# Knowing what's good for you:
# Can a repayment flexibility option in microfinance contracts improve repayment rates and business outcomes?[*]

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## Abstract

Repayment flexibility in microfinance contracts can enable clients to undertake higher return projects that have irregular payment streams. But there is the risk of increased default due to time-inconsistent or risky borrower behavior. How severe is this default risk and can it be mitigated simply by using contract price as a screening mechanism? To examine this we implement a randomized experiment with microfinance borrowers in Uttar Pradesh, India. In treated branches, borrowers select between the standard, rigid contract and a more expensive flexible contract. In control branches, customers are only offered the standard rigid contract. Clients in treated branches have higher repayment rates and higher business sales compared to control group. Selection is an important mechanism – in treated branches, time-consistent and more financially disciplined borrowers are significantly more likely to opt for the flexible repayment schedule.

**Keywords**: Microfinance, Repayment Flexibility, Borrowers' Selection, Contract Design
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# 1  Introduction

Repayment flexibility allows borrowers to make larger investments and to insure themselves against negative cash-flow shocks. Flexible repayment schedules can be especially useful to microentrepreneurs living in developing countries, who are likely to experience irregular income streams but are constrained by a limited set of financial instruments to cope with volatile cash flows.

Yet flexible debt contracts might not suit *every* borrower. Borrowers differ in their business characteristics and behavioral traits; those who are time-inconsistent or highly risk-loving may be more likely to default under repayment flexibility. It follows that in contexts where it is costly for lenders to ascertain borrowers' characteristics (as is often the case in developing countries), offering flexible contracts to all customers can translate into high default rates (Field et al., 2013, Czura, 2015). As lenders cannot identify ex-ante which customers may be more or less suitable for a flexible repayment schedule, they find it risky to offer repayment flexibility. This explains why most microfinance institutions (MFIs) rarely offer flexible contracts and, instead, provide standardized "rigid" contracts. Such contracts require frequent repayments to help borrowers keep repayment discipline, thus ensuring high repayment rates.

The poor performance of flexible repayment schedules in microfinance presents a challenge as to how such contracts can be designed and offered in order to be sustainable for MFIs. In this paper we argue that allowing borrowers to choose between a flexible and a rigid contract, when the former is made more expensive than the latter, mitigates the adverse selection problem lenders face that prevents them from realizing the full potential of flexible contracts. Offering repayment flexibility as a more expensive contract option triggers a (positive) selection mechanism wherein borrowers choose the repayment schedule that best suits their characteristics.

If a flexible contract were provided at the same price as the rigid contract, it would be implicitly more advantageous, since it would include the repayment flexibility without additional costs. Borrowers who instead choose the rigid contract over the flexible contract, despite the latter being cheaper, likely are doing so for behavioral motives – that is, because they are sophisticated enough to understand they need a "commitment device" to discipline themselves to comply with the rigid repayment schedule. These borrowers are willing to sacrifice the economic benefits of a flexible schedule to avoid defaulting and to continue their relationship with the lender.

Conversely, a contract where the repayment schedules are offered simultaneously at different prices would trigger a selection mechanism based not only on borrowers' behavioral traits but also

on their expected returns to capital. Indeed, borrowers are likely to choose the flexible contract as long as their returns to capital are equal to or higher than the price of the flexible contract. By contrast, borrowers whose returns to capital are lower than the contract price are screened out (De Mel et al., 2008; McKenzie and Woodruff, 2008; Barboni, 2017). The more expensive flexible option should be chosen not only by borrowers who are already financially disciplined and therefore do not need a commitment device, but also by those who are more likely to invest in high-risk and high-return projects and thus have higher expected returns to capital. Such contracts should perform better, both in terms of business income and repayment rates, than a contract where microfinance borrowers are exogenously assigned the flexible schedule or where they are offered only the standard microfinance contract that does not allow a repayment holiday.

We test these predictions through a Randomized Controlled Trial set up in Uttar Pradesh, India and carried out in partnership with a local Microfinance Institution, Sonata Microfinance Ltd. (Sonata hereafter).[1] The experiment is used to study the impact of offering a choice between a flexible, more expensive contract and a standard, rigid, and cheaper contract, on both repayment rates and business outcomes. We designed the flexible contract in collaboration with Sonata to allow borrowers to waive repayments during the loan cycle and to exercise this option whenever they needed it the most. The flexible contract gives borrowers the possibility to "reshuffle" their cash flows throughout the year and to smooth out business irregularities.

About 800 customers from Sonata were involved in the experiment across twenty-eight branches, half of which were randomly assigned to the treatment group. These borrowers had just graduated from group loans and had approached Sonata for the first time for individual loans, which are larger in size than typical group loans and targeted for business purposes. In treated branches, the lender offered both the flexible and the standard rigid contract, the former being more expensive than the latter. In control branches, only the standard rigid contract was offered.

Our results show that flexible contracts are desirable for microfinance borrowers, even when they are more expensive than the standard rigid contract. In fact, almost one-third of the treated borrowers chose the more expensive flexible contract versus the rigid one. When comparing treatment and control group about one year after the start of the intervention, we find that offering a pricy flexible option has a positive impact on borrowers, along several dimensions. Consistent with the idea that a flexible contract allows borrowers to manage their cash flows better throughout the year, and

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[1] http://www.sonataindia.com

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therefore to reinvest their profits to a greater extent, we find that weekly sales are 20 percent higher in the treatment than the control group. We detect an increased variability of sales, suggesting that treated borrowers are more likely to invest in high-risk and high-return business activities. We also find that treated borrowers are less likely to request additional loans from Sonata, confirming that the flexible contract provides additional liquidity to borrowers. At the same time, borrowers in the treatment group are 5 percentage points less likely to be late with their monthly repayments, suggesting that the selection mechanism triggered by the contract works effectively and that offering repayment flexibility as a more expensive contract option is also optimal for lenders. Taken together, our findings show that including a flexible repayment option at a higher price improves borrowers' returns without undermining repayment rates. Most importantly, such contracts appear sustainable for microfinance lenders.

In contrast to previous studies on repayment flexibility (Field et al., 2013; Czura, 2015), our novel experimental design allows us to relate borrowers' choice of the flexible versus the rigid contract with their business characteristics and behavioral traits. We find that time-consistent borrowers, those who draft a budget for their business activity more frequently and those who report being more worried about households' expenditures, are more likely to opt for the flexible contract. This result suggests that offering both repayment schedules simultaneously, and including a pricy flexibility option, selects "high-quality" entrepreneurs into the flexible contract.

One caveat to the interpretation of our results is that, for some outcomes – in particular business outcomes –, we have data only for the first year of the borrowers' loan cycle.[2] Additional survey rounds will be necessary to understand whether these short-term outcomes persist over time.[3] Additionally, one might argue that such a combination of contract features (price and flexibility option) represents a potential limitation to the interpretation of our results. Including a treatment where both contracts had the same price might have neutralized borrowers' demand for repayment flexibility, but was not feasible because of administrative and bureaucratic constraints.[4] In order to address this issue, at least partly, we performed a set of qualitative interviews with treated borrowers and asked how they perceived the price of the flexible schedule versus the rigid one and what made them opt

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[2]At the end of April 2018, we performed another round of data collection for repayment rates. Results will be discussed in Section 4.

[3]The maturity of the loan under study, as we will explain extensively in the following sections, is twenty-four months.

[4]Battaglia et al. (2017) study the introduction of repayment flexibility when the flexible contract is priced at the same interest as for the rigid contract. Though their flexible contract have different characteristics, they find similar results to our paper.

for one or the other. Results suggest that borrowers consider the higher price of the flexible contract "fair" – they seem to recognize that the advantages of benefiting from a repayment flexibility option should come at a premium.

Our paper is the first to study borrowers' selection in the context of flexible repayment contracts and to establish a causal link between borrowers' selection, repayment rates, and business growth. More generally, our paper is intended to contribute to the growing debate on customers' selection in credit contracts in developing countries by showing that a screening mechanism that builds on contract choice through different prices could be implemented effectively to identify more entrepreneurial and financially sophisticated borrowers, when lenders lack information on their quality.

We see the contribution of our paper to the microfinance literature as threefold: first, we test the impact of flexible schedules on repayment rates and business growth in a viable context for MFIs. One objective of this study has been to provide guidance to Sonata – and, in general, to MFIs – on how to introduce flexible repayment schedules in a sustainable way. Our paper aims to contribute to the research on the role of innovations in microfinance contracts in developing countries to promote entrepreneurship among micro- and small enterprises without negatively affecting repayment rates (Feigenberg et al., 2013; Field et al., 2013; Gulesci et al., 2017; Czura, 2015). Our study not only corroborates previous findings that rigid microfinance schedules impede microentrepreneurs' business activities from growing beyond subsistence level (Field et al., 2013; Fischer, 2013), but we also show that the rigid contract can be less profitable for lenders compared with a menu of contracts where both schedules are offered simultaneously with different prices (Barboni, 2017).

Second, we address the issue of selection in microfinance contracts by studying a novel way for lenders to screen borrowers: leveraging their sensitivity to contract price. We show that when a pricy flexible option is available, borrowers select the contract that is optimal both for themselves and for the lender. Our findings therefore suggest that by offering appropriate financial contracts, lenders are able to identify more entrepreneurial and financially disciplined borrowers, even in the absence of traditional screening instruments like credit bureaus or balance sheet data. In this sense, our study is closely related to Rigol et al. (2017)'s paper, which analyzes the role of local information in predicting microentrepreneurs' quality and find that peers can predict "high types" of entrepreneurs in their network.

Last, our paper speaks to the literature that analyzes how financial products can reduce the neg-

ative effects of behavioral biases (Bauer et al., 2012; John, 2015; Ashraf et al., 2006; Brune et al., 2016; Sprenger and Stavins, 2010). Our results show that behavioral traits that can lead to poor repayment (and business) performance, and which often deter lenders from introducing more sophisticated financial products, can be largely mitigated by allowing borrowers to choose their preferred repayment schedule. Our paper aligns with Bauer et al., 2012, who finds that time-inconsistent borrowers are more likely to prefer a rigid contract to a flexible one, precisely because it works as a commitment device. Although less-frequent repayment schedules have been shown to lead present-biased borrowers to over-borrow, at least theoretically (Fischer and Ghatak, 2010), our findings suggest that even time-inconsistent borrowers can discipline themselves by choosing the most appropriate contract for themselves.

From a policy perspective, our experiment leads to two main sets of recommendations: First, offering flexible schedules as a contract option represents an optimal strategy not only for lenders but also for borrowers. Despite the common belief that the rigid repayment schedule is necessary to discipline borrowers,[5] it may be beneficial for MFIs to move from the standard rigid contract toward more sophisticated contracts that allow borrowers to select their preferred repayment schedule. Second, behavioral characteristics matter for contract choice. Therefore, for microfinance borrowers' business activities to grow beyond the subsistence level and for them to continue to have access to microcredit, MFIs should offer more tailored financial products whose design takes into account borrowers' behavioral traits.

The remainder of the paper is organized as follows. Details on the flexible contract are discussed in Section 2. Section 3 describes the experiment and its target population; results, both in terms of business performance and repayment rates, are discussed in Section 4. That section also explores whether an effective selection has been implemented by offering both repayment schedules simultaneously. Section 5 concludes.

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[5]In his prominent book "Banker to the Poor," while describing the creation of the Grameen Bank, the first Microfinance Institution, Yunus (2003) stressed the importance of having "equal weekly installments [and] repayments start[ing] one week after the loan" (p. 110). He also emphasized that frequent repayments were more manageable and easier to be repaid, as "[...] large amounts are difficult to part with" (ibid., p. 31). In Yunus' opinion, rigid repayment schedules allow borrowers to maintain financial discipline.

## 2 The flexible contract

From January 2016, we partnered with an Indian Microfinance Institution, Sonata Financial Services Ltd. (Sonata), to design a flexible contract to offer its customers. Sonata is based in Lucknow (Uttar Pradesh, northern India) and operates throughout India with a network of 316 branches (data from 2016). Like most Indian MFIs, Sonata offers both group and individual loans. Individual loans are usually more expensive than group loans, are for larger amounts, and are targeted for business purposes. Customers who want to take an individual loan from Sonata must first have taken a few group loans (usually between three and four group loans). Conditional on their successful repayment behavior in the group lending schemes, these borrowers are then eligible for individual loans.

At the time we started discussions with Sonata, they did not have flexible contracts, but were interested in these innovative products and therefore we developed them together. The aim was to offer a flexible contract that would help borrowers cope with business fluctuations, whether from high-risk investments or other negative income shocks. Concerns for higher levels of borrower default under more flexible schedules had prevented the implementation of such a contract.[6]

With this in mind, we helped the product team at Sonata design a contract that would give borrowers the possibility to waive repayments at some point during the loan cycle and to exercise this option when they needed it the most. This, in turn, would allow individual-lending customers to better manage their business cash flows.

The flexible contract which resulted feasible gives borrowers the opportunity to exercise a three-month repayment holiday, which must be continuous. As all loans offered by Sonata have a maturity of twenty-four months,[7] this repayment holiday can be used twice over the entire loan maturity, once every twelve months. To be eligible to exercise the first repayment holiday, borrowers have to successfully repay at least three monthly loan installments after loan disbursal. Once this condition is satisfied, they can exercise the repayment holiday any time they want, provided they give Sonata a one-month notice.

Figure 1 shows a representation of the flexible contract Sonata ultimately offered, and highlights how it differs from the rigid contract usually offered by the MFI. It plots the outstanding amount of the loan over the number of installments to be repaid by Sonata's customers. The standard, rigid contract can be thought of as a "straight bond": Borrowers have to repay equal installments (which

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[6]This means that when we started the intervention, Sonata had never before offered a flexible contract.
[7]Borrowers still have the possibility of repaying the loan in advance if they want to.

include capital plus interest) on a monthly basis over the entire loan cycle. The flexible contract, in contrast, allows borrowers to suspend payments for some time during the loan cycle. At the end of this repayment holiday, repayments resume and the residual outstanding amount to be repaid is spread over the remaining installments. As a result, the size of the installments after the repayment holiday is larger than before the repayment holiday. The flexible contract can be thought as a "line of credit" available to borrowers (Sannikov, 2007): By skipping repayments, borrowers are implicitly provided with more liquidity, which can be used as a buffer against shocks or to make business investments.

Since the flexible contract carries a higher risk, it would be a more expensive option than the standard, rigid contract. To calculate the right interest rate that would entice borrowers who would be successful we built on the results from a set of lab-in-the-field games where we elicited borrowers' (hypothetical) willingness-to-pay for a flexible, as opposed to a rigid, microfinance contract (Barboni, 2017), we arrived at the price of the flexible contract at 26%, versus the rigid contract, which was offered at 24%.[8]

A more detailed description of how the flexible contract works "in practice" is shown in figure 2.[9] 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), but borrowers end up paying different installments each month. As already discussed, both borrowers would start repaying with a monthly schedule, the customer choosing the flexible option having a slightly larger installment, 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 have to pay a small "flexibility fee". Once the repayment holiday is over, monthly repayments resume, and the residual loan balance is spread across the remaining months. If borrowers decide to exercise the repayment holiday again during the second year of their maturity, they must do so before the 21st month. This is to avoid installments that would become too large for the borrowers in the very last months of the loan cycle.

Such a contract structure ensures that the Net Present Value of the flexible contract is always higher than the rigid contract – from the moment of the contract choice, the flexible contract is more

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[8]Sonata charges 24% on its "regular" rigid individual loans.

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

expensive than the rigid one.

## 2.1   Selection and repayment flexibility

By offering both contracts simultaneously, one being more expensive than the other, borrowers should select the repayment schedule that suits best their characteristics. In terms of business performance, customers should select the flexible schedule if their expected returns to capital are higher than its price, and the opposite for the rigid schedule. At the same time, sophisticated borrowers – that is, those who are aware of their personality traits and of any bias that might affect their behavior – should choose the contract that helps them maximize their repayment rates, if they value continuing their relationship with the lender.

The type of behavioral biases we consider here range from borrowers' time-inconsistency (especially in the form of lack of self-control), to excessive risk-taking behavior, to a lack of fiscal discipline or adequate financial literacy. While borrowers may not necessarily display all of these traits simultaneously, what these have in common, in the context of micro and small enterprises, is that they may compromise borrowers' ability to correctly predict and evaluate cash flows, potentially leading to poor repayment performance.

From a theoretical perspective, selection in microfinance contracts through flexible repayment schedules has received very little attention. The only exception we are aware of is Barboni (2017), who looks at borrowers' selection into rigid and flexible contracts based on their time-inconsistency, in the form of present-bias, which is modeled as $\beta$-$\delta$ discounting.

Barboni's model shows that by offering both contracts simultaneously, the flexible contract being more expensive than the rigid one ("mixed contract"), the microfinance lender can reach a separating equilibrium where present-biased borrowers will choose the rigid contract, while time-consistent ones will opt for the flexible contract. Importantly, this contract performs better than the standard rigid contract when enough borrowers in the pool are time-inconsistent.

These theoretical predictions were then tested through a set of lab-in-the-field games, in the form of a Multiple Price List (MPL), with microfinance borrowers in India. The games consisted of a hypothetical willingness-to-pay lottery, which is used to estimate the demand for repayment flexibility, as well as to elicit borrower "types" along many dimensions, including behavioral traits. Consistent with the model, Barboni finds that preferences for the rigid versus the flexible repayment schedule highly correlate with borrowers' behavioral characteristics. In particular, different attitudes toward

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risk and business performance significantly drive borrowers' choice for rigid versus flexible contracts.

In this paper, we design a field experiment that allows us to assess how relevant borrowers' behavioral traits are for contract choice. Building on Barboni (2017), we conjecture that, if the screening mechanism works effectively, we should observe borrowers with time-inconsistent preferences, as well as high risk aversion levels and low financial literacy rates choosing the rigid contract to a larger extent than the flexible contract. This is because such borrowers might be more exposed to the perils embedded in a flexible repayment schedule. Conversely, time-consistent and more risk-loving, or financially sophisticated borrowers should opt for the flexible repayment schedule. They would benefit from the possibility to "reshuffle" their cash flows and repayments over time and at the same time have the ability to correctly manage the larger installments following a repayment holiday.

We therefore generalize Barboni's theoretical predictions and make the following:

**Prediction 1**

*The pricing structure of the contract menu acts as a screening mechanism and enhances borrowers self-selecting a repayment schedule based on their characteristics.*

**Prediction 2**

*If Prediction 1 is satisfied, offering the flexible and the rigid contract simultaneously has better outcomes than the standard, rigid contract in terms of repayment rates, business outcomes, and, as a consequence, the lender's profits.*

Capturing every borrower's trait that can be predictive of the take-up of either the rigid or the flexible schedule is a relatively unexplored task. At baseline, we collected extensive data that aimed at gathering a full set of subjects' characteristics, including, among others, time preferences, risk preferences, financial literacy, personality traits through the "big 5" personality test, ambitions, expectations, and usage of time.

In the next sections, we provide an extensive discussion of how we use these characteristics to assess whether providing the flexible and the rigid contract simultaneously works as an effective screening mechanism.

# 3 The Experiment

To test the above predictions, we designed and set up a field experiment in India in collaboration with IFMR-LEAD, which organized and carried out all the field operations. It began in January 2016 and is still on-going.[10]

Twenty-eight branches of Sonata were selected in Uttar Pradesh for the experiment[11], either in urban or peri-urban areas, and randomly assigned to either the treatment or the control group using a pair-matching algorithm, as shown in Figure 3.[12]

Figure 4 shows the experimental design. Both in the control and treatment groups, subjects approached the branch to get a twenty-four month individual loan with a rigid repayment schedule, which is offered by Sonata at a standard interest rate of 24%.[13] Branches have a catchment area spanning several kilometers, and borrowers usually approach the closest bank branch to their place of residency or business location.[14]

Once Sonata's loan officers ascertained eligibility for an individual loan, customers in treated branches were offered the opportunity to choose between the product they asked for (i.e., the rigid contract) and a flexible contract offered at an interest rate of 26%. Customers in control branches were only offered the rigid contract at 24%. All subjects were micro-entrepreneurs who took up the loan to make an investment for their business activity.[15]

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 his loan. The treatment effects we find and discuss in this paper should therefore be interpreted as short-term outcomes. To validate present results and study longer-term outcomes, we are planning to carry out at least one additional follow-up survey after the end of the loan cycle.[16]

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[10]We will perform at least another round of data collection in the coming months.

[11]Around 9% of Sonata's total branches

[12]Our unit of randomization is the bank branch and, because of that, we always cluster standard errors at the branch level. In the coming sections, we also discuss randomization inference.

[13]The same interest rate applies, irrespectively of loan size.

[14]In order to avoid any "learning" effect, we included in the experiment first-time individual lending borrowers. Results from robustness checks performed to account for any potential sample selection bias are available upon request.

[15]Sonata indeed collects detailed data on the loan purposes and verifies them.

[16]In April 2018, approximately after one year from the midline, we performed another round of (phone-based) data collection for repayment rates only. Results for medium-term repayment rates are shown in the

Since customers were offered the flexible repayment schedule as a more expensive option than the rigid contract – that is, the intervention comes as a bundle (option *and* price) – our experimental design does not distinguish the selection deriving from the provision of repayment flexibility as a contract choice from the selection triggered by borrowers' demand for flexibility at different prices. The ideal design for such an experiment would have involved randomizing the price of the flexible contract across different branches, but was not feasible because of technical and administrative reasons.

Before the intervention we ran a set of hypothetical willingness-to-pay lotteries in the form of a Multiple Price List and used those to estimate microfinance borrowers' demand for repayment flexibility. Results from these experiments are extensively discussed in Barboni (2017).[17] They show a substantial drop in borrowers' demand for a flexible contract when the difference in price between the flexible and the rigid contract is equal to or higher than two percentage points. One potential interpretation is that until the prices of the two contracts are equal or just slightly different, borrowers perceive the flexible contract as a cheaper contract, because they value the repayment holiday as an additional benefit of the contract. As the difference in price across the two contracts begins to increase, costs outweigh the benefits of repayment flexibility, and indeed Barboni (2017) observes that the take-up rate for the flexible contracts at higher prices is associated with borrowers displaying higher revenues. Informed by these findings, the price of the flexible contract was set exactly two percentage points higher than the rigid one. We find similar take-up rates for the flexible versus the rigid contract as in Barboni (2017).

In addition, we performed a set of qualitative interviews with Sonata's customers. In particular, customers assigned to the treatment group were asked how they perceived the price of the flexible schedule versus the rigid one, what made them opt for either one or the other, and how much they would have been willing to pay for the flexible contract. Borrowers who, in the treatment group, opted for the flexible contract, believe that the higher price of the flexible contract is "fair". This suggests that not only they have understood the difference in price between the two contracts, but also acknowledge that the advantages of benefiting from a repayment flexibility option should come at a premium.

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section below.

[17]We must stress that the lab-in-the-field games were not administered specifically to Sonata's customers, but to a sample of group-lending borrowers who had just become eligible for individual loans in Kolkata and who had never been exposed to flexible repayment schedules.

## 3.1 Sample and Descriptive Statistics

A total of 799 borrowers were involved in the study: 410 in the control and 389 in the treatment branches. All were clients of Sonata who had successfully repaid the required loans as group-lending borrowers and approached Sonata to get an individual loan. However, these borrowers had not yet taken an individual loan. This sample of borrowers was particularly suitable for the experiment, for two main reasons: First, subjects were entrepreneurs with business growth potential and, as such, had borrowing needs for productive purposes. Second, these individuals had never taken individual loans before, nor benefited from repayment flexibility. Therefore, their preferences for repayment flexibility were 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 at the time we started the intervention.[18]

In terms of data collection, the baseline survey instrument contained questions that not only allowed us to detect subjects' main socio-demographic variables, business characteristics, and borrowing and saving behavior, but also to measure borrowers' aspirations, use of time, personality traits, and financial literacy. Two sets of games were also played to elicit both time and risk preferences.[19]

Borrowers' attitude toward risk was measured with a standard Multiple Price List (MPL), similar to Holt and Laury (2002). The MPL protocol consists of presenting the subjects with two different 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.

In addition, we assessed subjects' intertemporal preferences using standard list choices, similar to Harrison et al. (2002). This protocol consisted of two 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"

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[18]Additionally, Sonata is the only lending institution that is currently doing flexible loans, although only in the branches involved in the current experiment.

[19]The games were incentivized. A copy of the survey instrument and of the protocols used for the time and risk lotteries is available upon request.

the time horizon of the first lottery by three months. Combining the two lotteries not only allows one to estimate the subjects' discount rate but also to 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 (2011). 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.[20]

The follow-up we carried out after about eight months from baseline contained questions aimed to detect whether borrowers used the loan for business investment, business performance, borrowing, savings, and expenditures. Through monthly calls to subjects we gathered information on their repayment performance. These data were also complemented by information from Sonata, especially related to whether and when borrowers who had opted for the flexible repayment schedule exerted the repayment holiday.

Of the 799 individuals we interviewed at baseline, we were able to reinterview 789 at endline, with an implied attrition of 1.2%.[21]

Our experimental subjects are not the typical microfinance borrowers described by Yunus (2003); they are mostly male, micro and small entrepreneurs, and they are not borrowing through a group. Our results might therefore not apply to the female group borrowers that represent the most widely known microfinance model in developing countries. Our sample population is much more similar to the customers of banks and larger Non-Banking Financial Companies (NBFCs) in less-developed countries; it must also be mentioned that the characteristics and business models of our borrowers are not largely different from those in more advanced economies. In terms of external validity, our results can apply to a larger set of subjects and, most importantly, to both developing and developed countries.

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

[21]Attrition is balanced across treatment and control. 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 reinterview those borrowers. However, none of the ten borrowers we could not reach had defaulted with their loans. In addition, 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. However, answers for the business income sections for these subjects are missing.

## 3.2 Randomization and Balancing Checks

We set up a Clustered Randomized Controlled Trial where the unit of randomization is Sonata's bank branch. Before randomizing branches into treatment and control, we paired them using the Edmond algorithm for minimum distance, and then assigned each branch of each pair to either treatment or control. This allowed us to maximize the power of the experiment, given the relatively small number of clusters in the study. 389 subjects were recruited in treatment branches, while 410 subjects were recruited in control branches. These figures represent the universe of individual lending customers in the branches during the months we carried out the baseline.

Table 1 reports balancing checks across the treatment and control groups for the main demographic variables, as well as for wealth, income, and borrowing behavior. The businessperson in the household was targeted to be interviewed and, when this was 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, with the heads of households being 41 years old, on average. Ninety-seven percent of the household heads are male, and about 40% have completed at least middle school. Slightly less than half of households report owning land, at baseline. Average household income in the last twelve months was about 216,000 INR ($\approx$ 3,300 USD), and business sales reported for the last month were 13,100 INR ($\approx$ 200 USD). At baseline, less than one in five households had an outstanding loan, suggesting that our subjects lack borrowing opportunities outside of Sonata.[22] The average size of the loans borrowed from Sonata was 38,500 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). In terms of business activity, all borrowers were micro-entrepreneurs engaged in small-business activities that predominantly entailed producing and/or selling goods and services.

Treatment and control groups were balanced along the subjects' main socio-economic dimensions, suggesting that the randomization has worked well. We detect a small imbalance in terms of education of the household head: The share of individuals who completed middle school is slightly lower in the treatment versus the control group (4 p.p. less in treatment, significant at 5%), while the reverse holds true for the share of individuals who completed a higher degree (6 p.p. more in treatment, again

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[22]There might be other reasons for explaining the low borrowing rates: First, most of the subjects had already repaid their group-lending loans and were about to borrow as individual-lending customers for the first time. Second, Indian regulations regarding microfinance institutions does not allow microfinance borrowers to hold more than two or three outstanding loans from MFIs. Last, borrowers might under-report informal borrowing.

significant at 5%).[23]

Treatment and control groups are also balanced in terms of land ownership, income, and business performance (reported at baseline), as well as borrowing and savings behavior. We find a slight imbalance in the type of business activities held in the treatment versus the control group. Treated subjects are more likely to be small manufacturers/artisans/tailors, while control subjects are more likely to own a grocery store. Though the difference is quite small (six percentage points), we take into account these imbalances in the main analysis by including controls for the type of business activity carried out by borrowers.

# 4 Results

Our experimental design allows us to look at three main sets of results. First, comparing the treatment and control groups and using primary data collected on the field, we study the impact of providing a menu of contracts versus the rigid contract on borrowers' repayment rates and business income as well as on their borrowing and saving behavior. An improvement in these outcomes in the treatment as compared with the control branches suggests that this menu of contracts represents an effective screening mechanism for Sonata.

Second, using baseline data from the treated branches, we study which borrowers' characteristics are predictive of the choice for the flexible versus the rigid contract.[24]

In the following paragraphs we first discuss the Intention-To-Treat (ITT) estimates and compare the treatment and control branches to study the treatment effects in terms of loan usage, repayment rates, business outcomes, and borrowing and saving behavior. We then turn to our first stage to look at which variables predict at what rate the flexible schedule is selected.

## 4.1 Comparison Between Treatment and Control Groups

The following regression equation allows us to estimate the ITT:

$$y_{ibp} = \alpha + \beta T_{bp} + pair_p + \epsilon_{ibp} \tag{1}$$

where $y_{ibp}$ is the outcome of interest (loan usage; repayment performance; business outcomes;

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[23]Throughout the analysis, we will therefore control for education level to take into account for this imbalance.
[24]This is the first stage of our estimates.

borrowing, savings and expenditures) for individual $i$ in branch $b$, belonging to pair $p$. $T_{bp}$ 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 ($T_{bp} = 1$).

Our coefficient of interest is $\beta$, which measures the average causal effect of being offered the menu of contracts versus the standard rigid contract. Standard errors are clustered at the unit of randomization, that is at the branch level (Abadie et al., 2017). We include branch-pair fixed effects to control for stratified sampling.[25]

Given that treatment and control group were balanced at baseline, we estimate (1) using endline data only.[26] We also include an additional specification (Panel B) that introduces a vector of controls at the individual level, $X_{ibp}$: household size; age and education of the head of the household; type of business activity the borrower is engaged in; probability that the household owns land (all of which are evaluated at baseline); as well as the size of the loan borrowed from Sonata and the number of months since the loan was taken out.

### 4.1.1    Loan Usage

The first outcome we look at in estimating equation (1) is loan usage. This is to ascertain whether, at endline, any difference can be detected across the treatment and control groups in the way(s) borrowers have employed the loan from Sonata.

It must be mentioned that our field team collected data regarding loan usage only at endline. This was not by mistake. We were concerned that asking borrowers, at the beginning of the study, what they were planning to use the loan for was *too* sensitive a question – subjects might have worried that we would report this information to Sonata and as a result, potentially modify their behavior. To avoid any confounding factor, we decided to ask this information only during the second round of data collection. Therefore, for baseline information, we rely on Sonata's administrative data on borrowers' self-reported intended loan usage. As required by the MFI's enrollment protocol, customers have to state their borrowing purpose to Sonata's loan officers when they apply for the loan. Not surprisingly – both because of the very nature of individual loans and because this information was collected by Sonata directly – all borrowers at the start of the loan cycle reported they would use the

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[25]Given concerns for the relatively small number of clusters in our experiment, we account for randomization inference and also estimate our results using the *ritest* Stata command. We thank Thomas Fujiwara for pointing this out.

[26]In the Appendix, we show results from Diff-in-Diff analysis.

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loan for business investments.[27]

Endline results for loan usage are shown in Table 2. We asked borrowers whether they used the loan to: buy agriculture inputs, buy other inputs, make improvement works, start new businesses, purchase more stock during festivals, repay old debt. We also included nonbusiness-related loan usage categories such as consumption and other expenditures (health, education, weddings).

Interestingly, despite the large majority of borrowers who report using the loan to make investments to improve their business (70% of borrowers in the control group, not significantly different from the treatment group), we find that borrowers in the treated branches are 12 percentage points more likely to use the loan to buy more stock during the festivals. Borrowers are also more likely to use the loan for consumption – though point estimates are very small.

All in all, results from Table 2 suggest that the subjects in the treated group are more likely to invest in seasonal business activities and also to divert part of their loans toward consumption. This is consistent with the idea that being offered the possibility to choose between a rigid and a flexible contract allows borrowers to better manage their cash flows, thus increasing investment during the peak season, as well as to use this extra liquidity for consumption purposes.

### 4.1.2   Repayment Rates - Delinquencies and Default

Repayment rates are crucial to determining whether the flexible contract is a sustainable product from the lender's perspective. So far, studies on repayment flexibility have shown that flexible repayment schedules lead to an increase in delinquencies and default when these are exogenously assigned to borrowers (Field et al., 2013; Czura, 2015).

Repayment rates for the standard, rigid contract in the microfinance industry are very high: Sonata's yearly loan default rate is, for instance, less than 3%. This explains MFIs' concerns about introducing products that could potentially undermine their ability to retrieve credit owed.

Our analysis of repayment rates relies on the measurement of borrowers' delinquencies (delays in monthly repayments) rather than default rates. This is because borrowers have not yet completed their loan cycle – it is therefore too early to observe eventual defaults. Future data collection rounds will allow us to measure default rates and to establish a comparison between our results and those from previous studies on repayment flexibility.

In order to measure late repayments, we periodically called each borrower and asked whether,

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[27]Categories break-down are available upon request.

in the previous month(s), they were late in repaying their installment. We then cross-validated this information with administrative repayment data from Sonata. Borrowers are charged a penalty of 100 Indian Rupees every time they are late with their monthly repayments.[28] Despite the fact that no action is taken by Sonata when a borrower is late once, the MFI internally flags borrowers who are late several months in a row and classifies them as "potential defaulters".

We look at two measures of repayment delinquencies: i) number of times the borrower was late; ii) probability of being late at least once. These are computed by looking at the number of penalties each borrower has paid to Sonata for being late. We then estimate equation (1) using these measures of repayment delinquency as dependent variables. We present results for both short-term repayment rates, measured on average after 8 months from loan disbursal, and medium-term repayment rates, measured on average after 20 months. Results are displayed in Table 3, without and with controls, in Panel 1 and 2, respectively.[29]

Column (1) and (3) of both Panel 1 and Panel 2 show that, compared with control branches, borrowers in treated branches were late fewer times than those in the control group – they paid a significantly lower amount of late penalties. Similar results are also found in terms of probability of being late – proxied by the probability of paying the late penalty fee at least once (in column (2) and (4)), although the $\beta$ coefficient in column (4) is not statistically significant.[30]

Results from Table 3 show that, in terms of repayment rates, offering both schedules simultaneously performs better than (or at least as well as) the standard rigid microfinance contract, both at the extensive and intensive margin, and both in the short-term and medium-term. This confirms **Prediction 2**: If the screening mechanisms enhanced by the more expensive flexibility option works effectively, offering the flexible and the rigid contract simultaneously performs better than the standard rigid contract in terms of repayment rates. Although more data collection rounds will be needed to capture any difference across the treatment and control groups in terms of default rates, our findings appear in stark contrast to the existing literature: Indeed, both Field et al. (2013) and Czura (2015) find that offering a flexible contract undermines repayment rates.[31]

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[28]This also applies to flexible customers during the repayment holiday, as they still have to repay a small flexibility fee.

[29]We were able to reach out to 708 out of 799 customers for retrieving information on repayment behaviour after 8 months, and 727 after 20 months.

[30]The reader should note that this is not simply a "mechanical" effect deriving from flexible borrowers exerting the repayment holiday. Indeed, flexible borrowers can be late during those three months as they still have to repay the flexibility fee.

[31]As a robustness check, we also looked at the probability of being more than 120 days late – this variable can be considered as a proxy for default rates, which we do not observe yet. Results are not statistically different

### 4.1.3 Business Income

The third set of outcomes we look at relate to the differences in business performance between the treatment and the control group. As we discussed in section 2, borrowers should choose the flexible contract as long as their returns to capital are greater than or at least equal to the interest rate of this contract. Therefore, in theory, the screening mechanism triggered by the pricy flexible option ensures that borrowers who choose the flexible contract are the high-revenue ones – and are also time-consistent, as shown by Barboni (2017). The extra liquidity provided by the flexible schedule allows these borrowers to "reshuffle" their cash flows over the loan cycle. More flexibility in managing business income should thus allow these clients to either cover their losses or to further reinvest profits, or both. This should translate into increased business sales in the treatment group as compared with the control group. In order to see whether this hypothesis is confirmed, we study business performance by first looking at the timing of usage of the repayment holiday and then estimating equation (1) with both business sales and variability of business sales.

When designing the flexible contract with Sonata, the reason for setting the repayment holiday as a continuous three months-period was twofold: first, the festival season in India typically lasts three months (September to November or October to December, depending on the year). Festival months are likely to be an ideal period for borrowers to exercise the repayment holiday. Flexibility in repayment would in fact give them enough time to reinvest returns generated from their business activity, which are notably higher during the festival months. Second, three months are sufficiently long enough to allow borrowers to recover from any potential shock, or from the "lean" season, or simply to be able to collect returns generating from a more illiquid investment.

Figure 5 shows in which months flexible borrowers exercised the repayment flexibility. This is used to study whether any pattern can be identified in terms of *when* this option was taken. Among borrowers who selected the flexible schedule in the treated branches (120 out of 389, 31%), at the time we collected our follow-up data (May 2017-July 2017), 85% had already exercised the repayment holiday. The figure plots the share of eligible borrowers exercising the repayment holiday in each month – that is, those who had already completed the three compulsory monthly repayments and therefore could use the repayment holiday any time by giving Sonata one month's notice. Besides, it

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across treatment and control group, suggesting that offering a menu of contracts does not put borrowers *at risk* of default significantly more than borrowers who are only offered a standard, rigid contract. Results are shown in table A.1.

displays the average score borrowers gave to each month in terms of business performance.[32] This is used to study whether borrowers used the repayment holiday during "bad" or "good" months for the business, or both.

If borrowers intended to use the repayment flexibility *only* during the festival season, we should see a very high share of eligible borrowers starting to exercise the repayment holiday from September 2016[33] or over the following months. Figure 5 shows that 22%, 24%, and 28% and 29% of eligible borrowers in September, October, November, and December 2016, respectively, used the flexibility option.[34] Despite this shares are quite high, they are still far from comprehending the total of eligible borrowers. In fact, a non-negligible share of borrowers used the repayment holiday also in other months. All in all, Figure 5 shows that, although the repayment holiday appears to be predominantly used during the festival months, the flexible option is also exercised in other times of the year that are not particularly linked with a specific festival or business-related event. This suggests that borrowers do not use the repayment holiday just to increase investments during the high season but rather throughout the loan cycle. Such behavior is compatible with using the repayment holiday to better manage cash flows, thus shifting liquidity when it is most needed and allowing for planning expenditures in advance.[35]

Keeping this in mind, we turn to the analysis of business performance by looking at business sales. We mainly focus on the level of business sales in the last month and last week, as reported by borrowers. These are meant to be representative of a typical month and a typical week of borrowers' business activity. One reason for focusing on gross business revenues rather than on profits is that it is easier for borrowers to recall revenues – profits may be a noisier measure, given that they also have to take into account costs. We also compute a measure of sales variability by taking the square difference between the weekly sales and the average weekly sales. Results are shown in Table 4. Panel 1 shows results without controls, which are added in Panel 2. Consistent with our predictions, we find that borrowers in the treated branches report higher weekly sales than those in the control group, the dif-

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[32]Borrowers were asked to rate on a scale from 0 to 10 how good each month of the year is in terms of their business performance. The highest rated months (i.e. the best months for business) are October and April, which indeed coincide with Diwali and other festivals in Uttar Pradesh (April).

[33]The first month that eligible borrowers in our sample could have started using the repayment holiday.

[34]We subtract from the pool of eligible borrowers in each month those who exercised the repayment holiday in the previous month.

[35]Consistent with this view, we can make the claim that the one-month notice borrowers must give to Sonata before exerting the repayment holiday does not limit or constrain the use of the flexibility option. Indeed, if the repayment holiday allows borrowers to shift liquidity across months, such strategy requires some planning on the borrowers' side which a one month notice is not likely to affect.

ference being statistically significant. Weekly sales reported by borrowers in the treatment group are approximately 20% higher than those in the control group, with no major differences when baseline controls, loan size, and months since loan disbursal are added.[36] Column (2) of Table 4 shows that the variability of sales is also significantly higher in the treatment group than in the control group, suggesting that borrowers in the treatment group are more likely to invest in high-risk / high-return business activities. All in all, results from Table 4 show that the flexible contract is used by borrowers to increase the volume of their business. This is consistent with the view that the repayment holiday allows borrowers to reinvest returns. In the next section we focus on microentrepreneurs' borrowing behavior to assess whether this is consistent with their business performance.[37]

### 4.1.4 Treatment Effects on Borrowing, Savings and Expenditures

Results so far have shown that borrowers in the treated branches perform better, both in terms of repayment rates and business performance, than borrowers in the control group. In particular, by looking at both the timing of repayment holidays and the differences in business outcomes across treatment and control, our findings confirm the hypothesis that repayment flexibility, at least in the form of the contract Sonata offered, helps borrowers "reshuffle" their cash flows by providing extra liquidity, which they can use for investment in their business activity.

   In this section, we first look at changes in clients' borrowing behavior as a result of our intervention. The aim is to determine whether the additional liquidity derived from the flexible option is itself sufficient to allow borrowers to invest in high-risk / high-return investments or whether additional funds are necessary to cover borrowers' financial needs. To this end, we study two main sets of outcomes: the extensive and intensive margin of borrowing, both from formal and informal sources, and the probability that borrowers will ask Sonata for a loan top-up. Loan top-ups are a common product at Sonata, and consist of a one-shot extra credit, at an interest rate of 24%. The size of the loan top-up is quite arbitrary: It depends on the borrower's request, the size of the loan previously borrowed from Sonata, and also on the borrower's repayment performance. We estimate equation (1) using, as a de-

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[36]Results are also consistent using log and trimmed sales levels. Results are shown in the Appendix.

[37]One may wonder whether the positive treatment effects we find in terms of business sales are just a "mechanical" effect deriving by the fact that treated borrowers do not have payments during the repayment holiday. There are different reasons why this should not be the case. First, we use sales instead of profits precisely to avoid that borrowers could include business debt in profit calculation. Second, we compare sales between treated borrowers who were and were not benefiting from the repayment holiday in the months the follow-up was administered, and we do not find differences.

pendent variable, the borrower's probability of reporting having received a loan top-up from Sonata. Results are shown in column (1) of Table 5. Borrowers in the treated branches are 7 percentage points less likely to receive a loan top-up from our partner MFI, the coefficient being statistically significant and of the same magnitude after including baseline controls. In line with our hypothesis, this result suggests that the borrowers in the treated group are in less need of credit from Sonata than those in the control group: The repayment holiday appears to provide the additional liquidity that borrowers otherwise might seek from a loan top-up. At the same time, this finding also shows that borrowers in the treatment group value the advantages of repayment flexibility more than advantages deriving from a loan top-up, despite the loan top-up is less expensive than the flexible contracts. This suggests that borrowers not only appreciate the provision of the extra liquidity derived from the repayment holiday but also that the flexible contract allows them to manage their cash flows better.[38]

In order to complete the picture, we look at both the intensive and extensive margin of borrowing, both from the formal and the informal sector. Results from this analysis are shown in column (2), (3), and (4) of Table 5, respectively. While we do not find any difference between the treatment and control groups in terms of the total borrowed amount from formal sources at endline,[39] we instead find that borrowers in the treatment group are significantly more likely to borrow from informal sources, both at the intensive and the extensive margin. The coefficient of the treatment dummy remains positive and significant also after including baseline controls. Results from column (3) and (4) of Table 5 reveal that treatment borrowers are very much in need of liquidity, most likely from investment in higher-risk / higher-return business activities triggered by the repayment schedule. Since the formal channel is somehow "exhausted" – the loan from Sonata represents the main loan for most of these borrowers – they have to resort to informal credit to fund their investments.

Finally, we look at differences between the treatment and control groups in terms of both expenditures and savings. To this end, we asked borrowers to report expenditures on a number of items, including meat and vegetables, temptation goods,[40], education and health. Results are shown in table 6: consistent with a story where borrowers have more liquidity, we find that treated borrowers report higher expenditures than the control ones (column 1). We also look at differences in savings

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[38]It may also be the case that, by choosing the flexible option, borrowers are sure they can exercise the repayment holiday any time they want, whereas the possibility of being granted the loan top-up is, as we already mentioned, more discretionary.

[39]We do not perform the analysis for the probability of borrowing from formal sources, as this is equal to 1 for both treatment and control at endline, given that they all borrowed at least from Sonata.

[40]Alcohol, cigarettes. Also mobile phone expenses are grouped in this category.

behavior across treatment and control. We find weak evidence that the treatment group saves less than the control group – once controls are introduced, such difference is not statistically significant (column 2).

## 4.2 Disentangling the Screening Mechanism

The analysis so far has shown that borrowers in the treated group display better repayment rates than those in the control group; they also report higher sales and higher variability of sales. Finally, they are less likely to request a loan top-up from Sonata but, at the same time, they are more likely to borrow from informal channels. Offering both the rigid and the flexible repayment schedules versus only the rigid contract thus appears to enable borrowers to benefit from additional liquidity. This, in turn, allows them to manage their cash flows better and to invest in higher-risk/higher-return business activities. In general, our findings show that the more expensive flexible option works as an effective screening mechanism – borrowers who chose the flexible schedule are more likely to invest in their business activities, but they are also able to repay.

In this section we look in greater detail at this selection effect. To this end, we focus on the treatment branches and use the extensive data collected at baseline to understand which characteristics predict whether a borrower will choose the flexible contract. Overall, 120 out of 389 individuals chose the flexible schedule, a take-up rate of 31%. Recalling our predictions in section 2, we expected borrowers whose returns to capital are equal to or higher than the contract price to have chosen the flexible contract. At the same time, if borrowers value continuing their relationship with the lender, we should expect those who anticipate having more difficulties making payments under the flexible contract (time-inconsistent and financial illiterate customers, for instance) to be less likely to choose the flexible schedule over the rigid one (Barboni, 2017).

### 4.2.1 Borrowers' Selection into the Rigid Versus the Flexible Repayment Schedule

To study selection, we focus on the treatment branches and look at who chose the flexible versus the rigid repayment schedule. To this end, we recall **Prediction 1** from section 2: By offering the flexible contract as a more expensive option, borrowers should sort themselves into the most suitable repayment schedule, given their characteristics.

We therefore study which borrowers' baseline characteristics are predictive of the choice for the

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flexible versus the rigid contract, by estimating the following regression equation:

$$probflex_{ib} = \beta X_{ib} + \epsilon_{ib} \tag{2}$$

where $probflex_{ib}$ is the probability that borrower $i$ in a treated branch $b$ chooses the flexible contract when he is offered both schedules, and $X_{ib}$ is a vector of borrowers' variables including behavioral (time preferences, risk aversion, financial literacy) and business characteristics (income, savings, sales). Standard errors are clustered at the branch level.

Table 7 focuses on behavioral characteristics. In particular, we analyze the predictive power of time preferences, risk aversion, and financial literacy, among other variables. We include results with and without controls for the type of business activity borrowers were carrying out at baseline. This is because the seasonality of cash flows associated with a certain business may affect borrowers' attitude toward time and risk. Column 1 and 2 of Table 7 show that time-consistent borrowers are significantly more likely to choose the flexible contract compared with time-inconsistent ones. We then further distinguish time-inconsistent borrowers between present-biased and future-biased borrowers (columns 3 and 4), and find that both categories are less likely to opt for the flexible repayment schedule, compared with time-consistent borrowers.[41]

We also find evidence that risk-loving borrowers are more likely to choose the flexible contract, although the coefficient of the *risk loving* dummy is only significant after controlling for business activities (columns 5 and 6). We then look at borrowers' business literacy (columns 7 and 8), and find that borrowers who report drafting a budget for their business activity on a frequent basis (daily, weekly, or fortnightly) are more likely to opt for the flexible schedule than those who make their budget less frequently (monthly or less frequently than monthly). Finally, columns 9 and 10 show that borrowers who report being more worried about household expenditures are more likely to choose the flexible contract. The significance of the coefficients remains when we test them simultaneously, as shown in column 11.

Results from Table 7 suggests that more forward-looking and business-disciplined borrowers, as well as those who are more inclined to take risk, are more likely to choose the flexible contract. This confirms our hypothesis that the more flexible schedule represents an effective screening mechanism

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[41]One possible explanation for why we find that both present- and future-biased borrowers are less likely to take up the flexible contract is that the flexible contract seems to be appealing mainly to forward-looking, time-consistent borrowers. As such, all time-inconsistent borrowers, either present- or future-biased, are less attracted by such contracts.

for the lender.

We then turn to baseline business characteristics and wealth, including wealth ownership, income, and sales. Results are shown in Table 8. Interestingly, none of these characteristics predicts borrowers' probability of choosing the flexible contract. The only exception is the (log of) profits borrowers report in the best and the worst months of their business activity across the previous twelve months. As shown in column 7, borrowers with lower profits in the best month of the year are more likely to opt for the flexible contract. Similarly, borrowers who report a higher difference in profits between the best and the worst months of their business – which we interpret as larger business fluctuations across the year – are more likely to opt for the flexible repayment schedule. In line with Fafchamps (2013), this suggests that business irregularity is a big concern for the microentrepreneurs in our sample. As such, those who suffer more from unstable income are, in turn, more likely to opt for the flexible schedule.

All in all, findings from Table 7 and 8 are in line with previous results showing that customers value the flexible schedule as an opportunity to receive extra liquidity that can be used to manage cash flows better and for further investments. At the same time, our results confirm Karlan and Mullainathan (2007)'s view that rigid contracts may discourage more lucrative customers from borrowing, partly because these borrowers are very concerned about defaulting. Offering a pricy option thus seems to encourage those clients to borrow and to make additional investments in their business activity.

### 4.2.2 Predicting Take-Up of the Flexible Contract: Observables Versus Unobservables

In light of our results, one might wonder what lessons we can learn from the screening mechanism triggered by the pricy flexibility option. If, as Tables 7 and 8 show, it is possible to identify a set of characteristics that are predictive of the choice of the flexible schedule, does this imply that lenders can simply use a few screening tests before loan disbursal to measure borrowers' traits and subsequently assign each borrower a repayment schedule?[42] If this were the case, it would suggest that the screening mechanism relies fully on borrowers' *observable* characteristics and that giving borrowers a choice is not so important, after all. In reality, however, we find that borrowers' *unobservable* characteristics play a major role in driving their decisions.

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[42]We thank Atif Mian for pointing this out.

We address this concern in two ways. First, we test the predictive power of a large set of borrowers' baseline characteristics, simultaneously. We find that these variables contribute to explain only a small portion of borrowers' probability to choose the flexible contract – the $R^2$ of such regressions is never higher than 10%, suggesting that there is a large set of "unmeasurable" characteristics that plays a big role for selection. Second, we include in the ITT estimates the variables that appear to be most predictive of the take-up of the flexible repayment schedule (being time-consistent, risk-loving, drafting a frequent budget and being worried about expenditures). Results are shown in table A.2. Even after controlling for these variables, the treatment dummy is still positive and significant (column (5) of table A.2), suggesting that observable characteristics cannot fully explain our results.

All in all, our results show that any screening technique lenders can adopt – IQ tests, psychometric measurements, or risk assessments – can be helpful in guiding them toward the identification of borrowers who might be suitable for the flexible repayment schedule. However, none of these "hard-information" measures would be fully predictive of the profile of the ideal customer to be offered the flexible contract. This leads us to conclude that it is only by giving borrowers a choice between the two contracts that the screening mechanism is fully implemented, resulting in better repayment rates and better business outcomes.

## 4.3   Robustness Check: Heterogeneous Treatment Effects

In this section, we look into heterogeneous treatment effects to study which groups of borrowers are mostly affected by our treatment. We classify borrowers into low-income, medium-income, and high-income by looking at each subject's overall household income measured at baseline. The income categorization is made by taking the 25th and 75th income percentile: Borrowers whose income lies below the 25th percentile are classified as low-income, those whose income lies between the 25th and 75th percentile are classified as medium-income subjects. High-income borrowers are those whose household income at baseline was equal to or higher than the 75th percentile.

We then estimate the following regression equation:

$$y_{ib} = \alpha T_b + \beta_1 medium\_incm_{ib} + \beta_2 high\_incm_{ib} + \gamma_1 T_{ib} \times medium\_incm_{ib} + \gamma_2 T_b \times high\_incm_{ib} + \epsilon_{ib} \quad (3)$$

The omitted variable is the low-income borrowers' indicator. Therefore, the results should be interpreted with respect to this category.

Results from equation (3) are displayed in table A.3, without and with controls in Panel 1 and 2, respectively. Only the coefficient of $T_b \times high\_incm_{ib}$ is statistically significant, and in magnitude remarkably higher than the coefficient of $T_b \times medium\_incm_{ib}$. This indicates that the treatment we administered has an impact, both in terms of business sales and variability of business sales, only on borrowers who had a higher income level at the beginning of the intervention. Although we do not find income to be a predictive variable of the take-up of the flexible schedule, this result suggests that borrowers who had more resources at baseline are those who have been more able to reinvest their returns in high-productivity business activities.[43]

## 4.4 Discussion of results

Our analysis has shown that when borrowers were offered repayment flexibility as a more expensive contract option, 31% of them choose the flexible contract and that this allowed them to increase their business sales without negatively affecting their ability to repay Sonata, at least in the short-term.

The main channel through which the pricy flexible option works is by triggering a selection mechanism across borrowers, whereby the more financially disciplined and forward-looking individuals are more likely to choose the flexible contract. The flexible contract allows these borrowers to "reshuffle" their cash flows throughout the year. The flexibility can be thought of as a line of credit, or more simply as an injection of additional liquidity that helps borrowers reinvest their profits.

As already pointed out, one of the potential limitations of the flexible contract tested in this study is that it is a bundled product: It is more expensive than the standard rigid contract, but it is also offered as an option. This implies that we cannot really distinguish the effect of contract price from that of the contract option on borrowers' demand for flexibility.

In order to partly address this issue, we conducted a set of qualitative interviews with borrowers who chose the flexible option, a few months after loan disbursal and contract choice, to understand what made them opt for the flexible contracts and whether they felt it was adequately priced. Results from these interviews suggest, first of all, that borrowers are very satisfied with the product and also plan to use the repayment holiday over the second year of loan maturity. Second, they acknowledge that the flexible contract is adequately priced: A difference of two percentage points in the interest rate between the flexible contract and the rigid contract appears to them as a *"a fair price to pay to*

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[43]As a third robustness check, we also estimate a quantile regression. Consistent with the income analysis, results from the quantile regressions suggest that our treatment effects are significant particularly for values of the dependent variable above the median. Results are available upon request.

*benefit from repayment flexibility"*.[44]

This confirms our intuition that flexible contracts should be offered as a more expensive contract in order to be appealing to those borrowers who precisely recognize their value and intrinsic advantages. As a final step in this direction, we are currently working on the Cost-Benefit Analysis of the flexible contract in order to provide Sonata with a clear business rationale for offering flexible repayment schedules as a more expensive contract option.[45]

# 5    Conclusions

Although repayment flexibility allows borrowers to manage their cash flows better and to further reinvest their profits, flexible repayment schedules are rarely offered in the context of microfinance. This is because flexible microfinance contracts have been shown to increase borrowers' default rates.

Motivated by the poor performance of flexible schedules in microfinance, we sought to study the impact of introducing repayment flexibility in microfinance contracts as a more expensive option. Our interest lies in understanding whether this could be a sustainable approach for microfinance lenders, and how such a contract would perform compared with the standard rigid microfinance contract.

Through a Randomized Controlled Trial (RCT) we tested the impact, both in terms of repayment rates and business outcomes, of providing repayment flexibility to microfinance borrowers in the form of a contract option, versus offering them only the standard rigid contract. In the treated branches, the lender offered a menu of contracts including both the flexible and the standard rigid contract, the former being more expensive than the latter. In the control branches, only the standard rigid contract was offered. The flexible contract was designed to allow borrowers to "waive" repayments during the loan cycle and to exercise such an option whenever they needed it the most.

Almost one third of borrowers in the treated group chose the more expensive flexible contract versus the rigid one. When comparing the treatment with the control group one year after the start of the intervention, we find that borrowers in the treatment group are 5 percentage points less likely to be late with their monthly repayments. Moreover, their weekly sales are 20% higher in the treatment group than in the control. We also detect an increased variability of sales, as well as a lower need for extra liquidity, in the form of loan top-ups, in the treatment versus the control group. At the same time, borrowers in the treated group are significantly more likely to seek credit from informal lenders

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[44]Words pronounced by a subject during an interview conducted on a subject in October 2017.

[45]A preliminary version of the cost-benefit analysis is available upon request.

than those in the control group.

By looking at the selection mechanism triggered by the contract option, we find that time-consistent and more financially disciplined borrowers are more likely to opt for the flexible contract, suggesting that giving borrowers the opportunity to choose the contract they prefer successfully attracts borrowers who value the benefits of repayment flexibility the most. The flexible contract, in turn, gives borrowers the possibility of benefitting from extra liquidity that can then be used to reinvest in their business activity.

Our paper is the first study on borrowers' selection in the context of flexible repayment contracts. Indeed, our focus not only lies in estimating the impact of repayment flexibility on business growth and repayment rates but also in understanding which borrowers' characteristics drive the choice for rigid versus flexible contracts. In fact, our experimental design allows us to observe microfinance borrowers' choice for flexible versus rigid schedules and to relate this choice to their characteristics and behavioral traits. On a broader level, our paper is intended to contribute to the growing debate on customers' selection in credit contracts in developing countries by showing that a screening mechanism that builds on contract choice through different prices could be implemented effectively to identify more entrepreneurial and financially sophisticated borrowers, when lenders lack information on their quality. One caveat to the interpretation of our results is that we have data only for the first year of the borrowers' loan cycle – additional survey rounds will be necessary to understand whether these short-term outcomes persist over time.[46]

Finally, from a policy perspective, our experiment leads to two main sets of recommendations: First, offering flexible schedules as a contract option represents an optimal strategy not only for lenders but also for borrowers. Thus, it would seem to be beneficial for MFIs to move from the standard rigid contract toward more sophisticated contracts that allow borrowers to select their preferred repayment schedule. Second, behavioral characteristics matter for contract choice. Therefore, in order for microfinance borrowers' business activities to grow beyond the subsistence level and for them to continue to have access to microcredit, MFIs should offer more tailored financial products whose design takes into account borrowers' behavioral characteristics.

Taken together, our findings highlight the need for conducting further research that explores different ways of modifying contract characteristics and introducing repayment flexibility in microfinance contracts. The main objective of this research agenda is to guide lenders in developing coun-

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[46]Still, medium-term results on repayment rates confirm the short-term ones.

tries to adopt a more personalized approach toward their customers, catering to borrowers with heterogeneous business opportunities and financial needs, as well as different behavioural characteristics.

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# 6 Figures and Tables
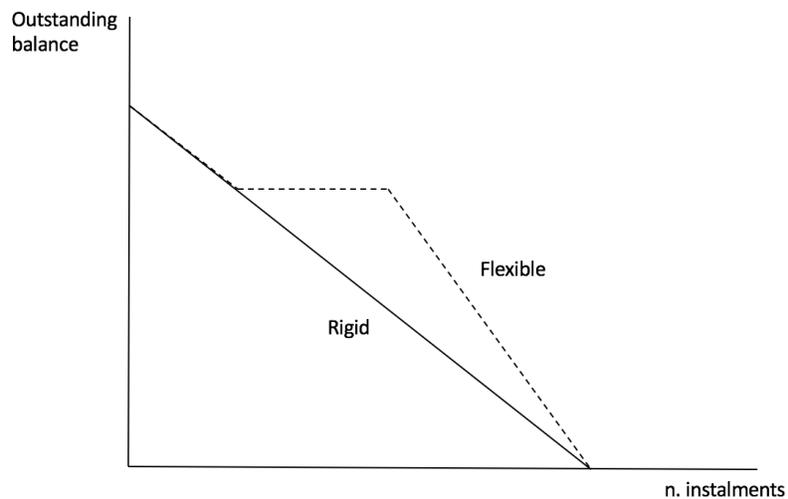


Figure 1: Flexible contract versus rigid contract

| 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 2: Flexible contract versus rigid contract

Figure 3: Randomization map



Figure 4: Experiment design

Figure 5: Usage of the repayment holiday, by month and share of eligible customers

Table 1: Balancing Checks Across Treatment and Control group

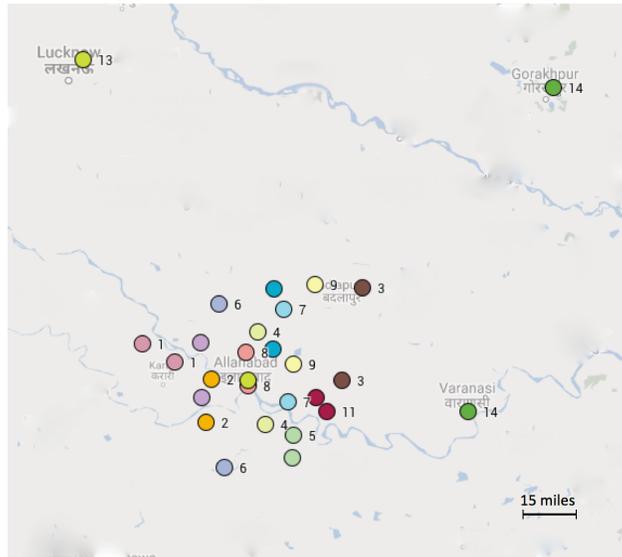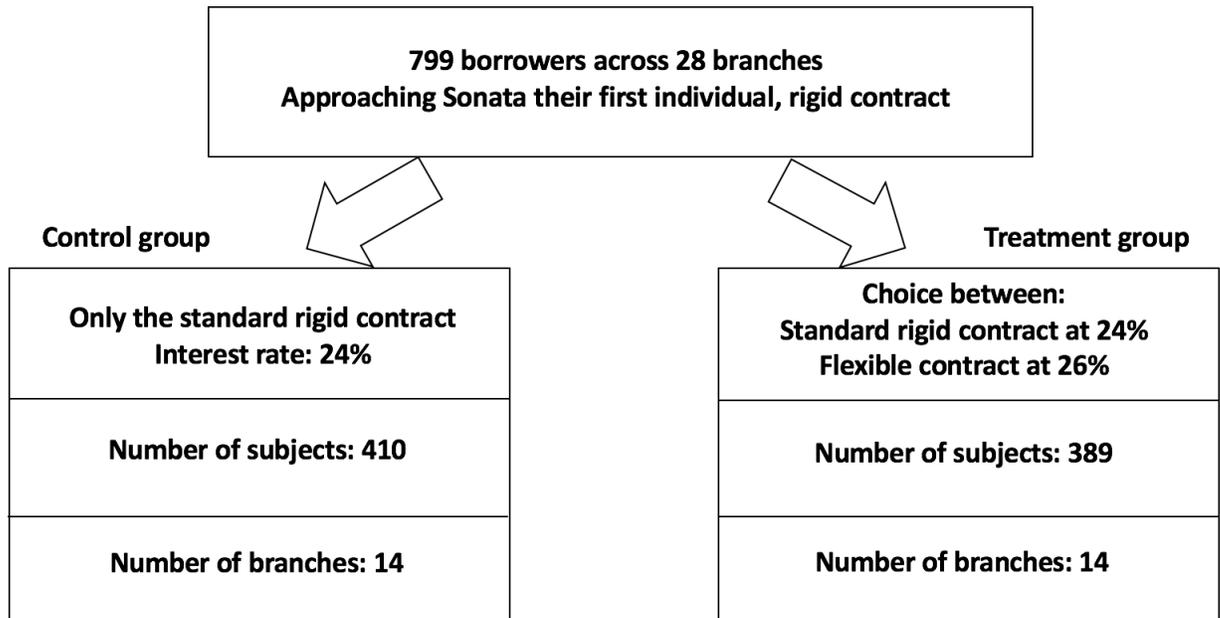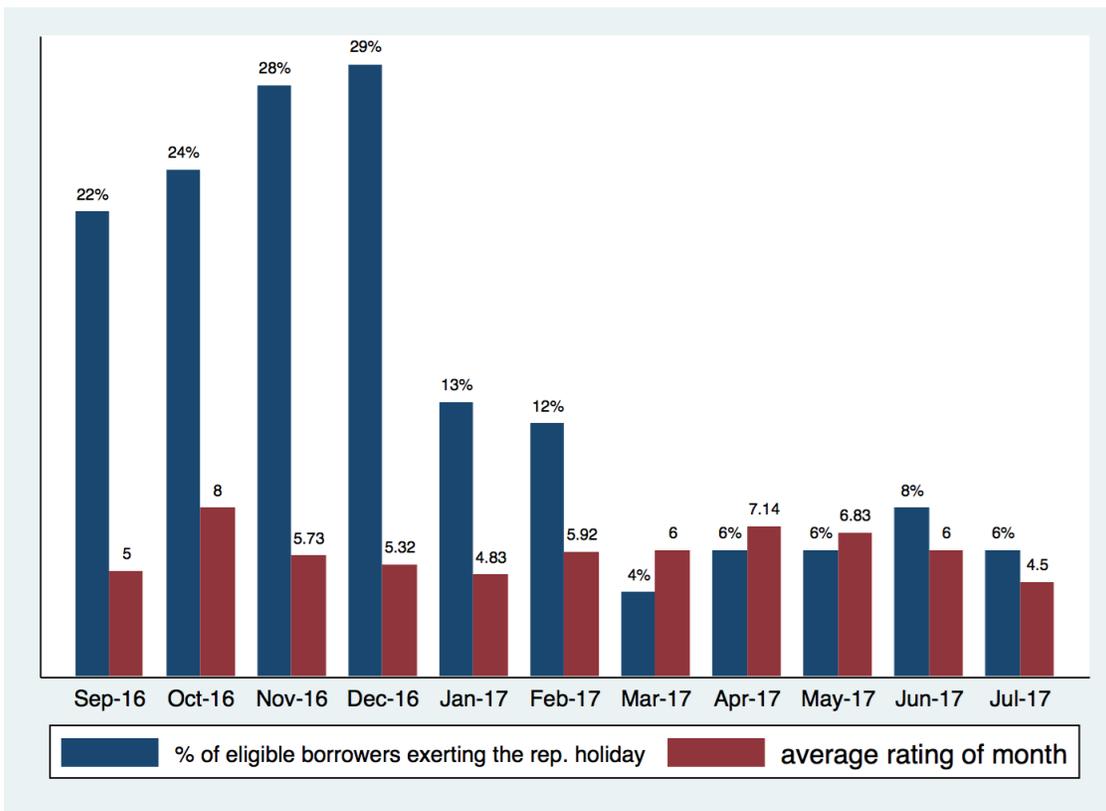| Variable | Control mean | Treatment mean (diff) | number of observations |
|---|---|---|---|
| **Demographics** | | | |
| Household size | 6.061 | -0.021 | 799 |
| Age of household head | 41.368 | -0.021 | 799 |
| Has completed primary school | 0.162 | -0.021 | 789 |
| Has completed middle school | 0.217 | -0.043** | 789 |
| Has completed high school | 0.441 | -0.011 | 789 |
| Has completed higher education | 0.125 | 0.062** | 789 |
| Has no formal schooling | 0.051 | 0.012 | 789 |
| | | | |
| **Wealth** | | | |
| Owns land | 0.435 | 0.067 | 799 |
| | | | |
| **Income and Business performance** | | | |
| Income last 12 months, tc 3sd | 222,379.80 | -13,501.64 | 799 |
| Business sales last 30 days, tc 3sd | 13,983.29 | -2250.23 | 787 |
| Δ profit (best/worst month) | 10,339.83 | -93.505 | 770 |
| | | | |
| **Borrowing and Savings** | | | |
| Has formal loans | 0.130 | 0.062 | 799 |
| (other than Sonata's loan) | | | |
| Has informal loans | 0.007 | 0.007 | 799 |
| Total formal borrowed amount | 10,215.33 | 465.43 | 799 |
| in the last 12 months (excl. Sonata loan) | | | |
| Sonata loan amount | 38,776.50 | -990.51 | 787 |
| Loan amount requested of Sonata | 38892.96 | -856.48 | 784 |
| Total informal borrowed amount | 329.49 | 256.39 | 799 |
| Total saved amount | 14,698.80 | 675.50 | 799 |
| # months after which borrowers | 8.43 | 0.03 | 789 |
| were reinterviewed | | | |
| | | | |
| **Business Activities** | | | |
| Manufacturer/Artisan/Tailor | 0.120 | 0.063** | 799 |
| Seller/Trader/Contractor | 0.132 | 0.057 | 799 |
| Dairy/Meat/Poultry | 0.187 | -0.049 | 799 |
| Grocery/Fruits & Vegetables | 0.231 | -0.058** | 799 |
| Business/Shop/Hotel | 0.185 | -0.017 | 799 |
| Transport | 0.074 | -0.008 | 799 |
| Services | 0.050 | 0.017 | 799 |
| Labor - Agri./Non Agri. | 0.018 | -0.008 | 799 |
| Others | 0.003 | 0.004 | 799 |

*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. Robust standard errors in parentheses (clustered at the branch level). Variables have been top-coded at three standard deviations, when indicated.

Table 2: Sonata's Loan Usage

| Dependent Variable | Buy agriculture inputs | Buy other inputs | Improvement works | Start new business | Buy more stock during festivals | Repay old debt | Consumption | Other expenditures |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| treatment | -0.038 | -0.014 | 0.039 | -0.020 | 0.117** | 0.001 | 0.010* | 0.014 |
| | (0.023) | (0.018) | (0.055) | (0.032) | (0.052) | (0.007) | (0.005) | (0.014) |
| Observations | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 |
| Control Mean | 0.132 | 0.072 | 0.700 | 0.097 | 0.127 | 0.009 | 0.001 | 0.032 |

*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. Standard errors in parentheses (clustered at the branch level). All the dependent variables are dummies that indicate whether or not the loan was used for a specific purpose. The dependent variables were constructed by aggregating borrowers' answer to the survey question: *"What did you use Sonata's loan for?"*. Borrowers could give more than one answer.

Table 3: Repayment Rates

**Panel 1 - No Controls**

| Dependent Variable | Short-term | | Medium-term | |
|---|---|---|---|---|
| | Total delinquencies | Prob. at least one delinquency | Total delinquencies | Prob. at least one delinquency |
| | (1) | (2) | (3) | (4) |
| treatment | -0.232* | -0.045* | -0.304* | -0.012 |
| | (0.120) | (0.026) | (0.155) | (0.028) |
| Observations | 708 | 708 | 708 | 708 |

**Panel 2 - with Controls**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| treatment | -0.236* | -0.054* | -0.310* | -0.022 |
| | (0.124) | (0.030) | (0.156) | (0.030) |
| Observations | 708 | 708 | 708 | 708 |
| Control Mean | 1.234 | 0.498 | 1.923 | 0.592 |

Standard errors in parentheses (clustered at the branch level).

*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. The dep. var. in column (1) and (3) reflects the number of months borrowers have been late in repaying (this also includes months during which flexible customers benefit from the repayment holiday, as they still have to repay the flexibility fee). The dep. var. in column (2) and (4) is a dummy that equals one if borrowers have been late at least once in a monthly repayment, and zero otherwise. Controls included in Panel 2: household size; age and education of the head of the household; type of business (all at baseline); number of months between baseline and endline; Sonata loan size.

Table 4: Business Income

| Dependent Variable | Weekly sales | Variability of weekly sales (ten thousands) |
|---|---|---|
| **Panel 1 - No Controls** | | |
| | (1) | (2) |
| treatment | 1,282.931** | 3,803.977*** |
| | (495.812) | (1,283.590) |
| Observations | 778 | 778 |
| **Panel 2 - with Controls** | | |
| | (1) | (2) |
| treatment | 1,341.866** | 3,223.451** |
| | (526.475) | (1,385.348) |
| Observations | 778 | 778 |
| Control Mean | 5,546.437 | 6,150.303 |

Standard errors in parentheses (clustered at the branch level).

*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. All the dependent variables used are top-coded (3 sd). Weekly sales are derived from the question: *"What were the total amount of sales in the last seven days?"* The variability of weekly sales has been computed by taking the square difference between weekly business sales and the mean computed in column (2). Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

Table 5: Formal and Informal Borrowing

| Dependent Variable | Loan top-up | Log formal borrowed amount | Log informal borrowed amount | Prob. informal credit |
|---|---|---|---|---|
| **Panel 1 - No Controls** | | | | |
| | (1) | (2) | (3) | (4) |
| treatment | -0.076* | 0.562 | 0.386* | 0.041** |
| | (0.043) | (0.458) | (0.194) | (0.021) |
| Observations | 787 | 789 | 789 | 789 |
| | | | | |
| **Panel 2 - with Controls** | | | | |
| | (1) | (2) | (3) | (4) |
| treatment | -0.069* | 0.526 | 0.367** | 0.039** |
| | (0.040) | (0.420) | (0.169) | (0.018) |
| Observations | 787 | 789 | 789 | 789 |
| Control Mean | 0.203 | 1.493 | 0.014 | 0.001 |

Standard errors in parentheses (clustered at the branch level).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Pair FE are included in all specifications. Loan top-up is a dummy that takes value of one if the subject reports having received an extra-loan amount from Sonata. Formal loans are loans from banks and MFIs, including Sonata. Informal loans are loans from moneylenders, employers, friends/relatives/neighbors and landlords. Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

Table 6: Expenditures and Savings

| Dependent Variable | Log monthly expenditures | Log total savings amount |
|---|---|---|
| **Panel 1 - No Controls** | | |
| | (1) | (2) |
| treatment | 0.159* | -0.193* |
| | (0.091) | (0.107) |
| Observations | 781 | 741 |
| | | |
| **Panel 2 - with Controls** | | |
| | (1) | (2) |
| treatment | 0.196** | -0.138 |
| | (0.084) | (0.115) |
| Observations | 781 | 741 |
| Control Mean | 7.323 | 8.994 |

Standard errors in parentheses (clustered at the branch level).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

 Monthly expenditures include: meat and vegetables, temptation goods, education and health. Expenses on both meat and vegetables and temptation good were captured for the last seven days, therefore are re-calculated on a monthly basis. Expenditures in education and health were reported for the last thirty days. Logarithms are taken on trimmed variables (99th percentile). Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

Table 7: Behavioral variables that predict borrowers' selection

| Dependent Variable | Prob. flex (1) | Prob. flex (2) | Prob. flex (3) | Prob. flex (4) | Prob. flex (5) | Prob. flex (6) | Prob. flex (7) | Prob. flex (8) | Prob. flex (9) | Prob. flex (10) | Prob. flex (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\beta_1$: time consistent | 0.202** (0.080) | 0.192*** (0.071) | | | | | | | | | |
| $\beta_2$: present biased | | | -0.156* (0.080) | -0.159** (0.073) | | | | | | | -0.154** (0.074) |
| $\beta_3$: future biased | | | -0.214*** (0.077) | -0.199*** (0.074) | | | | | | | -0.173** (0.077) |
| $\beta_4$: risk loving | | | | | 0.149 (0.123) | 0.213* (0.117) | | | | | 0.231** (0.113) |
| $\beta_5$: frequent budget | | | | | | | 0.095* (0.051) | 0.061 (0.052) | | | 0.024 (0.046) |
| $\beta_6$: worried about expenses | | | | | | | | | 0.177** (0.073) | 0.166** (0.068) | 0.149** (0.064) |
| Type of Business Activity | | X | | X | | X | | X | | X | X |
| Observations | 387 | 387 | 387 | 387 | 389 | 389 | 389 | 389 | 389 | 389 | 387 |
| P-values from F-Tests | | | | | | | | | | | |
| $\beta_2 = \beta_3$ | | | 0.492 | 0.673 | | | | | | | |
| Joint Test: All Coeffs. = 0 | | | | | | | | | | | 0.014** |

Standard errors in parentheses (clustered at the branch level)

*** p<0.01, ** p<0.05, * p<0.1

The time-consistent variable is a measure derived from the time lotteries administered to subjects at baseline. It is a dummy that takes the value of one if the subject consistently prefers the same later payoff to the early payoff in both lotteries, and zero otherwise. The subject is defined as present-biased if he prefers an earlier payoff to a later payoff in the "present" lottery but switches to the later payoff in earlier decisions when the lottery is shifted ahead in the future. An opposite behavior is classified as future-biased. The risk loving variable is a measure derived from the risk lottery administered to subjects at baseline. It is a dummy that takes the value of one if the subject prefers the risky to the safe lottery in decision one or two, thus showing greater risk-tolerance. Frequent budget is a dummy that takes the value of one if the subject reports drafting the budget for his business activity on a daily, weekly, or fortnightly basis, and zero otherwise. Worried about expenses is a dummy that takes the value of one if the subject reports being extremely worried or very worried about expenses for the household, and zero otherwise.

Table 8: Income variables that predict borrowers' selection

| Dependent Variable | Prob. flex (1) | Prob. flex (2) | Prob. flex (3) | Prob. flex (4) | Prob. flex (5) | Prob. flex (6) | Prob. flex (7) |
|---|---|---|---|---|---|---|---|
| $\beta_1$: owns land | 0.088 (0.070) | | | | | | 0.080 (0.074) |
| $\beta_2$: log(household income) | | 0.016 (0.036) | | | | | |
| $\beta_3$: log(weekly sales) | | | 0.057 (0.051) | | | | |
| $\beta_4$: log(variability weekly sales) | | | | -0.013 (0.016) | | | |
| $\beta_5$: log(profit best month) | | | | | 0.047 (0.030) | | -0.211* (0.112) |
| $\beta_6$: log(profit worst month) | | | | | | 0.025 (0.033) | 0.066 (0.041) |
| $\beta_7$: log(difference profit best/worst month) | | | | | | | 0.179** (0.074) |
| Type of Business Activity | X | X | X | X | X | X | X |
| Observations | 389 | 389 | 389 | 389 | 389 | 389 | 389 |
| P-values from F-Tests | | | | | | | |
| $\beta_5 = \beta_7$ | | | | | | | 0.019** |
| Joint Test: All Coeffs. = 0 | | | | | | | 0.037** |

Standard errors in parentheses, clustered at the branch level

*** p<0.01, ** p<0.05, * p<0.1

All variables are measured at the baseline. Household income is the overall income of the household. Weekly sales are the sales reported by borrowers in the last seven days. Best and worst profit are the profits of, respectively, the best and the worst month in the past twelve days, as reported by respondents.

# A   Appendix

Table A.1: Repayments late than 120 days

| Dependent<br>Variable | probability being<br>late more than 120 days |
|---|---|
| **Panel 1 - No Controls** | |
| | (1) |
| treatment | -0.008 |
| | (0.023) |
| Observations | 769 |
| **Panel 2 - with Controls** | |
| | (1) |
| treatment | -0.008 |
| | (0.023) |
| Observations | 769 |
| | |
| Control Mean | 0.062 |

Standard errors in parentheses (clustered at the branch level).
*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. The dependent variable is the probability that a borrower is late with repayments for at least 120 days. Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

## Table A.2: Business Income - Studying Unobservables

| Dependent Variable | Weekly sales | Weekly sales | Weekly sales | Weekly sales | Weekly sales |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| treatment | 2,277.435*** | 1,270.500** | 104.068 | 1,458.210** | 1,546.811* |
| | (784.022) | (544.900) | (789.254) | (633.362) | (836.917) |
| time consistent | 2,410.991*** | | | | 2,384.803*** |
| | (628.417) | | | | (771.015) |
| time consistent × treatment | -954.967 | | | | -1,277.662 |
| | (997.886) | | | | (1,155.753) |
| risk loving | | -809.416 | | | -447.275 |
| | | (1,472.403) | | | (1,426.991) |
| risk loving × treatment | | -663.493 | | | -1,666.484 |
| | | (1,787.402) | | | (1,935.984) |
| frequent budget | | | 786.941 | | 693.243 |
| | | | (1,583.503) | | (1,510.721) |
| frequent budget × treatment | | | 3,234.311* | | 3,493.684* |
| | | | (1,848.022) | | (1,877.822) |
| worried about expenses | | | | -474.926 | -718.275 |
| | | | | (892.270) | (841.691) |
| worried about expenses × treatment | | | | -970.205 | -1,401.320 |
| | | | | (1,430.221) | (1,483.931) |
| Observations | 776 | 778 | 778 | 778 | 776 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. Weekly sales variables are the sales in the last seven days and are top-coded (3 sd). The time-consistent variable is a measure derived from the time lotteries administered to subjects at baseline. It is a dummy that takes the value of one if the subject consistently prefers the same later payoff to the early payoff in both lotteries, and zero otherwise. The risk loving variable is a measure derived from the risk lottery administered to subjects at baseline. It is a dummy that takes the value of one if the subject prefers the risky to the safe lottery in decision one or two, thus showing greater risk-tolerance. Frequent budget is a dummy that takes the value of one if the subject reports drafting the budget for his business activity on a daily, weekly, or fortnightly basis, and zero otherwise. Worried about expenses is a dummy that takes the value of one if the subject reports being extremely worried or very worried about expenses for the household, and zero otherwise.

Table A.3: Business Income - Heterogeneity Analysis

| Dependent Variable | Weekly sales | Variability of weekly sales (ten thousands) | Total # delinquencies |
|---|---|---|---|

**Panel 1 - No Controls**

| | (1) | (2) | (3) |
|---|---|---|---|
| treatment | 558.531 | 1,661.872 | -0.417 |
| | (681.171) | (1,704.465) | (0.270) |
| treatment × medium income | 646.424 | -411.755 | -0.223 |
| | (681.171) | (2,650.810) | (0.301) |
| treatment × high income | 2,192.383* | 11,720.484** | 0.111 |
| | (1,119.810) | (4,517.352) | (0.336) |
| Observations | 778 | 778 | 708 |

**Panel 2 - w/Controls**

| | (1) | (2) | (3) |
|---|---|---|---|
| treatment | 564.232 | 1,939.275 | -0.193 |
| | (696.019) | (2,372.559) | (0.302) |
| treatment × medium income | 439.325 | -2,555.407 | -0.162 |
| | (727.523) | (3,583.113) | (0.327) |
| treatment × high income | 2,881.106** | 12,964.213** | 0.157 |
| | (1,200.789) | (4,893.781) | (0.362) |
| Observations | 778 | 778 | 708 |
| Control Mean | 4,517.216 | 8,731.370 | 1.265 |

Standard errors in parentheses (clustered at the branch level).
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

 Pair FE are included in all specifications. The variability of weekly sales has been computed by taking the square difference between weekly business sales and the mean computed in column (1). Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

Table A.4: Business Income - Difference in Difference

| Dependent Variable | Weekly sales | Log of weekly sales | Variability of weekly sales |
|---|---|---|---|
| **Panel 1 - No Controls** | | | |
| | (1) | (2) | (3) |
| post $\times$ treatment | 1,752.550* | 0.215* | 3,535.830 |
| | (941.807) | (0.111) | (3,007.303) |
| post | 2,076.080** | 0.352*** | 4,877.159** |
| | (751.437) | (0.093) | (2,312.309) |
| treatment | -587.210 | -0.054 | -342.675 |
| | (550.053) | (0.118) | (1,388.097) |
| Observations | 1,563 | 1,395 | 1,563 |
| | | | |
| **Panel 2 - w/Controls** | | | |
| | (1) | (2) | (3) |
| post_treat | 1,740.985* | 0.199* | 2,123.112 |
| | (951.466) | (0.111) | (1,718.589) |
| post | 2,077.689** | 0.359*** | 3,361.248** |
| | (759.479) | (0.092) | (1,237.652) |
| treatment | -471.193 | -0.027 | -172.352 |
| | (558.065) | (0.110) | (775.274) |
| Observations | 1,563 | 1,395 | 1,563 |
| Control Mean | 3,525.475 | 7.861 | 1,559.054 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. All the dependent variables used are top-coded (3 standard deviations). The variability of weekly sales has been computed by taking the square difference between weekly business sales and the mean computed in column (2). Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.

Table A.5: Business Income - trimmed and log variables

| Dependent Variable | weekly sales (trimmed p99) | log of weekly sales |
|---|---|---|
| **Panel 1 - No Controls** | | |
| | (1) | (2) |
| treatment | 1,377.621** | 0.146 |
| | (486.130) | (0.108) |
| Observations | 773 | 711 |
| **Panel 2 - w/Controls** | | |
| | (1) | (2) |
| treatment | 1,499.959*** | 0.144* |
| | (428.131) | (0.083) |
| Observations | 773 | 711 |
| | | |
| Control Mean | 5,248.845 | 8.220 |

Standard errors in parentheses (clustered at the branch level).

*** p<0.01, ** p<0.05, * p<0.1

Pair FE are included in all specifications. Controls included in Panel 2: household size; age and education of the head of the household; type of business; number of months between baseline and endline; Sonata loan size.