably to be more likely to choose the flexible contract. At the same time, borrowers who anticipate having more difficulties making repayments under the flexible contract (e.g., those with poor financial accounting skills and time-inconsistent customers) should be screened out and choose the rigid schedule over the flexible one. We estimate the following probit regression equation:

$$probflex_i = \beta X_i + \epsilon_i \tag{2}$$

where $probflex_i$ is the probability that a treated borrower i chooses the flexible contract when they are offered both schedules, and X_i is a vector of borrowers' characteristics and financial indicators: land ownership, household income, monthly business sales, cash flow irregularities, financial accounting, time consistency, risk aversion, being worried about making decisions on how to manage household's finances, and having control over life choices. Table A5 in the Appendix provides summary statistics for these variables. Table 4 shows results from estimating equation 2. In each regression, we always control for the type of business activity borrowers carried out at baseline, and also include household size, age of the head of the household and their education level as additional controls.

We first look at wealth and business indicators like land ownership, household income and business sales (column 1, 2 and 3 of Table 4), and find that none of these variables significantly predict the take up of the flexible contract. We then study the predictive role of cash flow irregularities experienced by borrowers on the take up of the financial innovation. We construct two measures of business irregularity: variability of sales and profit volatility.[24] The former variable reflects borrowers' likelihood to undertake higher return projects that have irregular payment streams. The latter is used as a proxy for demand volatility throughout the year. Column 4 and 5 of Table 4 show that borrowers that experience higher variability of sales and high profit volatility are more likely to choose the flexible contract, although the coefficient of profit volatility is imprecisely estimated.

We then consider the predictive power of financial literacy and time and risk preferences. Column 6 of Table 4 shows a positive and significant correlation between the likelihood that borrowers draft a budget for their business activity on a frequent (daily or weekly) basis and the likelihood to take

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[24]Sales variability is measured as the scaled deviation of borrowers' monthly sales from the control mean. Profit volatility is constructed as the probability that borrowers' self-reported profits lie in the bottom 25th percentile in the worst month, and in the top 25th percentile in the best month. Worst and best month refer to the 12 months preceding the baseline survey administration. This measure is used to classify borrowers based on the extent of profit fluctuations they experience throughout the year.

up the flexible contract: borrowers with better financial accounting skills (which are particularly important given the unpredictable nature of their business) prefer the flexible contract to a significantly higher extent. Column 7 shows that time-consistent borrowers are also significantly more likely to take up the flexible contract. Results from column 6 and 7 provide a strong argument for why we do not observe an increase in default rates in treatment versus control branches: borrowers who anticipated to be in need of financial discipline to manage their business activities hence to ensure good loan repayments were more likely to choose the standard contract. This is in line with work emphasising the discipline-enhancing nature of microfinance contracts (Bauer et al., 2012; Ashraf et al., 2006). We also detect a positive correlation between borrowers' risk-loving attitude and the take up of the flexible contract (column 8); this result suggests that more entrepreneurial borrowers prefer financial contracts that hold the potential for higher productivity.

Additionally, column 9 shows that borrowers who report being more worried when taking decisions about their households' money are more likely to take up the flexible contract. Together with financial literacy, this variable can be considered as an indicator of borrowers' financial sophistication, which translates in good repayment behavior as well as better cash flow management (Clark et al., 2017). We then test the predictive power of a measure of internal locus of control.[25] Although the coefficient is imprecisely estimated, its negative sign suggests that borrowers who felt they had little control over their life events were (perhaps for once) actively choosing the flexible contract. Column 11 of Table 4 tests all predictors simultaneously. The signs and magnitude of all the coefficients shown in the previous specifications remain unchanged, and borrowers' time consistency and being worried about future events still significantly predict the take up of the financial contract in this horserace exercise.

Taken together, results from Table 4 indicate that the flexible contract served its purpose to help borrowers mitigate variability in their business income realisation. They also provide strong evidence

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[25]We measure locus of control through the following question: "Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please tell me on a scale from 1 to 10 which number indicates better how much freedom of choice and control you feel you have over the way your life turns out: 1 means "no choice at all" and 10 means "a very great deal of choice".

that the contract pricing structure has succeeded in screening out borrowers that are unsuitable for financial innovations (Rothschild and Stiglitz, 1976, Barboni, 2017).

Yet, it could be argued that borrowers' choice to take up the flexible contract was motivated by other reasons than those discussed – for instance, concerns for financial claims from friends or relatives during the repayment holiday could have made borrowers opt out of the flexible contract (Squires, 2016). Conversely, borrowers may have chosen the flexible contract to signal their good quality to the lender (e.g., in terms of ability to repay a more expensive loan). While we cannot rule out these alternative explanations entirely, insights from borrowers' feedback, which we discuss more extensively in section 4.6, provide little support for this "signalling" hypothesis. As for the "kinship taxation" hypothesis, it must be noted that the flexible contract was overall more expensive than the standard contract thus providing a strong rationale for borrowers to reject external money requests. In addition, our sample consists of individual borrowers hence concerns for social pressure are less relevant in this context (Czura et al., 2020). Finally, one may also wonder whether the treatment effects we observe in Table 2 and 3 were rather affected by the nature of the contract (flexible versus rigid) that influenced borrowers' behavior ex post. While this is possible, results shown in Table 4 highlight that the menu of contract that was offered in the treatment group triggered a clear separation of borrowers' types, whereby more sophisticated borrowers consistently chose the financial innovation over the standard contract. This finding is central the paper, as it shows that in presence of information frictions, credit allocation can be improved by means of menus of contracts that vary in price and flexibility.

Table 4: Variables predicting borrowers' selection in the flexible contract

					Probability to Take Up the Flexible Contract						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
The household owns land	0.0901 (0.0505)*										0.0911 (0.0495)*
Household income (log)		0.0119 (0.0406)									0.0255 (0.0409)
Business sales (last 30 days, log)			-0.0020 (0.0089)								-0.0099 (0.0088)
Variability of sales (last 30 days, scaled)				0.0001 (0.00004)*							0.0001 (0.0004)
High profits volatility					0.0918 (0.0634)						0.0670 (0.0615)
Does budget frequently						0.0883 (0.0478)*					0.0785 (0.0485)
Is time consistent							0.202 (0.0612)***				0.170 (0.0590)***
Is risk loving								0.190 (0.106)*			0.166* (0.0983)*
Worries about making best financial decisions									0.163 (0.0487)***		0.152 (0.049)***
Has control over their life										-0.028 (0.019)	-0.030 (0.018)
N	383	383	383	383	383	383	383	383	383	382	382
Dep. Var. Mean	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Joint significance: All Coeffs = 0 (P-Value)											0.0003

Note: Standard errors in parentheses. Marginal effects are displayed. All variables are measured at the baseline. *The household owns land* is a dummy that equals one if the household reports owning land at baseline. *Household income* is the log of overall income of the household (topcoded 3 standard deviations from the mean). *Business sales* is the log of sales reported by borrowers in the last thirty days (topcoded 3 standard deviations from the mean). *Variability of sales* is measured as the (scaled) squared difference between total sales in the last month and the mean value of total sales in the last month. *High profits volatility* is a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile. *Does budget frequently* is a dummy that equals one if the respondent reports drafting a budget for their business activity on a daily or weekly basis (as opposed to fortnightly, monthly, or even more sporadically). *Is time consistent* and *Is risk loving* are dummies reflecting borrowers' attitude towards time discounting and risk as discussed in appendix B. *Worries about making financial decisions* is a dummy that equals one if the borrower reports being worried about making the best financial decisions. *Has control over their life* is a locus of control dummy constructed from borrowers' answer to the question "How much freedom of choice and control do you have in your life?" Business-activity dummies, head and education of the head of the household are included in every specification.

4.4 Heterogeneity

The main analysis carried out in this paper indicates that offering financial innovations through a pricing structure ensures a better allocation of credit. In this section, we test for heterogeneity in the treatment effects on business outcomes along the variables identified in Table 4 as being the most predictive of the take up of the flexible contract: sales variability; profit volatility; financial accounting skills; time consistency; risk aversion; borrowers' concerns about making financial decisions. This exercise further validates the predictive power of these indicators by helping identify which indicators specifically drive the main treatment effects. We estimate regressions in the form:

$$y_{ibp} = \alpha + \beta T_{bp} + \delta X_{ibp} + \gamma T_{bp} \times X_{ibp} + \epsilon_{ibp} \tag{3}$$

where T_{bp} is a dummy equal to one if the respondent was assigned to the menu of contract treatment group, and X_{ibp} is the vector of borrower's characteristics (profit volatility; accounting skills; time consistency; risk aversion) that most explain the choice of the flexible contract. We are particularly interested in the sign and significance of the γ coefficient.

Table 5 presents heterogeneous treatment effects on the amount of weekly sales at midline. Column 1 reproduces the estimate of Table 2 (column 4). Columns 2 - 7 consider the six different predictors. Column 8 includes all the characteristics and interactions together. The top part of the table reports the estimated interaction effects. Equation 3 is estimated with OLS.

Table 5: Heterogeneous Treatment Effects: Business Sales

	Weekly Sales (Midline)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	1542.27	1633.49	1329.19	114.93	2981.67	1446.37	1941.50	1832.81
	(593.80)**	(664.61)**	(653.24)*	(750.16)	(851.21)***	(608.87)**	(737.58)***	(1045.31)*
Treatment × Sales Variability		0.218						0.110
		(1.542)						(1.464)
Treatment × High Profit Volatility			1416.37					1888.61
			(1874.83)					(1884.95)
Treatment × Frequent Budget				3757.31				4307.45
				(1536.43)**				(1586.57)**
Treatment × Time Consistent					-1516.32			-1808.58
					(1039.84)			(1153.84)
Treatment × Risk Loving						609.29		-298.42
						(1769.11)		(1683.66)
Treatment × Worried							-1551.77	-2026.77
							(1697.91)	(1808.31)
Sales Variability		0.736						0.770
		(0.355)**						(0.380)*
High Volatility			117.29					-27.79
			(1426.49)					(1389.15)
Frequent Budget				188.07				-168.08
				(1321.14)				(1260.39)
Time Consistent					2844.27			2734.62
					(540.35)***			(631.38)***
Risk Loving						-1431.87		-1468.53
						(1496.10)		(1132.86)
Worries about making best financial decisions							9.96	-123.79
							(1063.84)	(992.90)
Dep. Var. Mean Control	5,941.36	5,941.36	5,941.36	5,941.36	5,941.36	5,941.36	5,941.36	5,941.36
N	778	778	778	778	778	778	778	778
p-value wild boostrap (T× Var)		0.830	0.494	0.040	0.183	0.790	0.485	
p-value rand. inference (T × var)		0.792	0.260	0.000	0.016	0.789	0.121	

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. OLS estimates are reported from regressing each dependent variable on a dummy indicating whether the borrower was offered a menu of contracts that differ in price and flexibility, or only the standard, rigid contract. Robust standard errors reported in brackets below coefficients are clustered at the branch level. The last two lines of the table report p-values from wild cluster bootstrap and p-values from randomization inference (1,000 replications), respectively, for interaction terms.

We first look at heterogeneous treatment effects of sales variability, which reflects borrowers' attitude to invest in higher return projects that have irregular payment streams. Despite sales variability predicts the take up of the flexible contract, the interaction term shown in column 2 of Table 5 is statistically not significant.

In column 3, we study how treatment effects vary with borrowers' profit volatility. Based on our theoretical framework, we expect this relationship to be positive as the treatment (i.e., a menu of contracts that varies in price and flexibility) allows borrowers with high cash-flow irregularity to smooth this volatility. Empirically, we find that the treatment effect is increasing with cash flow volatility but the coefficient is imprecisely estimated.

Column 4 considers heterogeneity in treatment effects by borrowers' financial accounting skills, measured by the likelihood the entrepreneur drafts a budget on a frequent basis (daily or weekly as opposed to fortnightly or monthly). We find the interaction term to be statistically and economically significant: borrowers with better accounting discipline report 3,757 Indian Rupees higher weekly sales. Furthermore, the treatment effect is not statistically different from zero for borrowers without accounting discipline.

Column 5 and 6 consider heterogeneity by borrowers' time consistency and risk aversion, respectively: although time consistency is a strong predictor of the take up of the flexible contract, the interaction term is statistically not significant. Column 7 examines whether the treatment effect varies with the borrower reporting concerns for future decisions, but we do not find that this interaction term is statistically significant. Finally, Column 8 includes all the interaction variables jointly rather than one at a time. Consistent with results from columns 2-7, only the heterogeneous treatment effect by accounting skills is statistically significant.

Summing up, the main source of borrowers' heterogeneity that explains higher sales in treatment than in the control group is the borrower's regular use of accounting techniques. This finding is in line with existing work on the importance of financial accounting for entrepreneurship (McKenzie

and Woodruff, 2015; Calderon et al., 2020), and highlights that one of the driving forces behind our results is financial discipline, which proves to be a crucial characteristics particularly when borrowers benefit from a financial innovation that implicitly entails the provision of additional liquidity to manage cash flow volatility.

4.5 Further analysis of Heterogeneous Treatment Effects

Results from Table 2 and 3 show that the financial innovation we study has a positive impact on repayment and business outcomes. One potential mechanism explaining these effects is through increased business investment triggered by relaxed credit constraints (Acemoglu and Zilibotti, 1997; Aghion et al., 2010).

As discussed in Section 3.1, Sonata designed the flexible contract to allow borrowers to make investments in view of the business peak season. Given the size of the businesses, inventory represents the main margin of investment hence of business expansion for the entrepreneurs in our study. We therefore study whether keeping regular financial accounting predicts borrowers' purchase of inventory. In a second, related analysis, we also study heterogeneous treatment effects on the likelihood borrowers used the loan from Sonata to purchase more stock during festivals.

4.5.1 Value of Inventory

Table 6 presents heterogeneous treatment effects on the value of business inventory. The dependent variable is the monetary value (in Indian Rupees) of the business inventory for the past 30 days. For consistency with the results shown in Table 5, we look at heterogeneous treatment effects on the value of business inventory at midline. Column 1 of Table 6 presents the average treatment effects. Offering a menu of contract that varies in flexibility and price has a positive impact on the value of inventory at midline, although the treatment coefficient is not statistically significant. Column 2-7 consider all the predictive characteristics and column 8 tests all of the interactions terms together. Borrowers in the treatment group who keep regular financial accounting (column 4) report +21,068 Rupees significantly higher value of inventory. This finding casts additional light on the mechanisms behind our main results: more financially disciplined borrowers, who select into the flexible contract,

increase their business investment and this translates into higher business sales (as shown in Table 3). Column 7 of Table 6 additionally shows that borrowers in the treatment group who were more worried about financial decisions report a significantly lower value of inventory at midline. One possible explanation for this result is borrowers' concerns to be unable to sell their goods or that the inventory stock would decrease in value.

Table 6: Heterogeneous Treatment Effects: Value of Inventory

	Value of Inventory (Midline)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	2430.76	5105.19	3298.95	-5795.99	9536.90	2470.87	11164.90	8559.37
	(6641.34)	(5755.39)	(8345.25)	(6131.24)	(13923.86)	(6196.56)	(8599.84)	(13974.36)
Treatment × Sales Variability		-6.078						-7.756
		(13.972)						(14.864)
Treatment × High Profit Volatility			-6314.96					-2453.05
			(24929.67)					(24603.82)
Treatment × Frequent Budget				21067.83				27830.44
				(11996.11)*				(12833.90)**
Treatment × Time Consistent					-7501.40			-4853.35
					(18314.5)			(14723.82)
Treatment × Risk Loving						-11887.30		-17051.01
						(21883.98)		(19106.07)
Treatment × Worried about future							-30908.62	-32950.58
							(14190.81)**	(13140.97)**
Sales Variability		12.733						12.580
		(3.784)**						(4.023)***
High Volatility			4387.58					4997.79
			(17505.31)					(16524.11)
Frequent Budget				12796.38				8220.77
				(7019.69)				(7508.78)
Time Consistent					13770.36			10510.28
					(12860.77)			(12459.75)
Risk Loving						-8082.60		-11320.00
						(15531.30)		(10997.58)
Worries about making best financial decisions							6779.54	4767.29
							(9172.31)	(8556.49)
Dep Var Mean Control	53294.94	53294.94	53294.94	53294.94	53294.94	53294.94	53294.94	53294.94
N	771	771	771	771	771	771	771	771
p-value wild bootstrap (T × var)		0.755	0.814	0.095	0.635	0.647	0.064	
p-value rand. inference (T × var)		0.501	0.632	0.013	0.250	0.556	0.000	

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. OLS estimates are reported from regressing each dependent variable on a dummy indicating whether the borrower was offered a menu of contracts that differ in price and flexibility, or only the standard, rigid contract. Robust standard errors reported in brackets below coefficients are clustered at the branch level. The last two lines of the table report p-values from wild cluster bootstrap and p-values from randomization inference (1,000 replications), respectively, for interaction terms.

4.5.2 Loan Usage

We complete our analysis by studying heterogeneous treatment effects on loan usage. The main loan usage categories include: make improvement works for the business; start new businesses; purchase more stock during festivals; buy agriculture and farming inputs; buy inputs for other businesses; repay old debt. We also identified non-business related loan usage categories such as consumption and other expenditures (health; education; weddings; purchase of jewelry; funerals).
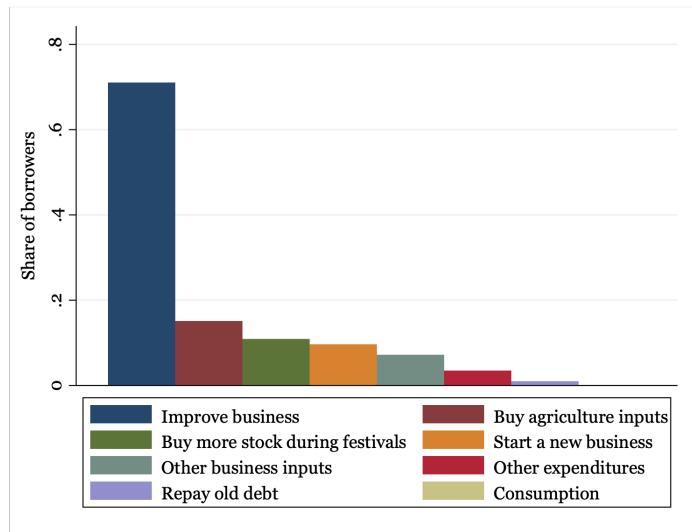
Figure 5: **Main loan usage categories (control group).** This figure shows share of borrowers in the control group that reported using their loans for each of the identified loan usage categories. This information was reported by borrowers during the midline data collection hence we only report here responses from the control group.

Figure 5 reports the share of borrowers in the control group for each of the above-mentioned loan categories.[26] Approximately 70% of borrowers used the loan to improve their business activity, and this evidence is consistent with the fact that borrowers took up business loans. The second and the third most frequent loan usage categories cited by the study respondents are the purchase of agricultural inputs (this is not surprising, as approximately 20% of borrowers are farmers/dairy farmers) and the purchase of additional stock during festivals. Since our goal is to study the mechanisms underlying the observed increase in business outcomes in the treatment group, we focus on the latter loan usage category. Results are shown in Table 7. Additionally, we report average

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[26]Borrowers could report multiple usage of their loans.

treatment effects for all loan usage categories in Table A7 in the Online Appendix.

Column 1 of Table 7 reports the ITT coefficient. Columns 2-7 include interactions and uninteracted terms for the six different characteristics that are predictive of taking up the flexible contract. Column 8 considers all the characteristics and interactions together. Column 4 shows that borrowers who, in the treatment group, report drafting a budget for their business activities on a regular basis are 25 percentage points significantly more likely to use the loan from Sonata to buy more stock during festivals. This finding once more speaks to the idea that individuals who understand and anticipate the challenges of business fluctuations through accurate business planning do also benefit the most from financial innovation (Cole et al., 2017).

Table 7: Heterogeneous Treatment Effects: Loan Usage

	Used the loan to buy more stock during festivals							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.117	0.115	0.123	0.024	-0.084	0.111	0.096	-0.146
	(0.057)**	(0.057)*	(0.056)**	(0.098)	(0.093)	(0.058)*	(0.066)	(0.094)
Treatment × Sales Variability		-0.00001						-0.00001
		(0.00003)						(0.00003)
Treatment × High Profit Volatility			-0.043					-0.024
			(0.086)					(0.084)
Treatment × Frequent Budget				0.245				0.220
				(0.060)***				(0.055)***
Treatment × Time Consistent					0.247			0.211
					(0.084)***			(0.080)***
Treatment × Risk Loving						0.013		-0.024
						(0.106)		(0.105)
Treatment × Worried							0.060	0.013
							(0.061)	(0.061)
Sales Variability		0.0000						0.0000
		(0.00000)						0.0000
High Volatility			0.037					0.020
			(0.061)					(0.058)
Frequent Budget				-0.143				-0.128
				(0.044)***				(0.040)***
Time Consistent					-0.107			-0.090
					(0.056)*			(0.051)*
Risk Loving						-0.108		-0.088
						(0.043)**		(0.035)**
Worries about making best financial decisions							-0.054	-0.038
							(0.033)	(0.030)
Dep. Var. Mean Control	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
N	788	788	788	788	788	788	788	788
p-value wild boostrap (T× Var)		0.893	0.655	0.001	0.020	0.908	0.354	
p-value random. inference (T × var)		0.877	0.422	0.000	0.000	0.897	0.120	

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. OLS estimates are reported from regressing each dependent variable on a dummy indicating whether the borrower was offered a menu of contracts that differ in price and flexibility, or only the standard, rigid contract. Robust standard errors reported in brackets below coefficients are clustered at the branch level. The last two lines of the table report p-values from wild cluster bootstrap and p-values from randomization inference (1,000 replications), respectively, for interaction terms.

4.6   Feedback questions on borrowing experience

Complementing this statistical analysis, we measured borrowers' overall degree of satisfaction with Sonata and the flexible contract through Likert scales administered during the endline data collection.[27] On a scale from 1 (lowest satisfaction) to 5 (highest satisfaction), the average score borrowers gave to their overall experience with Sonata was 4.25, the difference between the treatment and the control group being not statistically significant, revealing an overall positive borrowing experience.[28] The average rate of customers' trust in Sonata at the end of the study was 4.66 – 4.59 if we only consider clients who opted for the flexible contracts – indicating that the lack of the provision of the second holiday did not jeopardise the lending relationship.[29]

We also asked a few additional questions to borrowers who chose the flexible contract, in particular on why they did (or did not) ask for the first repayment holiday. Several borrowers reported they use the repayment holiday when "business was down" or when they had "money problems" (15%). We also find evidence that borrowers used the repayment holiday to buy additional stock during the festival seasons or other festivities (13%). 19% of borrowers reported using the repayment holiday to repay old debt. Finally, we asked the 53 borrowers who chose the flexible contract but did not opt for the repayment holiday the reasons for their choice. 20 of them (38%) said they did not need it. On the contrary, 32 borrowers reported not to have used the flexible contract because they felt they did not have full knowledge about it – once again indicating that one of the main barriers for microentrepreneurs to benefit in full from financial innovations is lack of information and financial skills.

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[27]In addition, at midline, we performed a set of qualitative interviews with a subset of Sonata's borrowers involved in the study. Customers assigned to the treatment group were also asked how they perceived the price of the flexible schedule versus the rigid one, what made them opt for either one or the other. Borrowers who, in the treatment group, opted for the flexible contract, reported that the higher price of the flexible contract was *fair*. This suggests that not only they understood the difference in price between the two contracts, but they also acknowledge that they should pay more for benefiting from a repayment flexibility option.

[28]The specific question was "On a scale 1-5 with 1 the worst and 5 the best, please rate Sonata on the overall borrowing experience".

[29]The specific question was "On a scale 1-5 with 1 the worst and 5 the best, please rate Sonata in terms of your trust in the institution".

4.7 Additional Robustness Checks

Two additional sets of robustness checks are reported in the Online Appendix. First, to test the sensitivity of the dependent variables in Table 3 to outliers, we re-estimate these results by top coding business outcomes at the 99th percentile, instead of 3 standard deviations from the mean. Results are shown in Table A4. Results are almost unchanged, suggesting that the transformation we use limits already the influence of extreme observations. Second, as mentioned earlier, we find similar estimated marginal effects if we estimate the specifications from equation 2 using a linear probability model, rather than the probit estimator (see Table A6).

5 Conclusions

How can a financial innovation like a flexible microfinance product designed to mitigate the negative impact of irregular cash flows be offered in presence of information frictions? We argue that the optimal way for lenders to offer this financial innovation is by introducing a menu of contracts that include both the flexible contract and the standard, microfinance contract with a "rigid"repayment schedule, the former product being more expensive than the latter. Our hypothesis is that offering a financial innovation like repayment flexibility as a more expensive contract option triggers a positive self-selection of borrowers into the repayment schedule that best suits their characteristics. This in turn mitigates the adverse selection problem lenders face and that undermines the realization of the full potential of financial innovations in imperfect financial markets.

We test this hypothesis by implementing a Randomized Controlled Trial (RCT) with a sample of 799 Indian microfinance borrowers. In treatment group, individual-lending borrowers were offered a menu of contracts that includes the flexible, more expensive contract and the rigid, and cheaper,contract. In the control group, borrowers were only offered the rigid contract.

We find that the provision of a more expensive financial innovation designed to mitigate irregular business cash flows has a positive impact on business growth: business sales and profits are significantly higher in the treatment than in the control group. We do find evidence of increased liquidity

in treatment: treated borrowers are significantly more likely to repay their loan in advance and significantly less likely to request additional funding to Sonata during the loan cycle. At the same time, using administrative data on borrowers' repayments, we find similar default rates across the treatment and control group. This indicates that offering repayment flexibility as a more expensive contract does not harm repayment rates hence benefits both borrowers and lenders.

We dig into the mechanisms underlying our main results and study borrowers' selection into the flexible versus the rigid contract. We find that the subset of borrowers that opted for the flexible contract is ex ante significantly different from those who chose the rigid contract, and in the expected direction. Borrowers with larger business fluctuations at the start of the study were more likely to choose the flexible contract. This indicates that the flexible contract has a higher value for borrowers whose business is plagued by irregularities to a higher extent. The menu of contracts mitigates adverse selection along several borrowers' characteristics that are key to successful repayment behavior: borrowers with better formal accounting skills and time-consistent borrowers are significantly more likely to opt for the flexible contract.

Heterogeneity analysis further indicates that our treatment effects are precisely driven by borrowers who were more likely to take up the flexible contract, and in particular by microentrepreneurs with better financial accounting skills: compared with individuals who at baseline reported drafting a budget for their business activity only sporadically, they report higher sales and larger inventory.

Our paper is possibly the first to show that the inclusion of a more expensive financial innovation like repayment flexibility within a menu of contracts is effective at mitigating the adverse selection problem lenders face in imperfect capital markets. By establishing a causal link between the provision of repayment flexibility to mitigate cash flow volatility, borrowers' selection, business performance and repayment rates, our findings indicate that, when information frictions are binding, credit allocation can be improved through well-designed financial innovations.

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A Online Appendix

Month #	Rigid Cash Flows	Flexible Cash Flows
0	38000	38000
1	-2009	-2047
2	-2009	-2047
3	-2009	-2047
4	-2009	-2047
5	-2009	-2047
6	-2009	-304
7	-2009	-304
8	-2009	-304
9	-2009	-2509
10	-2009	-2509
11	-2009	-2509
12	-2009	-2509
13	-2009	-2509
14	-2009	-2509
15	-2009	-304
16	-2009	-304
17	-2009	-304
18	-2009	-3695
19	-2009	-3695
20	-2009	-3695
21	-2009	-3695
22	-2009	-3695
23	-2009	-3695
24	-2009	-3695

Figure A1: **Flexible contract versus rigid contract – Payment Differences.** This figure plots a comparison between the monthly repayments in the flexible and the rigid contracts. In this example (which mirrors the example provided in the leaflet borrowers were given in treated branches), the flexible loan entails the repayment holiday in month 6,7,8 of year 1 and month 15,16,17 in year 2. During these months (highlighted in green), only a small "flexibility fee" was due by flexible borrowers. It can be easily seen that the repayment pattern under the rigid contract remains constant (2,009 Rs per month, including capital and interest rates. In the flexible contract, the higher interest rate applies from the very start. At the same time, monthly instalments increase every time after the end of each repayment holiday.

Table A1: Balancing Checks

Variable	Control Mean	Difference with Treatment	N	p-value
A. Demographic Characteristics				
Household Size	6.01	-0.02	799	0.8982
Age of the Head of the Household (Years)	41.43	-0.02	799	0.9816
Is non-Hindu	0.087	0.023	761	0.5686
Belongs to scheduled caste	0.236	-0.069	761	0.1972
B. Education of Head of the Household				
Household head is unschooled (1=Yes)	0.054	0.012	789	0.484
Household head has only attended primary school (1=Yes)	0.166	-0.021	789	0.5532
Financial Literacy: Knows how to make a budget (1=Yes)	0.627	0.038	799	0.996
C. Income and Assets				
Household Income in the last 12 months	222,006	-13501.64	799	0.2924
Household owns land (1=Yes)	0.402	0.067	799	0.4076
D. Business Outcomes and Characteristics				
Total Business Sales in the last 30 days	13,885.8	-2,466.82	799	0.3018
Difference in profits (best/worst month)	10,151.94	-626.808	793	0.3898
Type of Business				
Manufacturer / Artisan / Tailor	0.124	0.063	799	0.113
Seller / Trader / Contractor	0.137	0.057	799	0.5478
Dairy / Meat / Poultry	0.188	-0.049	799	0.3032
Grocery / Fruits and Vegetables	0.229	-0.058	799	0.1794
Business / Shop / Hotel	0.180	-0.017	799	0.7956
Transport	0.071	-0.008	799	0.602
Services	0.051	0.017	799	0.2466
Labor	0.018	-0.008	799	0.4034
E. Borrowing and Saving				
Has formal loans other than Sonata's loan (1=Yes)	0.132	0.062	799	0.3642
Has informal loans	0.007	0.007	799	0.878
Total formal borrowed (last 12 months)	6,277.78	3,206.45	799	0.2156
Total informal borrowed amount (last 12 months)	125.8053	55.280	799	0.8784
Loan amount received from Sonata	38,890.21	-1,052.15	799	0.2672
Total savings amount	14,374.61	675.504	799	0.6568

Note: Balancing checks for the entire sample of 799 borrowers. All the outcomes were measured at baseline except for the level of education of the head of the household and religion and caste that were measured at midline (education) and endline (religion and caste). Household income, business sales, as well as total formal and informal borrowed amount have been topcoded at 3 standard deviations from the mean. The last column shows p-values from from wild cluster bootstrap. Variables definition reported in Table A7.

Table A2: Analysis of Attrition

Variable	Control Mean	Difference with Treatment	N	p-value
	(1)	(2)	(3)	(4)
Attrition from Baseline to Midline	0.012	0.004	799	0.7117
Attrition from Baseline to Endline	0.051	-0.001	799	0.8799
Attrition from Midline to Endline	0.044	0.002	799	0.8159

Note: This table performs balance checks for attrition rates between the treatment and the control group. A total of 799 subjects were interviewed at Baseline; 789 were interviewed at Midline; 761 were interviewed at Endline. *Attrition from Baseline to Midline* is a dummy that is one if a respondent was interviewed in the baseline data collection, but was not found at the midline data collection. *Attrition from Baseline to Endline* is a dummy that equals one if the respondent was interviewed at Baseline but not at Endline. *Attrition from Midline to Endline* is a dummy that equals one if the respondent was interviewed at Baseline and Midline but not at Endline. Column (4) reports p-values from wild cluster bootstrap.

Table A3: Treatment Effects on Formal and Informal Borrowing

Dependent Variable	N	Mean of dep. var. control group	Household covariates included? with LASSO	All	p-value wild bootstrap	p-value rand. inference
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Midline						
Total Formal Borrowed Amount	783	4,737.20	4,890.44 (2,803.80)*	4,411.54 (2,599.74)	0.258	0.061
Total Informal Borrowed Amount	783	123.76	115.49 (163.31)	137.31 (162.34)	0.795	0.544
Panel B: Endline						
Total Formal Borrowed Amount	759	12,253.32	-4,568.84 (2,273.94)**	-4,905.66 (2,176.41)**	0.179	0.046
Total Informal Borrowed Amount	759	2,555.55	257.83 (844.62)	-24.86 (948.19)	0.841	0.981

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Total Formal Borrowing amount includes outstanding loans from banks and MFIs, excluding the loan from Sonata. Informal Borrowed Amount includes outstanding loans from moneylenders, employers, friends/relatives/neighbors and landlords. Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in brackets below coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications). All outcomes are top-coded (3 standard deviations from the mean).

Table A4: Treatment Effects on Business Outcomes

Dependent Variable	N	Mean of dep. var. control group	Household covariates included?		p-value wild bootstrap	p-value rand. inference
			with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Midline (top coded 99th percentile)						
Monthly Sales	781	25,094.06	3,363.04 (2,223.96)	4,099.72 (2,193.81)*	0.287	0.159
Weekly Sales	778	6,064.76	1,676.34 (608.40)***	1,617.06 (630.79)**	0.091	0.029
Monthly Profits	781	23,176.67	3,783.33 (2,322.09)	4,019.44 (2,240.51)*	0.294	0.180
Panel B: Endline (top coded 99th percentile)						
Monthly Sales	761	23,359.11	6,009.16 (2,064.54)***	5,235.76 (2,078.50)**	0.077	0.094
Weekly Sales	761	5,366.25	776.01 (573.11)	657.49 (595.69)	0.418	0.317
Monthly Profits	761	-5,169.55	5,769.66 (2,319.71)**	5,421.01 (2,317.64)**	0.091	0.055

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Monthly sales refer to business sales in the last 30 days; Weekly sales refer to business sales in the last 7 days. Monthly profits are computed as monthly sales minus monthly costs. Column (2) reports the mean of the dependent variable for the control group. Note that costs at midline were imprecisely elicited; this explains the (large) difference between average level of profits at midline and endline shown in column (2). Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in brackets below coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications). All outcomes are top-coded (99th percentile). Profits are also bottom-coded (1st and 99th percentile).

Table A5: Summary statistics, variables predicting flexible loan take-up (only Treament)

Variable	N	Mean	SD	p10	p50	p90
A. Wealth and Business Outcomes						
Household owns land (1=Yes)	389	0.535	0.499	0	1	1
Household Income (log)	389	12.08	0.593	11.36	12.10	12.82
Monthly Business Sales (log)	389	8.49	2.60	7.60	9.21	10.13
Variability of Sales (scaled)	389	132.10	456.51	0.648	46.309	219.192
High Profits Volatility (1=Yes)	389	0.149	0.357	0	0	1
B. Financial Sophistication and Locus of Control						
Does Budget Frequently (1=Yes)	389	0.373	0.484	0	0	1
Time Consistent (1=Yes)	389	0.792	0.407	0	1	1
Risk Loving (1=Yes)	389	0.051	0.221	0	0	0
Worries about making best financial decisions (1=Yes)	389	0.257	0.438	0	0	1
Has control over their life	387	4.556	1.267	3	5	6

Summary statistics for the variables used to study selection into the flexible contract (only for the 389 borrowers in the treatment group). See Table A7 in the Appendix for variable definitions.

Table A6: Variables predicting borrowers' selection in the flexible contract (Linear Probability Model)

	Probability to Take Up the Flexible Contract										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
The household owns land	0.086										0.082
	(0.052)										(0.053)
Household income (log)		0.010									0.0201
		(0.041)									(0.043)
Business sales (last 30 days, log)			-0.003								-0.011
			(0.009)								(0.009)
Variability of sales (last 30 days, scaled)				0.0001							0.0001
				(0.00004)**							(0.0004)*
High profits volatility					0.096						0.077
					(0.068)						(0.065)
Does budget frequently						0.090					0.078
						(0.052)*					(0.053)
Is time consistent							0.176				0.140
							(0.050)***				(0.050)***
Is risk loving								0.201			0.174
								(0.125)			(0.122)
Worries about making best financial decisions									0.176		0.141
									(0.058)***		(0.059)***
Has control over their life										-0.029	-0.029
										(0.020)	(0.0220)
N	389	389	389	389	389	389	389	389	389	387	387
Dep. Var. Mean	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Joint significance: All Coeffs = 0 (P-Value)											0.0003

Note: Standard errors in parentheses. OLS estimates are displayed. All variables are measured at the baseline. *The household owns land* is a dummy that equals one if the household reports owning land at baseline. *Household income* is the log of overall income of the household (topcoded 3 standard deviations from the mean). *Business sales* is the log of sales reported by borrowers in the last thirty days (topcoded 3 standard deviations from the mean). *Variability of sales* is measured as the (scaled) squared difference between total sales in the last month and the mean value of total sales in the last month. *High profits volatility* is a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile. *Does budget frequently* is a dummy that equals one if the respondent reports drafting a budget for their business activity on a daily or weekly basis (as opposed to fortnightly, monthly, or even more sporadically). *Is time consistent* and *Is risk loving* are dummies reflecting borrowers' attitude towards time discounting and risk as discussed in appendix B. *Worries about making financial decisions* is a dummy that equals one if the borrower reports being worried about making the best financial decisions. *Has control over their life* is a locus of control dummy constructed from borrowers' answer to the question "How much freedom of choice and control do you have in your life?" Business-activity dummies, head and education of the head of the household are included in every specification.

Table A7: Treatment Effects on Loan Usage

	N	Mean of dep. var. control group	Household covariates included?		p-value wild bootstrap	p-value rand. inference
			with LASSO	All		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Improvement Works to the Business	788	0.710	0.034 (0.056)	0.043 (0.056)	0.696	0.146
Agricultural Inputs	788	0.151	-0.055** (0.022)	-0.057** (0.023)	0.080	0.000
More Stock During Festivals	788	0.109	0.118** (0.051)	0.117** (0.057)	0.144	0.000
Start New Business	788	0.097	-0.023 (0.030)	-0.020 (0.030)	0.642	0.337
Buy Business Inputs in Normal Times	788	0.072	-0.016 (0.020)	-0.017 (0.019)	0.588	0.319
Other Expenditures	788	0.035	0.013 (0.016)	0.014 (0.014)	0.557	0.345
Repay Old Debt	788	0.010	-0.001 (0.006)	0.002 (0.007)	0.915	0.764
Consumption	788	0	0.011* (0.006)	0.010* (0.006)	0.138	0.079

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. All dependent variables are dummies for loan usage categories. For a description of each variable please refer to table A7. Borrowers could report multiple loan categories hence the sum of the mean of the dependent variables displayed in column (2) is larger than one. Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in brackets below coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications). All outcomes are top-coded (3 standard deviations from the mean).

Table A7: Variable Definitions

Variable	Definition
Has fully repaid by the due date	Dummy variable equal to 1 if the borrower has finished repaying their loan (the one under study) on time
Has fully repaid before the due date	Dummy variable equal to 1 if the borrower has finished repaying their loan (the one under study) before the due date
Has requested a loan top up	Dummy variable equal to 1 if the borrower has applied for a loan top up from Sonata or any other formal financial institution
Monthly Sales	Total Business Sales in the past 30 days. This variable is top coded at 3 standard deviations from the mean.
Weekly Sales	Total Business Sales in the past 30 days. This variable is top coded at 3 standard deviations from the mean.
Profits	Monthly business profits are computed as the difference between total monthly sales and total costs. Costs include: input costs; rent of land and cost of storage; utilities; wages/salaries; travels to meet suppliers; marketing; renovation of business premises; cleaning and maintenance costs; rent on machinery and equipment; minor repairs. Both monthly sales and monthly costs are top coded at 3 standard deviations from the mean. Note that at midline, we only asked borrowers to report total costs for wages, rent, water and electricity, as well as direct inputs. This variable is also bottom-coded at -3 standard deviations from the mean.

Table A7 (continued): Variable Definitions (used in the analysis of selection)

Variable	Definition
The household owns land	Dummy variable equal to 1 if the household reports owning land at baseline
Household Income	Total household income at baseline computed by summing up income from primary and secondary occupations of each household member. Before taking the log, household income has been topcoded, 3 standard deviations from the mean
Business Sales	Sales in the last 30 days preceding the baseline. Before taking the log, the variable has been topcoded, 3 standard deviations from the mean.
Variability of Sales	(Scaled – divided by 1,000,000) squared difference between total sales in the 30 days preceding baseline (topcoded, 3 standard deviations from the mean) and the mean value of total sales in the last month from the control group.
High profits volatility	At baseline, we asked borrowers to report the profit in the best and the worst month of the past year. We then create a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile.
Does budget frequently	Dummy variable equal to 1 if the borrower reported drafting a budget for their business activity on a daily or weekly basis (and 0 if they draft a budget fortnightly, monthly, or on a more sporadic frequency).
Is time consistent	Dummy variable equal to 1 if the borrower displayed unbiased time preferences as elicited in the protocol discussed in Section B.
Is risk loving	Dummy variable equal to 1 if the borrower switches to lottery B in round 2 or earlier, thus displaying a risk-seeking behavior from the risk-elicitation lottery discussed in Section B.
Worries about making financial decisions	Dummy variable equal to 1 if the borrower reported always or often worrying about making decisions to manage households' finances (as opposed to be rarely or just sometimes worried).
Has control over their life	On a scale from 1 to 10, respondents report how much control over their life choices they have (vs. how much their life choices depend on fate or others), where 1 corresponds to no choice at all and 10 corresponds to a very great deal of choice.

Variable	Definition
Agriculture and Farming Inputs and Assets	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to purchase agriculture-related machinery or other agriculture and farming inputs; land; livestock.
Business Inputs and Assets	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to purchase inputs for grocery shops, garment suppliers, tailoring and embroidery.
Improvement Works	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to finance improvement works to the business during normal times.
Start New Business	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to start a new business.
Buy More Stock During Festivals	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to purchase of more stock during major festivals or other festivals.
Repay Old Debt	Dummy variable equal to 1 if the borrower reported using the loan from Sonata to repay old debt.
Consumption	Dummy variable equal to 1 if the borrower reported using the loan from Sonata for household consumption.
Other Expenditures	Dummy variable equal to 1 if the borrower reported using the loan from Sonata for health expenditures, weddings; home improvements; purchase of jewelry; funerals.

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Table A7 (continued): Outcome Variables Definitions

Variable	Definition
Inventory	Amount of stock the borrower currently has in their business. The variable is top coded at 3 standard deviations from the mean.
Formal Borrowed Amount	Total amount from formal outstanding loans. These include loans from banks and MFIs, excluding the loan from Sonata. This variable has been top coded at 3 standard deviations from the mean.
Informal Borrowed Amount	Informal borrowed amount is the total amount from informal outstanding loans. These include loans from moneylenders, employers,friends/relatives/neighbors and landlords. This variable has been top coded at 3 standard deviations from the mean.

B Eliciting borrowers' time and risk preferences

B.1 Time Preferences

We assessed subjects' intertemporal preferences using standard list choices, similar to Harrison et al. (2002). This protocol consisted of two hypothetical lotteries. In the first, the respondent had to choose between 200 Indian Rupees (Rs. 200) to be received the day after the interview and an equal or larger sum (Rs. 200, 240, 260, 280, 300) to be received one month later. The second lottery "shifted" the time horizon of the first lottery by three months. Combining the two lotteries allows one to estimate the subjects' discount rate and detect any time inconsistency. If a subject preferred Rs. 260 one month later to Rs. 200 paid tomorrow, she should have also preferred Rs. 260 paid four months in the future to Rs. 200 paid three months in the future. This behavior is defined as "time consistent." Still, preference "reversals" may emerge. For example, when a subject prefers Rs. 260 one month later to Rs. 200 paid tomorrow, but the choice is reverted for the later rewards, the subject is said to display hyperbolic discounting, as shown by Mahajan and Tarozzi (2012). Conversely, when a subject prefers Rs. 260 one month later to Rs. 200 paid tomorrow, but this choice is reverted for the earlier rewards, the subject displays anti-hyperbolic discounting.[30]

B.2 Risk Preferences

Borrowers' attitude toward risk was measured with a standard Multiple Price List (MPL), similar to Holt and Laury (2002). The MPL protocol in our case consists of presenting the subjects with two different hypothetical lotteries, Lottery A and Lottery B, entailing six decisions. Payouts are constant in both lotteries, but the probabilities of success change from one decision to the next, with Lottery B being riskier than lottery A. Until round three, lottery A gives a higher expected value than lottery B. Starting from round four, Lottery B yields a higher expected value. Therefore, subjects who stay with Lottery A longer than three rounds display increasing levels of risk aversion. Conversely, subjects switching to Lottery B in the earlier rounds display increasing levels of risk-tolerating behavior.

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[30]Although less documented in the behavioral economics literature, anti-hyperbolic discounting has been reported in a number of contexts (see Read et al., 2013).