

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

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Abstract

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

Keywords: Microfinance, Repayment Flexibility, Borrowers' Selection, Contract Design

JEL Codes: O12, O16, C93, D91

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1 Introduction

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

In this paper, we study an innovative microfinance product designed to mitigate the negative impact of irregular cash flows among Indian microentrepreneurs through the provision of repayment flexibility at the borrower's discretion. A growing literature on financial innovation in developing countries shows that adapting contract terms to entrepreneurial needs and business characteristics positively affects production decisions and business growth (Field et al., 2013; Czura, 2015; Battaglia et al., 2017; Bari et al., 2021; Cole et al., 2017; Casaburi and Willis, 2018). Yet, despite flexible financial products have become increasingly available in advanced economies to help small businesses weather cash flow variations (Vives, 2017), financial institutions operating in low-income countries rarely offer these financial innovations (Bruhn et al., 2017). The limited supply of tailored financial products is often caused by the lack of information infrastructures, such as credit bureaus (Daley et al., 2020). Financial innovation has been found to increase credit risk (Subrahmanyam et al., 2014); these effects may be further exacerbated by information asymmetries (Lin et al., 2013), especially if the way innovative contracts are offered does not account for borrowers' characteristics.

We investigate how repayment flexibility mitigates the negative effects of cash-flow volatility through a Randomized Controlled Trial (RCT) in India, in partnership with a local Microfinance Institution,

Sonata Microfinance Ltd. (Sonata hereafter). In this context, cash-flow fluctuations – for instance, stemming from seasonal demand for goods – heavily affect microentrepreneurs’ economic activities by exacerbating their liquidity needs.¹ Access to microfinance contracts that embed repayment flexibility holds the potential to improve business outcomes and to reduce delays in debt repayment by relaxing liquidity constraints that in turn allows to carry out additional investments.

However, not all microentrepreneurs face the same degree of cash flow irregularity, nor of liquidity constraints. These differences translate into varying needs for repayment flexibility, which may create an adverse selection problem for lenders when flexible contracts are made available. For example, if the flexible contract is made more advantageous than the non-flexible one (because it is cheaper, or it has a larger loan size), borrowers who face lower business seasonality, and hence who should repay their loan regularly, may also take up such a contract. The lender may then experience higher credit risk if the benefit of a repayment flexibility means that borrowers end up lacking sufficient income to repay the due balance that accrues in the future. All in all, this may discourage lenders from offering flexible contracts.

Building on information-based theories of security design (Myers and Majluf, 1984; DeMarzo, 2005) we hypothesise that lenders can solve this problem by introducing a menu of contracts that include both the flexible contract and the standard contract with a “rigid” repayment schedule. In a similar spirit as Bester (1985), this menu of contracts should contain combinations of contract terms – in our case, repayment flexibility and price – that allow borrowers to self-select in the contract that *ex-ante* reveals their type: borrowers with higher cash-flow volatility and greater financial sophistication are more likely to choose contracts with higher flexibility and higher interest rates.

The RCT tests this conceptual framework as follows: In a randomly chosen subset of Sonata branches (the “treatment group”) individual-lending borrowers² were offered a menu of contracts

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

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

that includes the flexible, more expensive contract and the rigid, and cheaper, contract. We compare this to the *status quo* in the microfinance industry, i.e., borrowers being exclusively offered the standard, rigid contract (the “control group”). We find that the provision of an expensive financial innovation designed to mitigate irregular business cash flows has a positive impact on business growth: business sales and profits are significantly higher in the treatment than in the control group. We also find evidence of increased liquidity in treatment: treated borrowers are significantly more likely to repay their loan in advance and are significantly less likely to request additional funding from Sonata during the loan cycle. Finally, using Sonata’s administrative data on borrowers’ repayments, we observe similar default rates across the treatment and control group. This indicates that offering repayment flexibility as a more expensive contract does not harm repayment rates and hence benefits both borrowers and lenders.

Taken together, these findings show that the use of a menu of contracts to uncover borrower information leads to borrowers sorting by the financial product that ex-ante reveals their type. By alleviating frictions deriving from offering flexible contracts under private information, this menu of contracts therefore represents a viable way for lenders to make financial innovations available to their clients. However, it could also be argued that the effects we identify may not only be driven by the treatment revealing borrowers’ private information at the time of the loan offer; it could also be the nature of the contract (flexible versus rigid) that influences borrowers’ behavior *ex post*. While it is certainly possible that the treatment also affected borrowers’ characteristics and investment choices (Fischer, 2013; Field et al., 2013), the study of borrowers’ selection into the flexible versus the rigid contract reveals that the subset of borrowers that opted for the flexible contract is ex ante significantly different from those who chose the rigid contract, and in the expected direction. Borrowers with larger business fluctuations at the start of the study were more likely to choose the flexible contract. This indicates that the flexible contract has a higher value for borrowers whose business is plagued by irregularities to a higher extent. The menu of contracts mitigates adverse selection along several borrowers’ characteristics that are key to successful management of cash-flow volatility – but also to ensure a good repayment behavior: better formal accounting skills, time-consistency and being worried about making financial decisions, all indicators of financial so-

phistication, positively and significantly predict the take up of the flexible contract.

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

Our paper offers three main contributions. First, it helps shed light on how pricing flexible contracts vs. non-flexible contracts can lead borrowers to sort in the contract that reveals their type, enabling lenders to screen borrowers in informationally opaque environments. In this sense, our findings offer novel insights on the provision of repayment flexibility both in low-income countries, where financial innovations are still a niche product but their demand among microentrepreneurs is on the rise, as well as in high-income countries, where small business lending and higher-education flexible loans are increasingly offering ways to cope with income fluctuations. Second, our paper contributes to uncover the mechanisms through which flexible contracts work: financially sophisticated borrowers, who are more likely to select into the costlier contract, take advantage of repayment flexibility and of the implicit additional liquidity that comes with it to increase business inventory, which translates in better business outcomes without deteriorating repayment rates. Last, by establishing a causal link between the provision of repayment flexibility to mitigate cash flow volatility, borrowers' selection, business performance and repayment rates, our findings indicate that, when information frictions are binding, credit allocation can be improved through well-designed financial innovations.

Our paper adds to several strands of the literature. By investigating how opaque borrowers reveal information about themselves through their contract choice, our paper relates to the study of the role of information asymmetries in credit markets ([Karlan and Zinman, 2009](#); [Adams et al., 2009](#); [Dobbie and Skiba, 2013](#)). Specifically, we complement the work of [Hertzberg et al. \(2018\)](#) and [Céspedes \(2019\)](#) by studying how borrowers' contract choices are informative of their characteristics

in low-income settings.

Our research also adds to the growing literature on the role of financial innovations in microfinance contracts (Field et al., 2013; Barboni, 2017; Battaglia et al., 2017; Czura, 2015; Cole et al., 2017; Casaburi and Willis, 2018; Lane, 2018) by providing empirical evidence of how flexible microfinance contracts can be designed to improve business outcomes without harming repayment rates. Our study differs from Field et al., 2013’s work on at least two dimensions. First, we study the role of repayment flexibility in the form of an option that allows to cope with irregular cash flows; on the contrary, Field et al., 2013 focus on a distinct product that provides a grace period and ask whether relaxing liquidity constraints early in the loan cycle promotes investment in illiquid opportunities. Secondly, our paper demonstrates how gains from trade can be enhanced by improving borrowers’ ability to meet demand fluctuations and smooth cash flow seasonality through flexible products that are adequately priced. In this sense, our study can be considered as complementary to Field et al. (2013)’s paper, since it provides insights on the pricing and offer of flexible contracts. Finally, in contrast with Battaglia et al., 2017, the menu of contracts we study, in which repayment flexibility is traded off with price, makes borrowers reveal their type and the value they attribute to financial innovations (Gamba and Triantis, 2008), triggering a screening mechanism based on contract choice.

Importantly, findings from our paper can inform the design and pricing of financial products beyond microfinance. The financial innovation we consider presents similarities with both the flexible contracts multinational, e-commerce platforms and mobile payment companies offer their merchants, and with income-driven repayment (IDR) contracts that are increasingly available in the United States student loan market in place of inflexible student loan contracts, which do not account for income shocks. Akin to microfinance, college financing is affected by adverse selection (Herbst and Hendren, 2021); yet, IDR may reduce delinquency rates and improve financial outcomes Herbst (2021). Our paper also aligns with the recent literature in household finance showing the importance of contracts that allow for debt relief, and specifically loan forbearance when borrowers face severe liquidity constraints (Aydin, 2021; Cherry et al., 2021).

Also related to contract design, our paper shows that efficient (menus of) contracts that account for the trade-off between commitment (dictated by the need to ensure repayment discipline) and flexibility (driven by uncertainty in future income) can be viable. In this sense, our work provides empirical evidence supporting theoretical work by [Amador et al. \(2006\)](#) and [Bond and Sigurdsson \(2018\)](#). In particular, our findings indicate that borrowers are self-aware and choose contracts by correctly considering their characteristics and anticipating their preferences. Specific to the micro-finance context, our findings align with [Bauer et al. \(2012\)](#)'s work demonstrating that impatient borrowers from Indian Self-Help Groups strongly prefer the standard rigid contract to discipline their present bias. We also add to [Bauer et al. \(2012\)](#)'s paper by showing that these effects hold for individuals who borrow larger, individual loans. More broadly, our paper contributes to the household finance literature examining how financial products with innovative features that account for customers' behavioral characteristics can improve the efficiency of financial markets, both in developing ([Ashraf et al., 2006](#); [John, 2020](#); [Brune et al., 2016](#); [Sprenger and Stavins, 2010](#); [Fischer and Ghatak, 2010](#)) and developed countries ([Beshears et al., 2015](#)).

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

2 Setting

Our partner financial institution, Sonata, is based in Lucknow (capital city of the Indian state of Uttar Pradesh) and as of 2019 operated throughout India with a network of 478 branches. Like most Indian Microfinance Institutions (MFIs), Sonata offers both group and individual loans. While group loans are typically for generic use (consumption, business, emergency), individual loans are for business purposes, and therefore are larger and are also costlier than group loans. Individuals

taking up these loans either hold a microentrepreneurial activity or plan to set up one through the loan. Sonata’s average individual loan amount is Rs 40,000. This is substantially larger than group loans – for example, in their study with group-lending borrowers, [Field et al. \(2013\)](#) report an average loan size between Rs 4,000 to Rs 10,000. The major implication is that our study borrowers have already received immediate liquidity to kick-start their businesses. On the contrary, they lack liquidity to make additional investments and to cope with cash flow irregularities.

2.1 The flexible contract

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

Building on these insights, the product team at Sonata designed a contract that would give borrowers the possibility to waive repayments during the loan cycle and to exercise this option (labelled “repayment holiday”) when it was most needed. The rationale behind the provision of the optional repayment holiday was to help borrowers make additional investment (like inputs purchase) in anticipation of the peak season, or smooth consumption during the lean season without dissaving or incurring additional debt. Hence, the repayment holiday was set to three continuous months, in order to cover either the festival season or the lean season, or part of both. To be eligible to exercise the repayment holiday, borrowers had to successfully repay at least three monthly loan instalments after loan disbursement. Once this condition had been satisfied, they could avail of the repayment holiday at any time, provided they gave Sonata a one-month notice.³

³This repayment holiday is a very different contract feature from the two-months grace period provided immediately after the loan disbursement, which is studied by [Field et al., 2013](#) and [Czura, 2015](#), among others. The grace period is not a feature Sonata was considering because the initial capital injection provided by the MFI through their regular individual loans is high enough for borrowers to invest in illiquid investment opportunities. However, the regular contract is not specifically designed to help borrowers with income

The individual loans Sonata offers have a maturity of twenty-four months hence the flexible contract allowed for two repayment holidays to be used over the entire loan maturity, one every year of maturity.⁴ However, due to a software issue in their Management Information System (MIS), Sonata was not able to offer a repayment holiday during the second year of the contract to *any* customer who had chosen the flexible contract at the beginning of the study. We discuss the implications of the lack of the second repayment holiday in detail in the next sections, also drawing from customers’ feedback at the end of the study (section 5.6 and 5.7).

Figure 1 graphically represents the rigid and the flexible contract offered by Sonata – showing when the repayment holiday option is exercised. The figure plots the outstanding amount of the loan over the number of instalments to be repaid by borrowers.

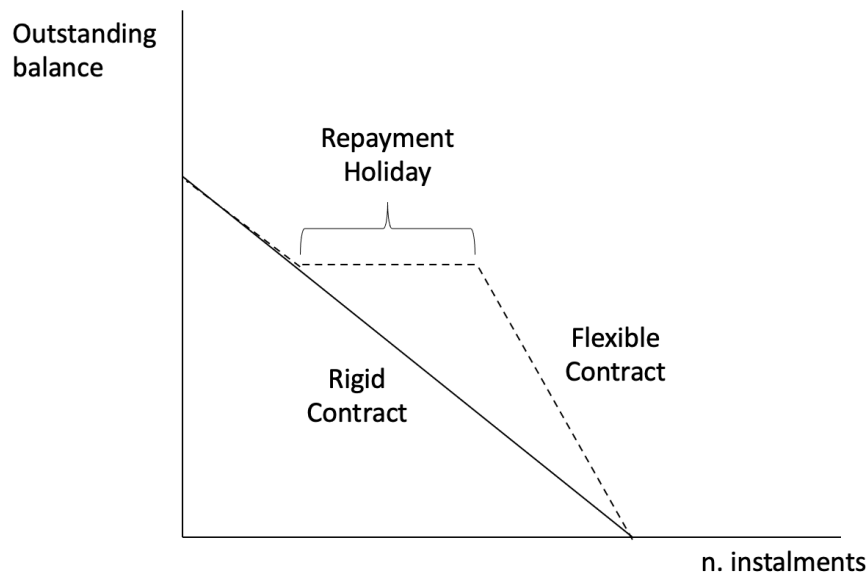


Figure 1: **Flexible contract versus rigid contract.** This figure plots a comparison between the flexible and the rigid contracts in terms of outstanding balance over the total number of instalments. It shows an “interruption” in repayments during the repayment holiday, which also translates into a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

irregularities, which are a major hindrance to business growth (Minton and Schrand, 1999)

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

In the standard, rigid contract, borrowers have to repay equal instalments (which include capital plus interests) on a monthly basis until maturity. The flexible contract, in contrast, allows borrowers to suspend payments during the loan cycle. At the end of the repayment holiday, repayments resume and the residual outstanding amount is spread over the remaining instalments. As a result, the size of the instalments after the repayment holiday is larger than before the repayment holiday.

The flexible contract incorporates two features. On the one hand, it can be thought of as a line of credit (Sannikov, 2007; Aragón et al., 2019; Lane, 2018) – by skipping repayments, borrowers are implicitly provided with more liquidity, which they may use to undertake further investments and mitigate the negative effects of cash flow volatility. On the other hand, it provides borrowers with a *real option* to waive repayments to mitigate business irregularity, which they can decide whether to exercise or not. Yet, this contract may attract borrowers who do not necessarily need repayment flexibility – e.g., those who do not plan to make additional investments during the peak season, or who have lesser need to smooth consumption during the lean season. This may happen if, for example, the price of the flexible contract is low enough to attract these borrowers. In this case, credit risk could increase and the lender would realize losses (Field et al., 2013, Czura, 2015).

These concerns motivated Sonata to make the flexible contract more expensive than the rigid one, which is offered at an interest rate of 24%. While Section 3 will discuss in detail the implications of charging a higher price for the flexible contract for both lenders and borrowers, here we want to highlight two considerations in setting the pricing structure of the rigid vs. the flexible contract. First, other contract terms could have been used to differentiate the two financial products beyond price – collateral or loan maturity, for example (Hertzberg et al., 2018). However, Sonata could not leverage these alternative dimensions: loans are uncollateralised, and maturity is fixed at 24 months because of regulatory reasons. Second, the price difference between the two financial contracts had to be set in compliance with the guidelines of the Reserve Bank of India (RBI), who has extensively ruled on interest rate caps and differentials in the microfinance sector (Ferrari et al., 2018).

Interest rates were also informed by the results from a set of lab-in-the-field experiments in which

we elicited borrowers' willingness-to-pay for flexible, as opposed to a rigid, microfinance contracts (Barboni, 2017). The price of the flexible contract was finally set at 26%, 2 percentage points higher than the rigid contract, which was also the interest rate cap typically set for microfinance individual loans. This price also takes into account additional administrative and legal costs for Sonata to set up the new contract.⁵

Figure A1 in the Appendix shows how the flexible contract worked in practice.⁶ In the Figure, the repayment pattern of the standard, rigid monthly repayment loan is compared to that of the flexible contract. In this example, both loans have the same size (38,000 Rs, or approximately 500 USD, which the average loan size for Sonata), and borrowers start repaying on a monthly schedule, irrespective of the chosen contract. However, borrowers end up paying different instalments each month depending on the chosen contract: customers choosing the flexible option have a larger instalment, as the 26% interest rate instead of the 24% interest rate applies from the first repayment. After the first three months, the repayment holiday can be exercised at any time. During the repayment holiday, flexible borrowers had to pay a small "flexibility fee".⁷ Once the repayment holiday was over, monthly repayments resumed, and the residual loan balance was spread across the remaining months. At the time of the contract offer, borrowers were also told that if they decided to exercise the repayment holiday again during the second year of their maturity, they must have done so before the 21st month. This was to avoid instalments that would have become too large for the borrowers in the very last months of the loan cycle. The way it was conceived and designed, the structure of the flexible contract ensures that the Net Present Value of the flexible financial product, if borrowers do not default, is always higher than the rigid contract for the lender.

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

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

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

3 Conceptual Framework

The financial innovation we study is intended to offer borrowers the option to smooth the cash-flow volatility caused by the seasonality of their businesses (peak season, lean season, or both), and to improve their business performance by mitigating the liquidity constraints they face.

Here we discuss the intuition that guides our conceptual framework, the design of the RCT, and its main findings. We outline in particular the adverse selection problem the lender may face in offering this financial innovation in absence of credit scoring and rigorous screening techniques. Given the type of business activities carried out by the microentrepreneurs in our sample (small retail shops, hospitality, grocery stores – see Table 1, which is described more comprehensively in the next section), we center our discussion on their behavior during the business peak season – typically coinciding with the October-November festivals in India – which is also the main source of business irregularity.⁸

3.1 Borrowers’ types and the need for repayment flexibility

Our main hypothesis is that microentrepreneurs differ in their ability to understand and anticipate market conditions, especially in terms of customer demand. This translates in differences in their propensity to undertake investments to meet potential business demand surges, which in turn results into heterogeneous liquidity needs. “High-type” microentrepreneurs anticipate customers’ demand during the peak season and hence would like to seize these demand surges to enhance business growth. “Low-type” microentrepreneurs, on the contrary, do not respond to demand peaks, either because they underestimate their business potential or they simply choose not to change their behavior. It follows that the former type of microentrepreneurs will face greater liquidity constraints, and will value financial products that waive interim payments to a higher extent. The latter type, on the contrary, will have a lower need for liquidity during the peak season. To give an example, one could think of high-type microentrepreneurs as being more likely to buy larger quantities of a certain good they anticipate will be in increased demand during the peak season; low-type microentrepreneurs, instead, will buy the same amount of goods, irrespective of the time of the year.

⁸<https://economictimes.indiatimes.com/industry/banking/finance/credit-cards-emi-payments-sparkle-during-diwali-sale/articleshow/71845805.cms?from=mdr>.

We leverage differences across microentrepreneurs to develop a simple model where they seek funding from a lender to start a business. During the peak season, only high-type microentrepreneurs see value in undertaking additional high-income investment projects (e.g., buying additional units of a certain good). The high-type microentrepreneur will choose to invest in this additional opportunity with probability π . If they choose not to seize this additional investment opportunity, high-type microentrepreneurs will invest in the same technology as low-type ones. Crucially, investing in this new opportunity requires additional financial resources. High-type microentrepreneurs will re-invest their current income in order to obtain a return. On the contrary, low-type microentrepreneurs will not make additional investments during the peak season. Finally, we assume that income realizations are pledgeable by the lender.

3.2 The contracts

We provide here a verbal argument to explain our conceptual framework – in Online Appendix C, we outline a model to discuss it more formally. At the initial period the lender lends one unit of capital to each of the two types of microentrepreneurs. The capital is used to initiate a business. The lender offers two contracts: a standard, rigid one which carries an interest rate r_1 , and a more flexible contract that allows to waive repayments at an interest rate r_2 . The flexible contract consists of an option (the repayment holiday) to waive repayments. Both contracts have the same maturity. We also assume that the lender is impatient, and hence prefers receiving borrowers’ repayments sooner rather than later.⁹

If borrowers’ quality was perfectly observable, the lender would simply offer each borrower the contract that best suits their type: high-quality borrowers would be provided with a flexible contract so that they could use the repayment holiday to re-invest their income into the additional business opportunity while low-type borrowers would be granted the rigid contract. Since cash-flow realizations are pledgeable, the lender would then receive repayments when borrowers’ income is realised.

⁹This is to model the fact that a bank is financially constrained, see for example [DeMarzo and Duffie \(1999\)](#); [Biais and Mariotti \(2005\)](#); [DeMarzo \(2005\)](#); [Asriyan and Vanasco \(2020\)](#).

When private information of borrowers' quality is unavailable, an adverse selection problem may arise. For example, if the price of the flexible contract is low enough to attract low-type borrowers, they may take up this contract and eventually defer interim repayments mimicking high-type borrowers. This may exacerbate credit risk: low-type borrowers may not necessarily have enough income to repay the residual outstanding amount.¹⁰ The model therefore predicts (see Online Appendix C) that the flexible contract should be charged at a higher price, with $r_2 > r_1$. The payoffs the lender will receive under each contract ensure that the lender will not incur a loss in any of the two contracts.

This condition further ensures a separation by types: low-type entrepreneurs will always choose the cheaper contract – the rigid one – and will repay regularly. Instead, as long as the high-type agent expects high enough future business performance through the additional investment opportunity – hence benefiting marginally more from the flexible contract – they will be willing to take the more expensive contract that gives them the option to waive repayments and to have necessary liquidity to seize the new investment opportunity during the peak season.¹¹ This enhances a separating equilibrium à la [Rothschild and Stiglitz \(1976\)](#) and [Bester \(1985\)](#): borrowers self-select in the contract that ex-ante reveals their type hence permitting a strict Pareto gain – or an “advantageous” selection ([De Meza and Webb, 2001](#)).

3.3 Implications for contract take up and default

One question is whether low-type borrowers would be enticed by the more expensive flexible contract, although it could lead them to default. From our assumption that cash flows are pledgeable, it follows that borrowers will strictly prefer the strategy that maximizes their utility in every period. Hence, they will choose the contract that allows them not to default – i.e., the cheapest one.

¹⁰We assume, in line with [Banerjee and Duflo \(2007\)](#), that at any point in time borrowers consume their available income, and do not transfer resources over time.

¹¹An alternative strategy would be to request additional credit. We discuss this more in detail in section [5.1](#)

Another question is how borrowers behave when the lender only makes the standard, rigid contract available. This is the current *status quo* in the microfinance industry. Under this contract, borrowers are required to make regular repayments in every period following the loan disbursement. For the same argument outlined before – i.e., borrowers wanting to avoid default – borrowers, irrespective of their type, will choose the low-income business opportunity to have available income to repay in all periods. It follows that when only the rigid contract is offered, the extent of adverse selection the lender may face is mitigated by the nature of the contract itself (i.e., regular repayments applying to all borrowers). This result also aligns with [Gottlieb and Moreira \(2022\)](#)’s theory showing that offering a single contract versus a menu of contracts, under limited liability, may mitigate adverse selection. Nevertheless, when only a rigid contract is offered by the lender, borrowers will not invest in additional projects that require forgoing their current income. This may explain the low rates of business growth among microfinance borrowers under the traditional contract ([Banerjee et al., 2015](#); [Crépon et al., 2015](#)). All in all, offering only the standard, rigid contract, minimizes borrowers’ default rates. However, this comes at the cost of low business performance.

A third concern is whether we would obtain the same outcomes if the two contracts differed along one dimension only (e.g., different degrees of repayment flexibility, provided at the same price). We further show in the model that if the two contracts were offered simultaneously and at the same price, the lender would make a loss by offering the flexible contract. This is because the rate at which flexible contract is offered is low enough to attract low-type borrowers.¹²

Taken together, the points just discussed highlight the role of the current and future costs of default as another key aspect of our model. Extensive anecdotal evidence from the microfinance setting indicates that lenders take action against a defaulting borrower by both seizing their current income and by turning down their future loan requests. Thus, defaulting implies both no present consumption, which borrowers want to avoid, and the cost of being denied access to additional credit from their current lender. Clients must borrow for several loan cycles with the same lender before being

¹²Another way of seeing this is that the flexible contract would strictly dominate the rigid one, making it impossible for lenders to screen across borrowers.

allowed to borrow larger loans, as also shown by early work in microfinance (Tedeschi, 2006). This makes loan default costly not only because it hampers borrowers' access to future credit, but also because it depreciates the value of their current lending relationship (Petersen and Rajan, 1994).¹³

The above discussion allows us to make two predictions about repayment rates and business performance in treatment vs. control:

Prediction 1: Repayment Rates: *If a repayment flexibility option is made available through a menu of contracts that differ in price and flexibility, a separating equilibrium will be achieved that will allow as good repayment rates as under the classical, rigid contract.*

Prediction 2: Business Performance: *Under the same conditions stated above, offering the menu of contracts will lead to better business performance than offering only one standard, rigid contract.*

Our randomized intervention allows us to test both Prediction 1 and 2. We also study borrowers' selection into the flexible vs. the rigid contract to test whether the menu of contracts does enhance a separating equilibrium. Selection in microfinance contracts through flexible repayment schedules has received little attention. The only exception we are aware of is Barboni (2017), who looks at borrowers' selection into rigid and flexible contracts by their ability to correctly evaluate future cash-flows. The innovative financial product we study in this paper is designed to help borrowers cope with business income volatility. Hence, in the treatment group, borrowers with irregular cash flows should be more likely to take up the flexible contract, especially if they expect to take advantage of their business seasonality. At the same time, assuming that agents are self-aware, we expect financially educated borrowers to take up the flexible contract to a higher extent. In fact, financially sophisticated agents have been shown to make more profitable investments (Clark et al.,

¹³Even if the absence of credit bureaus makes borrowing from other lenders relatively easy for a defaulting borrower in theory, this is quite complicated in practice. For the reasons mentioned above, when borrowers switch to a different lender, it will take them many loan cycles before being able to borrow large amounts of money.

2017) and to take more risk (Bianchi, 2018). Additionally, borrowers’ contract choice is also driven by concerns for default, which they want to avoid in order to smooth consumption over time. We therefore expect impatient or “overoptimist” borrowers (Landier and Thesmar, 2008; Bauer et al., 2012) to prefer the standard contract to a higher extent.

4 Experimental design

Informed by the predictions of the theoretical framework discussed in Section 3, we partnered with Sonata to evaluate the impact of offering the flexible loan through a menu of contracts. Twenty-eight Sonata branches in the state of Uttar Pradesh were selected for the experiment, either in urban or peri-urban areas.¹⁴ To maximize statistical power, branches were paired by the researchers according to geographic location and observable characteristics of the catchment population, and then treatment was randomly assigned within each pair.

Figure 2 illustrates the experimental protocol: both in the treatment and the control, micro-entrepreneurs approached a branch of Sonata to obtain a twenty-four month individual loan, offered by Sonata with a rigid repayment schedule and at a standard interest rate of 24%.¹⁵ Once borrowers’ eligibility for an individual loan had been ascertained, Sonata loan officers in treated branches offered customers the opportunity to choose between the rigid contract and the newly available flexible contract of the same loan size at an interest rate of 26%. Customers in control branches were only offered the individual loan with a rigid repayment schedule at 24%. The flexible contract was not publicly marketed so not to bias credit demand. Branches’ catchment areas span several kilometers, and borrowers typically approach the closest bank branch to their place of residency or business location. Therefore, spillover effects (e.g., customers going to another branch having heard a flexible contract was offered there) were quite unlikely, also because the flexible contract was only offered for a limited amount of time given the scope of the study.

¹⁴Around 9% of Sonata’s total branches at the beginning of the study.

¹⁵Before Sonata designed the flexible contract, this was the only uncollateralised business loan offered by Sonata. The standard, individual business loan carries the same interest rate, irrespective of their size.

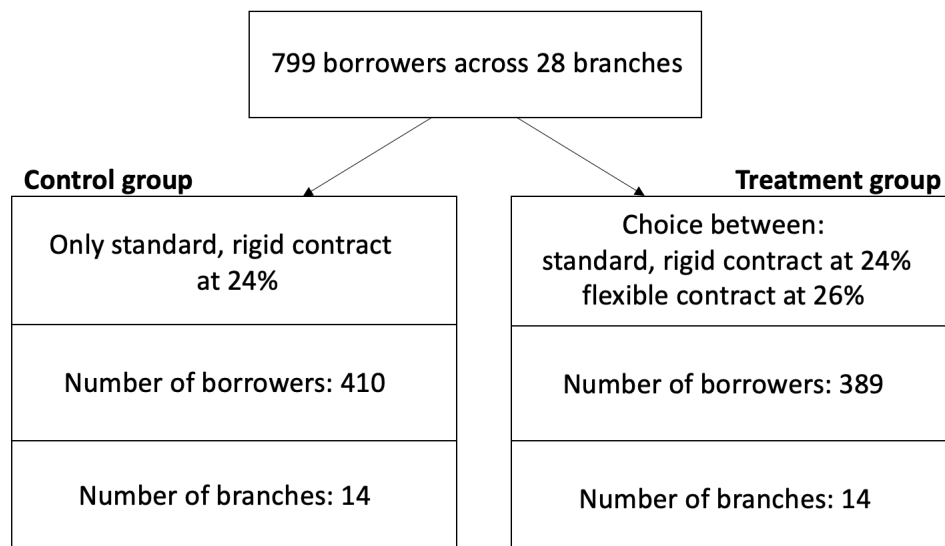


Figure 2: **Experimental protocol** This figure shows the experimental design and the type of contracts, number of subjects involved, and number of branches in the treatment versus the control group.

We followed 799 borrowers across a period of 24 months: 410 in the control and 389 in the treatment group. These figures represent the universe of individual lending customers accepted at Sonata’s branches during the months we carried out the baseline and hence they are fully representative of the first-time individual-lending clients’ segment. All subjects were microentrepreneurs who took up the loan to make an investment for their business activity.¹⁶ These borrowers had already borrowed from Sonata as group lending borrowers. This is a common feature of individual lending borrowers: Sonata, as all Indian MFIs, follows an “upgrading” process of their clients from group to individual loans, whereby customers must take three to four group loans and successfully repay them before becoming eligible for individual loans. This process can be thought of as providing borrowers with dynamic incentives in the form of larger group loan size (Tedeschi, 2006) to enhance screening in the absence of collateral. Important for our setting, these borrowers had never taken individual loans before, nor benefited from repayment flexibility.¹⁷

¹⁶Individual loans are *strictly* business loans and, as we discussed, are larger in size compared with group loans. Sonata collects detailed data on the loan purposes and verifies them.

¹⁷This implies that borrowers’ preference for repayment flexibility was driven solely by their circumstances and characteristics, and not by any learning from previous experiences with flexible loans. This condition

4.1 Data

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

All survey rounds contained questions on business performance, loan usage, and investment, among others. At baseline, we also asked questions to measure borrowers' behavioral characteristics including financial literacy, aspirations, locus of control, personality traits. Two sets of lottery games were also played to elicit both time and risk preferences. Their protocols are detailed in Section B in the Appendix. These data were complemented by repayment information from Sonata, together with data on whether and when borrowers who had opted for the flexible repayment schedule used the repayment holiday. Of the 799 individuals we interviewed at baseline, 789 were re-interviewed at midline, and 761 at endline, with an implied attrition of 1.2% and 4.8%, respectively.¹⁸

5 Empirical Approach and Results

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

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

where y_{ibp} is the outcome of interest (e.g., repayment performance; business outcomes) for individ-

is further ensured by the fact that, to the best of our knowledge, no MFI in India was offering a flexible contract that provided borrowers with a repayment holiday option at the time we started the intervention.

¹⁸Attrition is balanced across treatment and control for both midline and endline data collection, as shown in Table A2 in the Appendix. Migration, lack of interest in participating in the survey, as well as a subject's death were among the reasons we were not able to re-interview borrowers.

A few months after loan disbursement, Sonata's loan officers found that 12 borrowers (1.5% of the original sample) had actually taken a loan for somebody else. In order to avoid any potential endogeneity, we kept these subjects in the sample but re-coded their business outcomes to 0.

ual i in branch b , belonging to pair p . Table A9 contains a detailed description of the variables we use to estimate treatments. T_{bp} is a binary variable for the treatment assigned to the branch b - whether borrowers were only offered the standard rigid contract ($T_{bp} = 0$) or, instead, both contracts at different prices ($T_{bp} = 1$). δ_{bp} are branch-pair fixed effects to account for randomization strata. Standard errors are clustered at the unit of randomization, i.e., at the branch level (Abadie et al., 2017). Given potential concerns for the relatively small number of clusters in our experiment, we also wild cluster bootstrap p-values (Cameron et al., 2008; Roodman et al., 2019). The vector x_{ib} contains household-level controls measured at baseline. Our coefficient of interest is β , which is the average intent-to-treat (ITT) effect of the menu of contracts. In light of the randomized design, the key assumption for causal identification is that treatment status is orthogonal to ϵ_{ibp} .

Table 1 provides an overview of the characteristics of our entire sample at baseline. The businessperson in the household was targeted to be interviewed and, when they were not available, we resorted to the person in the household who had the most extensive knowledge of the business activity. The households in our sample consist on average of six members, they are predominantly Hindu, and have heads who are on average 41 years old. Households are fairly educated: only 15% of the sample reports the household head only completed primary school, while less than 6% reports no schooling at all. In terms of income and assets, 47% of the households report owning land, at baseline. Average household income in the past twelve months is about 216,000 Rs (\approx 3,000 USD). Average total business sales reported for the last month are approximately 13,000 Rs (\approx 200 USD), whereas average profit difference in the best vs. the worst month is about 9,800 Rs, (\approx 150 USD) – in the best month, profits are on average 18,000 Rs (\approx 280 USD), suggesting that during business peaks, business income represents a very large part of households’ income. In terms of occupations, all borrowers are microentrepreneurs engaged in small-business activities that predominantly entailed producing and/or selling goods and services. The most frequent types of businesses in our sample are: owning a grocery, fruits or vegetables store (20% of the sample); owning a shop and other types of business (18%) and being a dairy farmer (16%). At baseline, less than one in five households have an outstanding formal loan aside from the one from Sonata.¹⁹ The average size of the Sonata

¹⁹Indian regulation of Microfinance Institutions does not allow microfinance borrowers to hold more than

loans is 38,000 Rs (\approx 600 USD). This is significantly higher than standard group-lending loan size offered by the MFI, which usually ranges between 10,000 Rs and 20,000 Rs (\approx 150 USD-300 USD).²⁰

Table 1: Summary statistics

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

Note: Summary statistics for the entire sample of 799 borrowers that were recruited at baseline. Household income, business sales, as well as total formal and informal borrowed amount have been topcoded at 99th percentile. See Table A9 in the Appendix for detailed variable definitions.

two or three outstanding loans from MFIs. This may contribute to explain the relatively low formal borrowing rate in our target population.

²⁰Group loans offered by Sonata are also slightly higher than those offered by Field et al. (2013)'s partner lender.

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

5.1 Treatment Effects on Loan Repayment

Prediction 1 suggests that compared with offering only the standard rigid contract, offering a menu of contracts should not worsen repayment performance. We test this prediction by looking at treatment effects on repayment rates. Table 2 presents the estimated average treatment effects of providing a menu of contracts on loan repayment completion.

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

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Has fully repaid by the due date	792	0.890	-0.0004 (0.031)	-0.0004 (0.030)	-0.005 (0.030)	0.994	0.991
Has fully repaid before the due date	789	0.300	0.094 (0.019)***	0.094 (0.018)***	0.104 (0.021)***	0.000	0.003
Has requested a loan top up	761	0.080	-0.056 (0.010)***	-0.056 (0.011)***	-0.056 (0.012)***	0.001	0.002

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. *Has fully repaid by the due date* is a dummy that takes the value of one if, at the end of the loan cycle, the borrower has fully repaid their loan, and zero otherwise. *Has fully repaid before the due date* is a dummy that takes the value of one if the borrower has completed their loan repayment before the initially-stated loan closing date. *Has requested a loan top up* is a dummy that takes the value of one if the borrower reports, at the end of the loan cycle, to have requested a loan top up from any formal borrowing sources (MFIs including Sonata, Non-Banking Financial Companies, etc.). Both *Has fully repaid by the due date* and *Has fully repaid before the due date* variables have been constructed using administrative data from Sonata. *Has requested a loan top up* is a self-reported information from the research team’s survey data collection. Column (2) reports the mean of the dependent variable for the control group. Column (3), (4) and (5) report Intention-to-Treat coefficients. In column (3), no baseline controls are added. In column (4), controls are selected through LASSO; in column (5), all controls are included. Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (6) reports p-values from wild cluster bootstrap. Column (7) reports p-values from randomization inference (1,000 replications). P-values refer to the LASSO specification shown in column (4).

Information on loan repayment was obtained from Sonata’s customer-level administrative data and refer to the whole loan cycle. Almost 90% of borrowers in the control group completed the repayment of their loan by the due date (i.e., within 24 months), as shown in Column 2.²¹ Columns 3, 4 and 5 of Table 2 report Intention-To-Treat coefficients, estimated with branch-pair dummies, re-

²¹Sonata, as with most Indian Microfinance Institutions, does not have a clear-cut definition of defaulting borrowers. Customers who do not complete their loan repayment by the due date are classified into different default categories, based on whether they are either within three months late, or more than three months late.

spectively excluding and including a set of household characteristics (which in Column 4 are selected through double LASSO procedure, as per [Belloni et al., 2014](#)).²² Average repayment rates are not statistically different between the treatment and control group, indicating that offering the flexible loan through a menu of contracts does not increase default. Adding the full set of controls has little effect on the estimates, consistent with the random assignment of borrowers to the treatment and control groups. Column 6 reports p-values obtained from wild cluster bootstrap, which are meant to address the relatively small number of clusters ([Cameron et al., 2008](#)); column 7 reports p-values obtained from randomization inference (RI). Through RI, we assess the probability that the treatment effects observed could be drawn from 1,000 alternative random assignments ([Gerber and Green, 2012](#); [Heß, 2017](#)). We find similar results to those shown in the other columns where significance levels refer to robust standard errors clustered at the branch level.

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

Taken together, these results show that offering both schedules simultaneously at different prices successfully achieves a separation of borrowers' types and hence confirm **Prediction 1** formulated in section 3: the menu of contracts yields equal repayment rates to the classical, rigid contract. At the same time, evidence that borrowers in the treatment group are significantly more likely to repay before the due date indicates that the design of the flexible loan has achieved the desired effect of

²²The full list of controls includes: household size; age and education of the household head; religion; caste; land ownership; sector of business activity; and, amount borrowed from Sonata (top coded at 99th percentile from the mean). All these outcomes were measured at baseline except for education level of the household head, religion and caste – education was measured at midline religion and caste at endline. We do not see any reason for our intervention to have changed religion and caste. In the Indian context, it is reasonable to presume that caste is time-invariant. Given that the average age of household heads was over 40, we also believe that education level, as measured on average eight months after baseline, should have not been affected by our study.

relaxing liquidity constraints for treated borrowers.²³

To confirm this latter finding, we study treatment effects on an additional indicator of borrowers' need for liquidity: top-up loans. Top-up loans are offered by Microfinance Institutions alongside with standard loans, and typically consist of a one-shot credit boost at the same interest rate of the current loan. The terms of the top-up loan depend on the borrower's request, the size of the loan previously borrowed, and also on the borrower's repayment performance. Treatment effects on top-up loans are shown in Table 2. Borrowers in the treated branches are 70% less likely to request a loan top-up from formal financial institutions, including Sonata, as demonstrated by the statistically significant ITT coefficient that is also of the same magnitude after including baseline controls.

In line with our hypotheses, this result indicates that borrowers in the treatment group are in lower need of additional credit as compared to borrowers in the control group: the flexible contract seems to provide the extra liquidity that borrowers may otherwise seek with a top-up loan.²⁴ Yet, one may argue that borrowers that were offered a menu of contracts may seek additional credit from other borrowing sources, either formal or informal. Table A3 in the Appendix shows no significant treatment effects on total formal and informal outstanding loan amounts, both at midline and at endline (column 5, the most restrictive hence our preferred specification). This finding confirms that borrowers in the treatment group are in lower need of additional credit. At the same time, it suggests that borrowers value the ex-ante committed provision of extra liquidity embedded in this financial innovation more than the additional credit they could potentially receive through standard loans. This result, on one hand, suggests that borrowers may be uncertain about getting additional credit through standard channels. On the other, it provides additional evidence of the suitability of the flexible contract to meet the business and financial needs of our study population.

²³One could also argue that borrowers may repay earlier their loan since this makes the cost of credit cheaper (recall from Section 3 our assumption that the lender is impatient as in DeMarzo and Duffie (1999), among others). While we do not have survey data to disentangle the two stories – liquidity vs. costs – both stories would speak to borrowers' financial sophistication driving the choice for the flexible contract. We discuss this in greater detail in Section 5.3.

²⁴The dependent variable here represents any loan top up from any formal financial institution.

5.2 Business Outcomes

We turn to the study of the treatment effects on business performance. As we discussed in Section 3, we hypothesize that, compared with offering only the standard rigid contract, offering a menu of securities should lead borrowers to reveal their type through contract choice (Rothschild and Stiglitz, 1976; Bester, 1985). In particular, the model predicts that borrowers with better knowledge of the market in which they operate will take up the flexible contract as long as the additional investment opportunity they intend to seize is profitable enough. Hence, choosing the financial innovation is associated with better business performance.

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

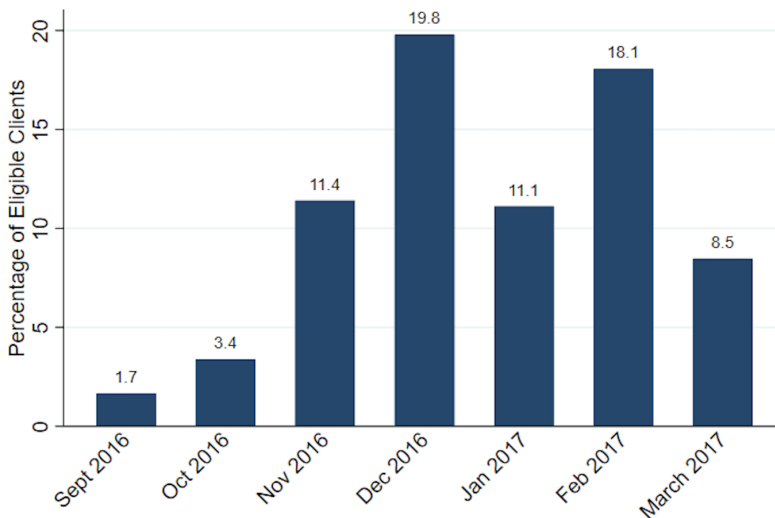


Figure 3: **Share of eligible customers using the first repayment holiday, by month** This figure shows the share of borrowers that, in each month of the first year of their loan, exercised the repayment holiday being eligible for it (i.e., they had already repaid three months in individual instalments)

Figure 3 plots the share of eligible borrowers²⁵ exercising the repayment holiday, by calendar

²⁵Borrowers were eligible to use the repayment holiday once they had completed the three compulsory

month.²⁶ Most of the borrowers who took up the flexible contract opted for waiving repayments between November 2016 and February 2017. These months correspond to both the festival (November and December) and the lean season (January and February).²⁷ Figure 3 indicates that borrowers used the flexible contract during periods in which their need for liquidity was more pronounced, either because there is higher demand for their products and services (festival season) or because the lower demand following the peak business season makes it more difficult to meet debt repayment and expenditures (lean season).

Figure 3 suggests that borrowers opting for the flexible contract in the treatment group used it to mitigate business irregularities. Hence, as **Prediction 2** formulated in Section 3 suggests, we should observe improved business performance in the treatment compared to the control group, where borrowers could not benefit from a financial product specifically designed to smooth cash flow volatility. We estimate business outcomes at midline and endline, separately. This allows us to show both the short-term (i.e., after approximately 10 months) and the medium-term (i.e., after 24 months) impacts of providing a menu of contracts. Our outcomes of interest include business revenues and profits: we mainly focus on the level of total business sales in the last month and last week, as reported by borrowers; business profits are measured as business revenues minus costs.²⁸ These business outcomes refer to the business activity for which borrowers took up the business loan from Sonata. Results for business outcomes are shown in Table 3.

monthly repayments We subtract from the pool of eligible borrowers in each month those who exercised the repayment holiday in the previous month.

²⁶Given the study timeline, September 2016 is the first month that eligible borrowers in our sample could have started using the repayment holiday.

²⁷In November 2016, Indian demonetization took effect and caused a substantial shock to the entire Indian economy, including immediate although relatively short-term negative consequences on a number of economic outcomes. It is possible that borrowers who have used their repayment holiday in December 2016 may have done so to mitigate the negative effects of demonetization. However, we do not observe *every* borrower using the repayment holiday right after the demonetization, nor in January 2016. This supports the idea that the effects of demonetization were not persistent, as also shown by Chodorow-Reich et al. (2020)

²⁸We include the following cost categories: input costs; rent of land and cost of storage; utilities; wages/salaries; travels to meet suppliers; marketing; renovation of business premises; cleaning and maintenance costs; rent on machinery and equipment; minor repairs. While we report profits both at midline and endline, it must be noticed that costs were imprecisely estimated at midline. More details on how we measured costs and profits are discussed in table A9.

Table 3: Treatment Effects on Business Outcomes

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Midline							
Monthly Sales	781	25,094.06	2,416.01 (2,153.94)	3,363.04 (2,223.96)	4,099.72 (2,193.81)*	0.298	0.287
Weekly Sales	778	6,064.76	1,441.61 (569.47)**	1,676.34 (608.40)***	1,617.06 (630.79)**	0.073	0.082
Monthly Profits	781	23,176.67	2,251.77 (2,215.62)	3,783.33 (2,322.09)	4,019.44 (2,240.51)*	0.276	0.288
Panel B: Endline							
Monthly Sales	761	23,359.11	5,105.53 (2,078.45)**	6,009.16 (2,064.54)***	5,235.76 (2,078.50)**	0.085	0.095
Weekly Sales	761	5,366.25	608.65 (545.81)	776.01 (573.11)	657.49 (595.69)	0.426	0.405
Monthly Profits	761	-5,169.55	5,769.66 (2,384.34)**	5,769.66 (2,319.71)**	5,421.01 (2,317.64)**	0.085	0.096

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Monthly sales refer to business sales in the last 30 days; weekly sales refer to business sales in the last 7 days. Monthly profits are computed as monthly sales minus monthly costs. Column (2) reports the mean of the dependent variable for the control group. Note that costs at midline were imprecisely elicited; this explains the (large) difference between average level of profits at midline and endline shown in column (2). Column (3), (4) and (5) report Intention-to-Treat coefficients. In column (3), no baseline controls are added. In column (4), controls are selected through LASSO; in column (5), all controls are included. Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (6) reports p-values from wild cluster bootstrap. Column (7) reports p-values from randomization inference (1,000 replications). P-values refer to the LASSO specification shown in column (4). All outcomes are winsorized (99th percentile). Profits are also bottom-coded at the 1st percentile.

Panel A reports results from estimating equation 1 with midline data; Panel B with endline data. Column 3 shows results without household covariates, which are then included in Columns 4 (through double LASSO procedure) and 5 (all). Column 6 reports p-values obtained from wild cluster bootstrap to account for the small number of clusters; column 7 reports p-values obtained from randomization inference.

Borrowers in the treatment group report higher weekly and monthly sales than those in the control group, the difference between treatment and control being statistically significant both at midline and at endline. The estimated coefficients for weekly sales at midline and monthly sales at endline are positive and statistically significant after we bootstrap standard errors, as shown in Column 6 and 7, respectively. Monthly and weekly sales at midline in the treatment group are approximately 16% and 27% higher than those in the control group, respectively (Panel A, Column 5); monthly sales at endline are 22% significantly higher in treatment group (Panel B, Column 5). These findings are in line with the magnitude of the results found by other studies focusing on financial innovations (Battaglia et al., 2017; Bari et al., 2021). We then look at profits and find evidence of statistically

higher profits at endline.²⁹ While the business activities of borrowers in control group operate on average in loss (the mean of the dependent variable for control group is about minus 5,170 Rs), borrowers in the treatment group do break-even, on average, and realise positive and significantly higher profits than the control group. This suggests that they run their business more efficiently.

Results from Table 3 show that the flexible contract allows borrowers to carry out higher-revenues and more profitable business activities. This is consistent with the view that this financial innovation helps borrowers mitigate the negative effects of cash flow volatility, for instance by allowing them to purchase additional inputs in anticipation of the business peak season, which translates into higher sales, as we hypothesise in our theoretical framework. Findings from Table 3 thus confirm **Prediction 2**: offering the menu of contracts leads to better business performance than only offering the standard, rigid contract.

Finally, Figure 4 plots the cumulative distribution function (CDF) of weekly sales by treatment status, at midline. The graph shows a clear separation of CDFs, and with a shift to the right. Weekly sales are consistently larger in the treatment than in control group, further corroborating the average treatment effects reported in Table 3. In the Appendix, Figure A2 also plots the CDF of weekly sales by treatment status, at baseline. The two curves are mostly overlapping throughout the distribution, indicating they are similar, on average, as also confirmed by the balance checks shown in Table A1.

²⁹Some categories of monthly costs we include in the computations of profits at endline were not elicited at midline. This explains why the mean of profits at midline (shown in Panel A, Column 2) is substantially higher than at endline. See also Table A9 for variables definitions.

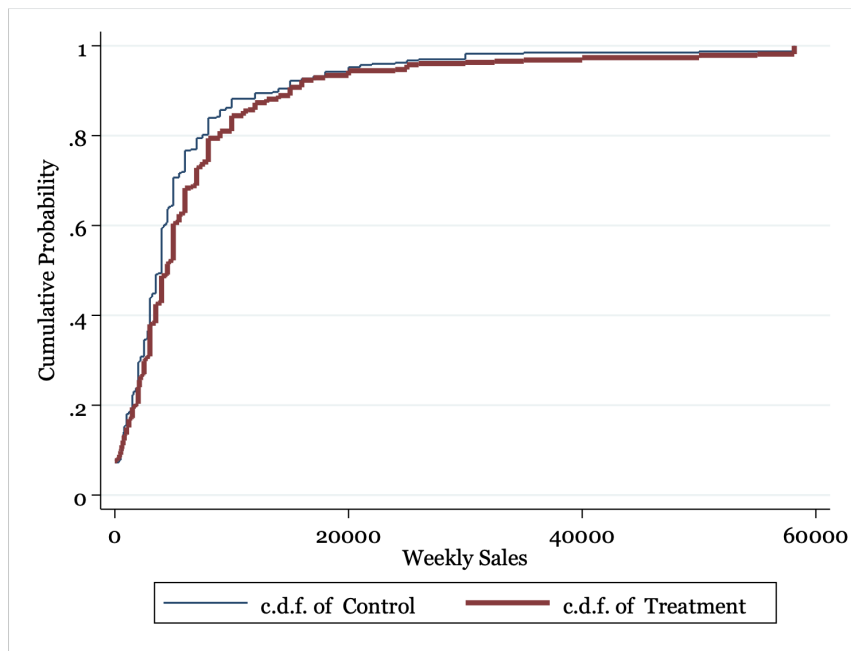


Figure 4: **CDF, weekly sales (midline)** This figure plots the cumulative distribution function (CDF) of weekly sales by treatment status, at midline.

5.3 Disentangling the Selection Mechanism

Our empirical findings validate our theoretical predictions that offering a menu of contracts that vary in price and flexibility vs. offering only the standard, rigid contract improves business performance without increasing default rates. Our theory further predicts that these outcomes are achieved because low-type entrepreneurs – those with less knowledge about market conditions and who respond less to demand peaks – will choose the cheaper contract: the rigid one. Instead, as long as the high-type agent expects high enough future business performance through the additional investment opportunity – hence benefiting marginally more from the flexible contract – they will be willing to take the more expensive contract.

In this section, we look in greater detail at borrowers’ selection. We focus on the treatment branches and use the extensive data collected at baseline to study which characteristics predict borrowers’ choices for the flexible contract vis-à-vis the standard rigid contract. In light of the observed treatment effects, we expect borrowers with higher cash-flow volatility and higher potential to run their business profitably (e.g., those with better financial accounting skills and time-consistent

customers) to be more likely to choose the flexible contract. At the same time, borrowers who anticipate having less need for the flexible contract (e.g., those with lower variability of sales and profits) should be more likely to choose the rigid schedule over the flexible one. We estimate the following probit regression equation:

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

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

We first look at land ownership as a wealth indicator (Column 1 of Table 4) and find that this variable does not significantly predict the take up of the flexible contract.³⁰ We then study the predictive role of cash flow irregularities experienced by borrowers on the take up of the financial innovation. We construct two measures of business irregularity: variability of sales and profit volatility.³¹ The former variable reflects borrowers’ likelihood to undertake higher return projects that have irregular payment streams. The latter is used as a proxy for demand volatility throughout the year. Columns 2 and 3 of Table 4 show that borrowers that experience higher variability of sales and higher profit volatility are more likely to choose the flexible contract, although the coefficient of profit volatility is imprecisely estimated.

³⁰We also test the predictive power of baseline sales and household income, none of which are significantly correlated with borrowers’ likelihood to take up the flexible contract. Results are available upon request.

³¹Sales variability is measured as the scaled deviation of borrowers’ monthly sales from the control mean. Profit volatility is constructed as the probability that borrowers’ self-reported profits lie in the bottom 25th percentile in the worst month, and in the top 25th percentile in the best month. Worst and best month refer to the 12 months preceding the baseline survey administration. This measure is used to classify borrowers based on the extent of profit fluctuations they experience throughout the year.

We then consider the predictive power of financial literacy and time and risk preferences. Column 4 of Table 4 shows a positive and significant correlation between the likelihood that borrowers draft a budget for their business activity on a frequent (daily or weekly) basis and the likelihood to take up the flexible contract: borrowers with better financial accounting skills (which are particularly important given the unpredictable nature of their business) prefer the flexible contract to a significantly higher extent. Column 5 shows that time-consistent borrowers are also significantly more likely to take up the flexible contract. Results from Column 4 and 5 provide further evidence that borrowers are self-aware and also understand the costs of default: those who anticipated to be in need of financial discipline to manage their business activities hence to ensure good loan repayments were more likely to choose the standard contract. This is in line with work emphasizing the discipline-enhancing nature of microfinance contracts (Bauer et al., 2012; Ashraf et al., 2006). We also detect a positive correlation between borrowers' risk-loving attitude and the take up of the flexible contract (Column 6); this result suggests that more entrepreneurial borrowers prefer financial contracts that hold the potential for higher productivity.

Additionally, Column 7 shows that borrowers who report being more worried when taking decisions about their households' finances are more likely to take up the flexible contract. Together with financial literacy, this variable can be considered an indicator of borrowers' financial sophistication, which translates into good repayment behavior as well as better cash flow management (Clark et al., 2017). We then test the predictive power of a measure of internal locus of control.³² Although the coefficient is imprecisely estimated, its negative sign suggests that borrowers who felt they had little control over their life events were (perhaps for once) actively choosing the flexible contract. Column 8 of Table 4 tests all predictors simultaneously. The signs and magnitude of all the coefficients shown in the previous specifications remain unchanged, and borrowers' time consistency and worry about future events still significantly predict the take up of the financial contract in this horse-race exercise.

³²We measure locus of control through the following question: "Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please tell me on a scale from 1 to 10 which number indicates better how much freedom of choice and control you feel you have over the way your life turns out: 1 means "no choice at all" and 10 means "a very great deal of choice".

Taken together, results from Table 4 indicate that the flexible contract served its purpose to help borrowers mitigate variability in their business income realisation. They also provide strong evidence that the contract pricing structure has succeeded in screening out borrowers that are unsuitable for financial innovations (Rothschild and Stiglitz, 1976, Barboni, 2017).

Yet, it could be argued that borrowers' choice to take up the flexible contract was motivated by other reasons than those discussed – for instance, concerns for financial claims from friends or relatives during the repayment holiday could have made borrowers opt out of the flexible contract (Squires, 2016). Conversely, borrowers may have chosen the flexible contract to signal their good quality to the lender (e.g., in terms of ability to repay a more expensive loan). While we cannot rule out these alternative explanations entirely, insights from borrowers' feedback, which we discuss more extensively in Section 5.7, provide little support for this “signalling” hypothesis. As for the “kinship taxation” hypothesis, it must be noted that the flexible contract was overall more expensive than the standard contract thus providing a strong rationale for borrowers to reject external money requests. In addition, our sample consists of individual borrowers hence concerns for social pressure are less relevant in this context (Czura et al., 2020). Finally, one may also wonder whether the treatment effects we observe in Table 2 and 3 were rather driven by the nature of the contract (flexible versus rigid) that influenced borrowers' behavior ex post. Relatedly, another question is whether flexible contracts like the one we study may lead to moral hazard. While we discuss moral hazard in our setting in greater detail in Section 5.6, here we note that results shown in Table 4 highlight that the menu of contracts that was offered in the treatment group triggered a clear separation of borrowers' types, whereby more financially sophisticated borrowers consistently chose the financial innovation over the standard contract, as predicted by our model. This finding is central the paper, as it shows that in presence of information frictions, credit allocation can be improved by means of menus of contracts that vary in price and flexibility.

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

	Probability of Taking Up the Flexible Contract								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
The household owns land	0.0902 (0.0487)*								0.0842 (0.0495)*
Variability of sales (last 30 days, scaled)		0.0001 (0.00004)**							0.0001 (0.0004)*
High profits volatility			0.0918 (0.0633)						0.0764 (0.0611)
Does budget frequently				0.0883 (0.0478)*					0.0688 (0.0472)
Is time consistent					0.202 (0.0612)***				0.164 (0.0595)***
Is risk loving						0.190 (0.106)*			0.162 (0.0991)
Worries about making best financial decisions							0.163 (0.0487)***		0.128 (0.0483)***
Has control over their life								-0.028 (0.019)	-0.039 (0.018)
<i>N</i>	383	383	383	383	383	383	383	382	382
Dep. Var. Mean	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Joint significance: All Coeffs = 0 (P-Value)									0.0000

Note: Standard errors in parentheses. Marginal effects are displayed. All variables are measured at the baseline. *The household owns land* is a dummy that equals one if the household reports owning land at baseline. *Variability of sales* is measured as the (scaled) squared difference between total sales in the last month and the mean value of total sales in the last month, topcoded 99pc from the mean. *High profits volatility* is a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile. *Does budget frequently* is a dummy that equals one if the respondent reports drafting a budget for their business activity on a daily or weekly basis (as opposed to fortnightly, monthly, or even more sporadically). *Is time consistent* and *Is risk loving* are dummies reflecting borrowers' attitude towards time discounting and risk as discussed in Appendix B. *Worries about making financial decisions* is a dummy that equals one if the borrower reports being worried about making the best financial decisions. *Has control over their life* is a locus of control dummy constructed from borrowers' answer to the question "How much freedom of choice and control do you have in your life?" Business-activity dummies, age and education of the household head are included in each specification.

5.4 Heterogeneity

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

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

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

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

Table 5: Heterogeneous Treatment Effects: Business Sales

	Weekly Sales (Midline)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	1617.06 (630.79)**	1689.00 (701.03)**	1383.33 (692.79)*	139.93 (823.87)	3203.56 (981.69)***	1515.88 (645.33)**	2026.66 (816.88)**	1973.42 (1215.53)
Treatment × Sales Variability		0.244 (1.572)						0.136 (1.488)
Treatment × High Profit Volatility			1578.07 (2030.45)					2092.65 (2060.52)
Treatment × Frequent Budget				3888.38 (1755.32)**				4481.89 (1745.39)**
Treatment × Time Consistent					-1689.99 (1185.61)			-2009.39 (1311.89)
Treatment × Risk Loving						538.94 (1815.20)		-370.61 (1732.54)
Treatment × Worried							-1614.44 (1870.01)	-2100.95 (1971.73)
Sales Variability		0.728 (0.363)*						0.705 (0.359)*
High Volatility			-65.22 (1519.40)					-220.17 (1504.63)
Frequent Budget				202.52 (1448.09)				-236.49 (1502.85)
Time Consistent					2975.61 (593.05)***			2889.89 (719.66)***
Risk Loving						-1586.87 (1553.39)		-1632.55 (1191.32)
Worries about making best financial decisions							-37.85 (1214.40)	-183.64 (1145.20)
Dep. Var. Mean Control	6,064.76	6,064.76	6,064.76	6,064.76	6,064.76	6,064.76	6,064.76	6,064.76
N	778	778	778	778	778	778	778	778
p-value wild bootstrap (T× Var)		0.817	0.462	0.055	0.188	0.803	0.465	

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

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

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

Column 4 considers heterogeneity in treatment effects by borrowers' financial accounting skills, measured by the likelihood the entrepreneur drafts a budget on a frequent basis (daily or weekly as opposed to fortnightly or monthly). We find the interaction term to be statistically and economically significant: borrowers with better accounting discipline report 3,888 Indian Rupees higher weekly sales. Furthermore, the treatment effect is not statistically different from zero for borrowers without accounting discipline.

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

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

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

5.5 Further Analysis of Heterogeneous Treatment Effects

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

As discussed in Section 2, all borrowers received a large loan (four times the size of a group loan) to initiate or expand their small business activities, irrespective of their characteristics or treatment assignment. Administrative data from Sonata indicate that borrowers were able to undertake sizeable capital expenditures with this initial liquidity provision, including the purchase of rickshaws, of power generators, and of buffaloes, among other assets.

On the contrary, the flexible loan, which was only offered in treatment branches through a menu of contracts, was specifically intended to help borrowers smooth business irregularity by mitigating the additional liquidity constraints they may face during the business cycle. As predicted by the theoretical model outlined in section 3, we expect inventory purchase (i.e., inputs and finished goods) to be the main type of investment high-type microentrepreneurs undertook to meet demand seasonality. This, in turn, would enable them to respond to demand peaks and increase their business sales.

Building on previous heterogeneity analysis, we therefore study whether keeping regular financial accounting predicts borrowers' purchase of inventory. In a second and related analysis, we also study heterogeneous treatment effects on the likelihood borrowers used the Sonata loan also to purchase more stock during festivals.

5.5.1 Value of Inventory

Table 6 presents heterogeneous treatment effects on the value of business inventory. The dependent variable is the monetary value (in Indian Rupees) of the business inventory borrowers currently own. For consistency with the results shown in Table 5, we look at heterogeneous treatment effects on the value of business inventory at midline. Column 1 of Table 6 presents the average treatment effects. Offering a menu of contracts that varies in flexibility and price has a positive impact on the value of inventory at midline, although the treatment coefficient is not statistically significant.³³ Columns 2-7 consider all the predictive characteristics and Column 8 tests all of the interactions terms together. Borrowers in the treatment group who keep regular financial accounting (Column 4) report that the value of their inventory is on average +30,700 Rupees higher. This finding casts additional light on the mechanisms behind our main results: more financially disciplined borrowers, who select into the flexible contract, increase their business investment and this translates into higher business sales (as shown in Table 3). Column 7 of Table 6 additionally shows that borrowers in the treatment group who were more worried about financial decisions report a significantly lower value of inventory at midline. One possible explanation for this result is borrowers may be concerned they will be unable to sell their goods or that the stockpiled inventory would decrease in value.

³³The value of inventory was gathered by asking respondents the following question: “*What is the value of finished products and inputs that you have in stock today?*”. We acknowledge that this question may have led to a noisily-measured outcome since we did not ask for individual categories of inventory.

Table 6: Heterogeneous Treatment Effects: Value of Inventory

	Value of Inventory (Midline)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	4505.31 (7408.51)	6740.76 (6573.41)	7097.26 (9583.37)	-7444.43 (6470.97)	14004.02 (14635.89)	4638.03 (7061.45)	15035.44 (10028.23)	13058.79 (15074.14)
Treatment × Sales Variability		-2.436 (15.822)						-4.893 (16.856)
Treatment × High Profit Volatility			-18307.92 (29656.71)					-13452.45 (29069.23)
Treatment × Frequent Budget				30732.25 (14021.72)**				37651.24 (14831.36)**
Treatment × Time Consistent					-10094.34 (15686.80)			-8013.74 (15571.42)
Treatment × Risk Loving						-14898.63 (23853.38)		-21568.29 (20979.21)
Treatment × Worried about future							-36397.85 (17900.16)*	-38883.84 (16773.40)**
Sales Variability		11.775 (4.213)**						11.811 (4.353)**
High Volatility			8953.10 (22169.14)					9191.41 (20871.84)
Frequent Budget				9784.11 (6925.64)				4891.70 (7387.75)
Time Consistent					17776.68 (13102.64)			14745 (12752.76)
Risk Loving						-8496.76 (18165.48)		-11474.98 (13209.02)
Worries about making best financial decisions							10020.57 (11841.30)	8106.17 (11294.36)
Dep Var Mean Control	56080.18	56080.18	56080.18	56080.18	56080.18	56080.18	56080.18	56080.18
N	771	771	771	771	771	771	771	771
p-value wild bootstrap (T × var)		0.934	0.544	0.037	0.538	0.603	0.064	

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

5.5.2 Loan Usage

We complement the analysis on inventory by studying heterogeneous treatment effects on loan usage. The main loan usage categories include: to make improvements for the business; to start new businesses; to purchase more stock during festivals; to buy agriculture and farming inputs; to buy inputs for other businesses; and to repay old debt. We also identified non-business related loan usage categories such as consumption and other expenditures (health; education; weddings; purchase of jewelry; funerals).

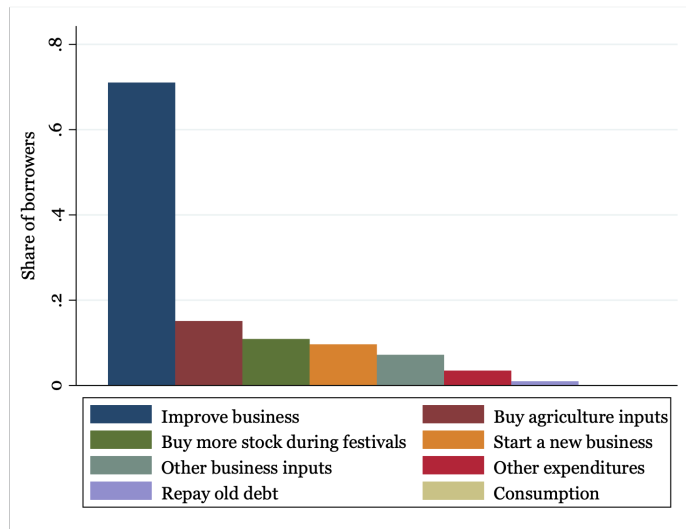


Figure 5: **Main loan usage categories (control group)**. This figure shows share of borrowers in the control group that reported using their loans for each of the identified loan usage categories. This information was reported by borrowers during the midline data collection hence we only report here responses from the control group.

Figure 5 reports the share of borrowers in the control group in each of the above-mentioned loan categories.³⁴ Approximately 70% of borrowers used the loan to improve their business activity, which is consistent with the fact that borrowers took up business loans, and with the size of these loans. The second and the third most frequent loan usage categories are the purchase of agricultural inputs, which is not surprising given that approximately 20% of borrowers are farmers/dairy farmers, and the purchase of additional stock during festivals. Since our goal is to study the mechanisms underlying the observed increase in business outcomes in the treatment group, we focus on the

³⁴Borrowers could report multiple usage of their loans.

latter loan usage category. Results are shown in Table 7. Additionally, we report average treatment effects for all loan usage categories in Table A7 in the Online Appendix.

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

Table 7: Heterogeneous Treatment Effects: Loan Usage

	Used the loan to buy more stock during festivals							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.117 (0.057)**	0.116 (0.057)*	0.123 (0.056)**	0.024 (0.098)	-0.084 (0.093)	0.111 (0.058)*	0.096 (0.066)	-0.146 (0.094)
Treatment × Sales Variability		-0.00001 (0.00001)						-0.00001 (0.00003)
Treatment × High Profit Volatility			-0.043 (0.086)					-0.024 (0.084)
Treatment × Frequent Budget				0.245 (0.060)***				0.221 (0.055)***
Treatment × Time Consistent					0.247 (0.084)***			0.212 (0.080)**
Treatment × Risk Loving						0.013 (0.106)		-0.024 (0.105)
Treatment × Worried							0.060 (0.061)	0.014 (0.062)
Sales Variability		0.0000 (0.00000)						0.0000 (0.00000)
High Volatility			0.037 (0.058)					0.020 (0.058)
Frequent Budget				-0.143 (0.044)***				-0.128 (0.040)***
Time Consistent					-0.107 (0.056)*			-0.090 (0.051)*
Risk Loving						-0.108 (0.043)**		-0.087 (0.035)**
Worries about making best financial decisions							-0.054 (0.033)	-0.038 (0.030)
Dep. Var. Mean Control	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
<i>N</i>	788	788	788	788	788	788	788	788
p-value wild bootstrap (T× Var)		0.916	0.655	0.001	0.020	0.908	0.354	

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

5.6 Testing for Moral Hazard

Our paper so far has discussed the adverse selection problem lenders face when they offer financial innovations to a pool of borrowers with varying liquidity needs in managing their business. Our findings indicate, both theoretically and empirically, that the use of a menu of contracts to uncover borrower information mitigates adverse selection problems as it is consistent with borrowers sorting by private information. Yet, one concern is whether introducing the flexible contract may lead to moral hazard as well. For example, borrowers could take the flexible contract without undertaking additional investment to enjoy present consumption, at the cost of not being able to repay the loan.

We look into this empirically by first exploiting the lack of repayment holiday in the second year of loan maturity, which was independent of borrowers' types and contract choice, and affected *all* borrowers who chose the flexible contract at the onset of the intervention. We study whether borrowers that selected into the flexible contract changed their behavior in the second year of loan maturity as compared to the first year. We conduct this analysis graphically; results are shown in Figure A3 in the Online Appendix. The left panel shows midline vs. endline average weekly sales. The right panel shows midline vs. endline (scaled) variance of sales, which can be interpreted as a measure of sales dispersion.³⁵ The figure indicates a reduction in both average and variance of sales at endline compared with midline. This suggests that benefiting from a flexible contract has allowed microentrepreneurs to invest in more profitable activities. Moreover, in line with our theoretical predictions, evidence of higher sales dispersion at midline vs. endline may indicate that the provision of a more expensive flexible repayment option has led to an effective separation of borrowers' types, whereby high-type borrowers invested in higher-income business opportunities and low-type borrowers in lower-income ones.

While we acknowledge that this analysis should be considered with caution – we do not control for households' covariates, and the sample size only consists of 120 borrowers who opted for the flexible contract in the treatment group – results are suggestive that benefiting from the flexible repayment contract led (high-type) borrowers to take up additional investment opportunities that translated

³⁵We follow an approach similar to [Rajan et al. \(2015\)](#) and [Fisman et al. \(2017\)](#).

in better business outcomes overall. These findings, alongside with the results on repayment rates from Table 2, confirm that the provision of a repayment holiday did not come at the cost of worsened repayment and heightened moral hazard.

5.7 Feedback on Borrowing Experience

Complementing this statistical analysis, we measured borrowers’ overall degree of satisfaction with Sonata and the flexible contract through Likert scales administered during the endline data collection.³⁶ On a scale from 1 (lowest satisfaction) to 5 (highest satisfaction), the average score borrowers gave to their overall experience with Sonata was 4.25, with no statistically significant difference between the treatment and the control group, revealing an overall positive borrowing experience.³⁷ The customers’ scored trust in Sonata was 4.66 – 4.59 if we only consider clients who opted for the flexible contracts – indicating that failing to provide repayment holidays in the second year did not jeopardise the lending relationship.³⁸

We also asked a few additional questions to borrowers who chose the flexible contract, in particular on why they did (or did not) ask for the first repayment holiday. Several borrowers reported they used the repayment holiday when “business was down” or when they had “money problems” (15%). We also find evidence that borrowers used the repayment holiday to buy additional stock during the festival seasons or other festivities (13%). 19% of borrowers reported using the repayment holiday to repay old debt. We also asked the 53 borrowers who chose the flexible contract but did not opt for the repayment holiday the reasons for their choice. 20 of them (38%) said they did not need it, while 32 borrowers reported they felt they did not have a full understanding of it – once again

³⁶In addition, at midline, we performed a set of qualitative interviews with a subset of Sonata’s borrowers involved in the study. Customers assigned to the treatment group were also asked how they perceived the price of the flexible schedule versus the rigid one, what made them opt for either one or the other. Borrowers who, in the treatment group, opted for the flexible contract, reported that the higher price of the flexible contract was *fair*. This suggests that not only they understood the difference in price between the two contracts, but they also acknowledge that they should pay more for benefiting from a repayment flexibility option.

³⁷The specific question was “On a scale 1-5 with 1 the worst and 5 the best, please rate Sonata on the overall borrowing experience”.

³⁸The specific question was “On a scale 1-5 with 1 the worst and 5 the best, please rate Sonata in terms of your trust in the institution”.

indicating that one of the main barriers for microentrepreneurs to benefit in full from financial innovations is lack of information and financial skills.

5.8 Additional Robustness Checks

Several robustness checks are reported in the Online Appendix. First, to test the sensitivity of the dependent variables in Table 3 to outliers, we re-estimate these results by top coding business outcomes at the 98th and 95th percentile. Results are shown in Table A4. Results are almost unchanged, suggesting that the transformation we use already limits the influence of extreme observations. Second, as mentioned earlier, we find similar estimated marginal effects if we estimate the specifications from equation 2 using a linear probability model, rather than the probit estimator (see Table A6).

Finally, to dig deeper into the mechanisms behind our main results, we look at treatment effects on business assets ownership. Our sample consists of entrepreneurs who at the start of the intervention received a fairly large loan to start or expand their business, hence we do not expect significant differences across treatment and control in terms of capital expenditures. We look at three categories of business assets: equipment and appliances; transportations; and land. Data on business assets were only collected at endline. We report results in Table A8 in the Appendix. The impact of offering the menu of contracts vs. offering the standard rigid contract on this group of outcomes at endline is generally small in size and not statistically significant.³⁹ Intention-to-treat coefficients appear less noisy when we consider land ownership, which we find to be lower in treatment vs. control. This latter result aligns with findings from Table A7, which shows that borrowers in the treatment group are significantly less likely to use loans to purchase agricultural inputs.

³⁹This is also in line with results shown in Table A7, where we do not find significant treatment effects on loans being used to improve the business; to start a new business; or to buy business inputs in normal times.

6 Conclusions

How can a financial innovation like a flexible microfinance product designed to mitigate the negative impact of irregular cash flows be offered in the presence of information frictions? We argue that the optimal way for lenders to offer this financial innovation is by introducing a menu of contracts that include both the flexible contract and the standard, microfinance contract with a “rigid” repayment schedule, the former product being more expensive than the latter. Our hypothesis is that the menu of contracts allows borrowers to self-select into the contract that *ex-ante* reveals their type: borrowers with higher cash-flow volatility and greater financial sophistication are more likely to choose contracts with higher flexibility and higher interest rates. This in turn improves business outcomes without harming repayment rates, enhancing the full potential of financial innovations in imperfect financial markets.

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

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

We dig into the mechanisms underlying our main results and study borrowers’ selection into the flexible versus the rigid contract. We find that the subset of borrowers that opted for the flexible

contract is ex ante significantly different from those who chose the rigid contract, and in the expected direction. Borrowers with larger business fluctuations at the start of the study were more likely to choose the flexible contract. This indicates that the flexible contract has a higher value for borrowers whose business is more plagued by irregularities. The menu of contracts mitigates adverse selection along several borrowers' characteristics that are key to successfully manage cash-flow volatility and repayment: borrowers with better formal accounting skills and time-consistent borrowers are significantly more likely to opt for the flexible contract.

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

Our paper is possibly the first to show that the inclusion of a more expensive financial innovation like repayment flexibility within a menu of contracts is effective at mitigating the adverse selection problem lenders face in imperfect capital markets. By establishing a causal link between the provision of repayment flexibility and the mitigation of cash flow volatility, borrowers' selection, business performance and repayment rates, our findings indicate that, when information frictions are binding, credit allocation can be improved through well-designed financial innovations. Importantly, the financial innovation we consider presents similarities with the flexible contracts that are increasingly being offered in the context of small business lending and education financing in the United Kingdom and the United States, for example. Hence, findings from our paper can help inform the design and pricing of flexible financial products beyond microfinance and low-income countries.

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A Online Appendix

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

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

Table A1: Balancing Checks

Variable	Control Mean	Difference with Treatment	N	p-value
<i>A. Demographic Characteristics</i>				
Household Size	6.01	-0.02	799	0.8982
Age of the Head of the Household (Years)	41.43	-0.02	799	0.9816
Non-Hindu	0.087	0.023	761	0.5686
Scheduled caste	0.236	-0.069	761	0.1972
<i>B. Education of Head of the Household</i>				
Unschooling (1=Yes)	0.054	0.012	789	0.484
Attended Primary school Only (1=Yes)	0.166	-0.021	789	0.5532
Financially Literate (1=Yes)	0.627	0.038	799	0.996
<i>C. Income and Assets</i>				
Household Income in the Past 12 Months	222,006	-13501.64	799	0.2924
Household owns land (1=Yes)	0.402	0.067	799	0.4076
<i>D. Business Outcomes and Characteristics</i>				
Total Business Sales in the past 7 days	3,946.781	-761.119	784	0.251
Difference in profits (best/worst month)	10,151.94	-626.808	793	0.3898
<i>Type of Business</i>				
Manufacturer / Artisan / Tailor	0.124	0.063	799	0.113
Seller / Trader / Contractor	0.137	0.057	799	0.5478
Dairy / Meat / Poultry	0.188	-0.049	799	0.3032
Grocery / Fruits and Vegetables	0.229	-0.058	799	0.1794
Business / Shop / Hotel	0.180	-0.017	799	0.7956
Transport	0.071	-0.008	799	0.602
Services	0.051	0.017	799	0.2466
Labor	0.018	-0.008	799	0.4034
<i>E. Borrowing and Saving</i>				
Has formal loans other than Sonata's loan (1=Yes)	0.132	0.062	799	0.3642
Has informal loan(s)	0.007	0.007	799	0.878
Total formal borrowed amount (last 12 months)	6,277.78	3,206.45	799	0.2156
Total informal borrowed amount (last 12 months)	125.8053	55.280	799	0.8784
Loan amount received from Sonata	38,890.21	-1,052.15	799	0.2672
Total savings amount	14,374.61	675.504	799	0.6568

Note: Balancing checks for the entire sample of 799 borrowers. All the outcomes were measured at baseline except for the level of education of the head of the household and religion and caste that were measured at midline (education) and end-line (religion and caste). Household income, business sales, as well as total formal and informal borrowed amount have been winsorized at p99. The last column shows p-values from wild cluster bootstrap. Variables definition reported in Table A9.

Table A2: Analysis of Attrition

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

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

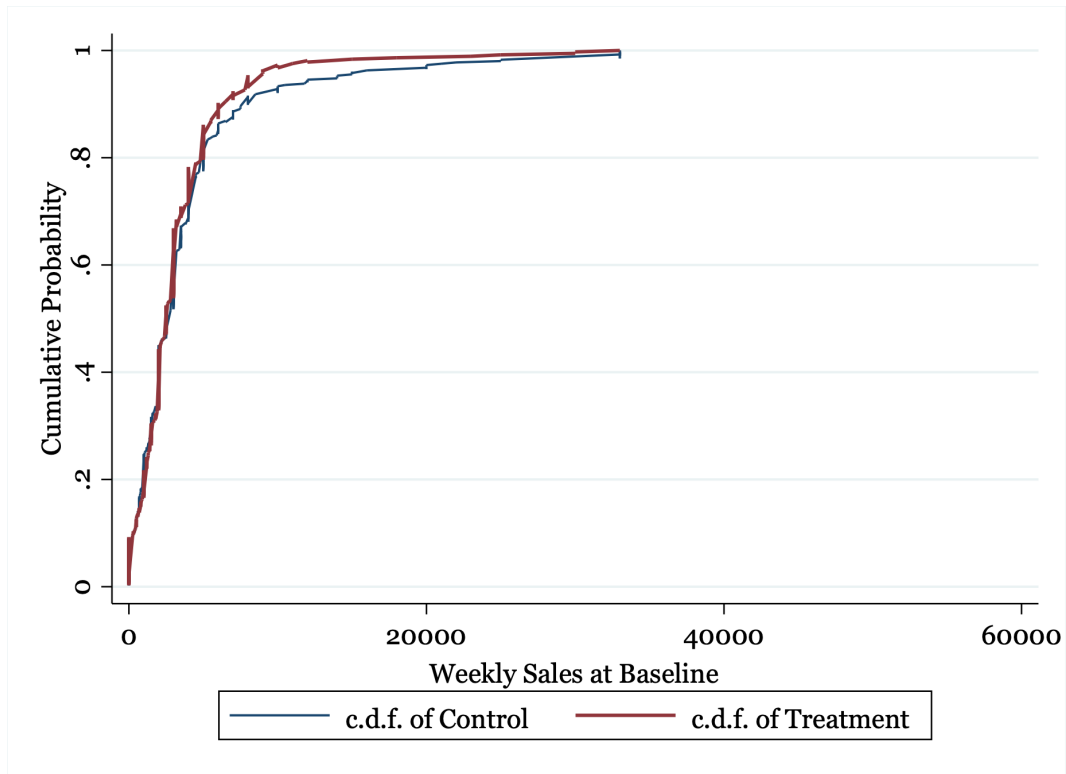


Figure A2: **CDF, weekly sales (baseline)** This figure plots the cumulative distribution function (CDF) of weekly sales by treatment status, at baseline.

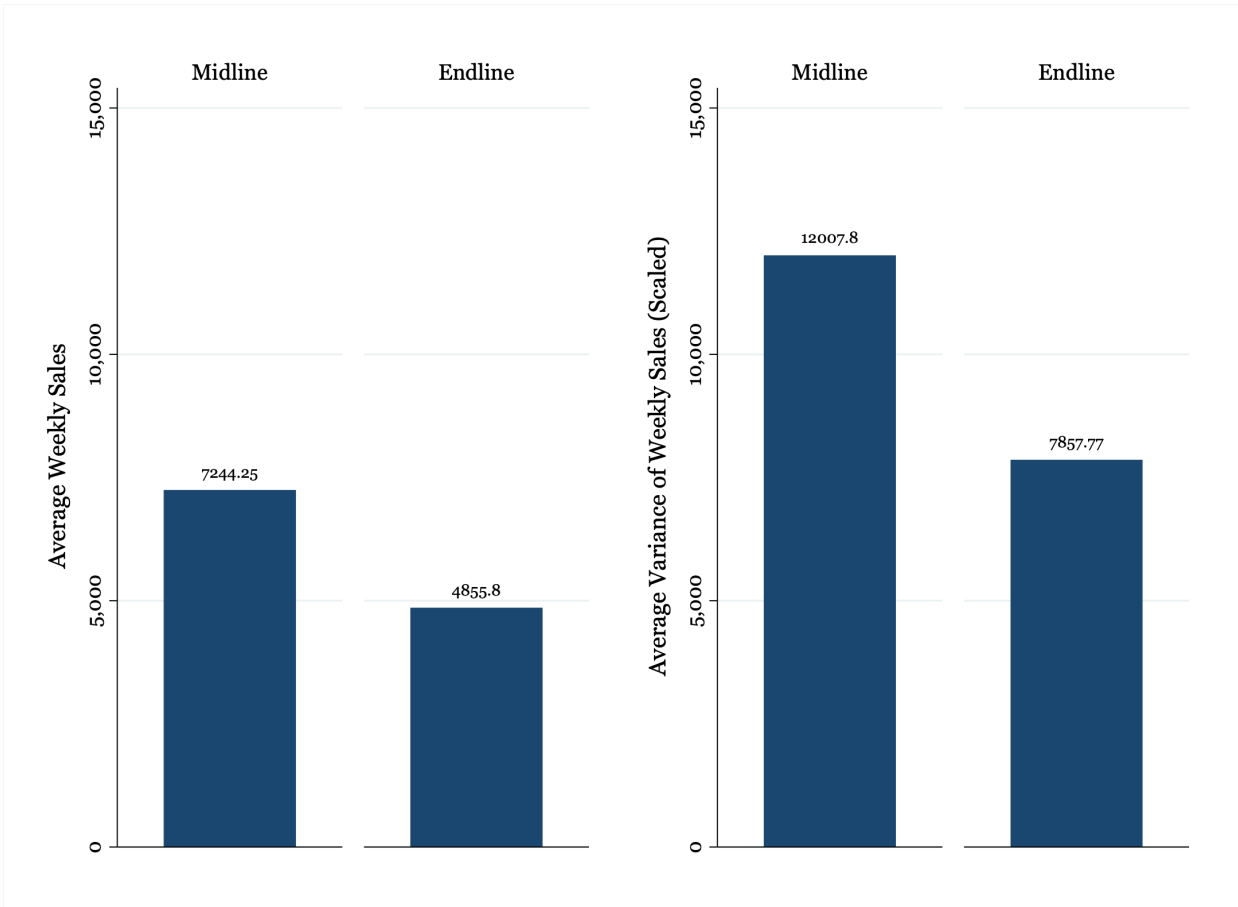


Figure A3: **Average Sales and Variance of Sales, midline vs. endline** This figure plots the average sales (top coded, 99th percentile) and variance of sales (top coded, 99th percentile, rescaled by 10,000) for borrowers assigned to the treatment group who chose the flexible contract at baseline, midline vs. endline.

Table A3: Treatment Effects on Formal and Informal Borrowing

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Midline							
Total Formal Borrowed Amount	783	4,768.65	5,249.64 (3,098.13)	5,249.64 (3,014.95)*	4,730.77 (2,793.75)	0.233	0.270
Total Informal Borrowed Amount	783	123.76	115.35 (167.50)	115.49 (163.31)	136.88 (162.32)	0.798	0.779
Panel B: Endline							
Total Formal Borrowed Amount	759	14,810.05	-6,893.56 (2,979.11)**	-6,893.56 (2,898.29)**	-7,036.94 (2,784.82)**	0.103	0.124
Total Informal Borrowed Amount	759	3,244.85	1,153.04 (1,218.78)	1,153.04 (1,118.71)	693.04 (1,330.93)	0.552	0.454

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Total Formal Borrowing amount includes outstanding loans from banks and MFIs, excluding the loan from Sonata. Informal Borrowed Amount includes outstanding loans from moneylenders, employers, friends/relatives/neighbors and landlords. Column (3), (4) and (5) report Intention-to-Treat coefficients. In column (3), no baseline controls are added. In column (4), controls are selected through LASSO; in column (5), all controls are included. Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (6) reports p-values from wild cluster bootstrap. Column (7) reports p-values from randomization inference (1,000 replications). All outcomes are winsorized (99th percentile).

Table A4: Treatment Effects on Business Outcomes

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Midline (98th pc)							
Monthly Sales	781	23,198.80	1,819.98 (1,828.96)	2,762.57 (1,829.24)	3,436.22 (1,842.487)*	0.322	0.360
Weekly Sales	778	5,839.20	1,273.00 (522.65)**	1,376.08 (548.60)**	1,450.10 (561.50)**	0.092	0.107
Monthly Profits	781	21,149.24	1,691.99 (1,860.34)	2,403.55 (1,960.34)	3,384.20 (1,840.84)*	0.442	0.427
Panel B: Endline (98th pc)							
Monthly Sales	761	21,405.38	4,176.28 (1,455.57)***	4,342.76 (1,397.15)***	4,432.27 (1,469.32)***	0.059	0.078
Weekly Sales	761	4,762.14	741.26 (429.95)*	828.33 (422.61)*	748.23 (449.65)	0.328	0.326
Monthly Profits	761	-3,634.311	3,857.89 (2,059.11)*	3,857.89 (2,003.29)*	3,856.62 (1,935.02)*	0.179	0.203
Panel C: Midline (95th pc)							
Monthly Sales	781	20,879.60	1,181.38 (1,408.27)	1,883.29 (1,376.26)	2,413.30 (1,367.12)*	0.393	0.386
Weekly Sales	778	5,212.63	766.67 (418.03)*	828.33 (422.61)**	956.53 (418.81)**	0.194	0.206
Monthly Profits	781	19,198.90	1,145.64 (1,508.07)	2,157.66 (1,464.67)	2,448.31 (1,451.06)	0.327	0.352
Panel D: Endline (95th pc)							
Monthly Sales	761	19,798.69	3,257.22 (1,149.24)***	3,392.01 (1,178.54)***	3,446.45 (1,229.20)***	0.085	0.082
Weekly Sales	761	4,206.87	717.36 (323.34)**	640.79 (329.51)*	697.88 (347.54)*	0.221	0.241
Monthly Profits	761	-1,551.76	2,533.38 (1,368.47)*	2,533.38 (1,331.38)*	2,490.53 (1,256.61)*	0.172	0.226

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. Monthly sales refer to business sales in the last 30 days; Weekly sales refer to business sales in the last 7 days. Monthly profits are computed as monthly sales minus monthly costs. Column (2) reports the mean of the dependent variable for the control group. Note that costs at midline were imprecisely elicited; this explains the (large) difference between average level of profits at midline and endline shown in column (2). Column (3), (4) and (5) report Intention-to-Treat coefficients. In column (3), no baseline controls are added. In column (4), controls are selected through LASSO; in column (5), all controls are included. Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (6) reports p-values from wild cluster bootstrap. Column (7) reports p-values from randomization inference (1,000 replications). P-values refer to the LASSO specification shown in column (4). Weekly and monthly sales are top-coded. Profits are also bottom-coded.

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

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

Summary statistics for the variables used to study selection into the flexible contract (only for the 389 borrowers in the treatment group). See Table A9 in the Appendix for variable definitions.

Table A6: Variables predicting borrowers' selection in the flexible contract

	Probability of Taking Up the Flexible Contract								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
The household owns land	0.086 (0.052)								0.073 (0.052)
Variability of sales (last 30 days, scaled)		0.0001 (0.00004)**							0.0001 (0.0003)**
High profits volatility			0.096 (0.068)						0.083 (0.065)
Does budget frequently				0.090 (0.052)*					0.067 (0.052)
Is time consistent					0.176 (0.050)***				0.134 (0.050)***
Is risk loving						0.201 (0.125)			0.168 (0.122)
Worries about making best financial decisions							0.176 (0.058)***		0.142 (0.059)**
Has control over their life								-0.028 (0.020)	-0.028 (0.020)
<i>N</i>	383	383	383	383	383	383	383	382	382
Dep. Var. Mean	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31

Note: Standard errors in parentheses. Marginal effects are displayed. All variables are measured at the baseline. *The household owns land* is a dummy that equals one if the household reports owning land at baseline. *Variability of sales* is measured as the (scaled) squared difference between total sales in the last month and the mean value of total sales in the last month, topcoded 99th percentile from the mean. *High profits volatility* is a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile. *Does budget frequently* is a dummy that equals one if the respondent reports drafting a budget for their business activity on a daily or weekly basis (as opposed to fortnightly, monthly, or even more sporadically). *Is time consistent* and *Is risk loving* are dummies reflecting borrowers' attitude towards time discounting and risk as discussed in appendix B. *Worries about making financial decisions* is a dummy that equals one if the borrower reports being worried about making the best financial decisions. *Has control over their life* is a locus of control dummy constructed from borrowers' answer to the question "How much freedom of choice and control do you have in your life?" Business-activity dummies, age and education of the head of the household are included in each specification.

Table A7: Treatment Effects on Loan Usage

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Improvement Works to the Business	788	0.710	0.048 (0.057)	0.034 (0.056)	0.043 (0.056)	0.726	0.664
Agricultural Inputs	788	0.151	-0.073** (0.031)	-0.055** (0.022)	-0.057** (0.023)	0.062	0.062
More Stock During Festivals	788	0.109	0.118** (0.053)	0.118** (0.051)	0.117** (0.057)	0.107	0.094
Start New Business	788	0.097	-0.022 (0.031)	-0.023 (0.030)	-0.020 (0.030)	0.656	0.609
Buy Business Inputs in Normal Times	788	0.072	-0.014 (0.021)	-0.016 (0.020)	-0.017 (0.019)	0.600	0.564
Other Expenditures	788	0.035	0.013 (0.016)	0.013 (0.016)	0.014 (0.014)	0.576	0.552
Repay Old Debt	788	0.010	-0.001 (0.006)	-0.001 (0.006)	0.002 (0.007)	0.932	0.967
Consumption	788	0	0.011* (0.006)	0.011* (0.006)	0.010* (0.006)	0.116	0.205

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. All dependent variables are dummies for loan usage categories. For a description of each variable please refer to table A9. Borrowers could report multiple loan categories hence the sum of the mean of the dependent variables displayed in column (2) is larger than one. Column (3) and (4) report Intention-to-Treat coefficients with baseline control (in column 3, these controls are selected through LASSO). Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (5) reports p-values from wild cluster bootstrap. Column (6) reports p-values from randomization inference (1,000 replications).

Table A8: Treatment Effects on Capital Expenditures (Endline)

Dependent Variable	N	Control group mean	Household covariates included?			p-value wild bootstrap	p-value rand. inference
			No	with LASSO	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Equipment and Appliances	761	0.780	-0.044 (0.029)	-0.044 (0.028)	-0.055 (0.027)*	0.248	0.265
Transportation	761	0.699	-0.020 (0.027)	-0.020 (0.026)	-0.022 (0.022)	0.495	0.603
Land	761	0.432	-0.056 (0.023)**	-0.056 (0.022)**	-0.059 (0.026)**	0.187	0.101

Note: ***, **, * indicates significance at the 1%, 5%, and 10% level respectively. All dependent variables are dummies for assets categories the respondent report to own either exclusively for business or in the household *and* for business. We include all assets categories for which at least 5% of respondents report ownership. For a description of each variable please refer to table A9. Borrowers could report multiple asset categories hence the sum of the mean of the dependent variables displayed in column (2) is larger than one. Column (3), (4) and (5) report Intention-to-Treat coefficients without (3) and with baseline controls (in column 4, these controls are selected through LASSO). Robust standard errors reported in parentheses below the coefficients are clustered at the branch level. Column (6) reports p-values from wild cluster bootstrap. Column (7) reports p-values from randomization inference (1,000 replications).

Table A9: Variable Definitions

Variable	Definition
Has fully repaid by the due date	Dummy variable equal to 1 if the borrower has finished repaying their loan (the one under study) on time
Has fully repaid before the due date	Dummy variable equal to 1 if the borrower has finished repaying their loan (the one under study) before the due date
Has requested a loan top up	Dummy variable equal to 1 if the borrower has applied for a loan top up from Sonata or any other formal financial institution
Monthly Sales	Total Business Sales in the past 30 days. This variable is top coded at the 99th percentile.
Weekly Sales	Total Business Sales in the past 30 days. This variable is top coded at the 99th percentile.
Profits	Monthly business profits are computed as the difference between total monthly sales and total costs. Costs include: input costs; rent of land and cost of storage; utilities; wages/salaries; travels to meet suppliers; marketing; renovation of business premises; cleaning and maintenance costs; rent on machinery and equipment; minor repairs. Both monthly sales and monthly costs are top coded at the 99th percentile. Note that at midline, we only asked borrowers to report total costs for wages, rent, water and electricity, as well as direct inputs. This variable is also bottom-coded at the 1st percentile.

Table A9 (continued): Variable Definitions (used in the analysis of selection)

Variable	Definition
The household owns land	Dummy variable equal to 1 if the household reports owning land at baseline
Variability of Sales	(Scaled – divided by 1,000,000) squared difference between total sales in the 30 days preceding baseline (topcoded, 99th percentile) and the mean value of total sales in the last month from the control group.
High profits volatility	At baseline, we asked borrowers to report the profit in the best and the worst month of the past year. We then create a dummy that equals one if the borrowers' best and worst monthly profits lie respectively above the 25th percentile and below the 25th percentile.
Does budget frequently	Dummy variable equal to 1 if the borrower reported drafting a budget for their business activity on a daily or weekly basis (and 0 if they draft a budget fortnightly, monthly, or on a more sporadic frequency).
Is time consistent	Dummy variable equal to 1 if the borrower displayed unbiased time preferences as elicited in the protocol discussed in Section B.
Is risk loving	Dummy variable equal to 1 if the borrower switches to lottery B in round 2 or earlier, thus displaying a risk-seeking behavior from the risk-elicitation lottery discussed in Section B.
Worries about making financial decisions	Dummy variable equal to 1 if the borrower reported always or often worrying about making decisions to manage households' finances (as opposed to be rarely or just sometimes worried).
Has control over their life	On a scale from 1 to 10, respondents report how much control over their life choices they have (vs. how much their life choices depend on fate or others), where 1 corresponds to no choice at all and 10 corresponds to a very great deal of choice.

Table A9 (continued): Variable Definitions

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

Table A9 (continued): Outcome Variables Definitions

Variable	Definition
Inventory	Amount of stock the borrower currently has in their business. The variable is top coded at the 99th percentile.
Formal Borrowed Amount	Total amount from formal outstanding loans. These include loans from banks and MFIs, excluding the loan from Sonata. This variable has been top coded at the 99th percentile.
Informal Borrowed Amount	Informal borrowed amount is the total amount from informal outstanding loans. These include loans from moneylenders, employers, friends/relatives/neighbors and landlords. This variable has been top coded at the 99th percentile.
Equipment and Appliances	Dummy variable equal to 1 if the borrower reported owning the following assets for business purposes: machinery; sewing machines; refrigerator; basic phone; smartphone.
Transportation	Dummy variable equal to 1 if the borrower reported owning the following assets for business purposes: motorcycle; bicycle; rickshaw; bus.
Land	Dummy variable equal to 1 if the borrower reported owning land for business purposes.

B Eliciting borrowers' time and risk preferences

B.1 Time Preferences

We assessed subjects' intertemporal preferences using standard list choices, similar to [Harrison et al. \(2002\)](#). This protocol consisted of two hypothetical lotteries. In the first, the respondent had to choose between 200 Indian Rupees (Rs. 200) to be received the day after the interview and an equal or larger sum (Rs. 200, 240, 260, 280, 300) to be received one month later. The second lottery "shifted" the time horizon of the first lottery by three months. Combining the two lotteries allows one to estimate the subjects' discount rate and detect any time inconsistency. If a subject preferred Rs. 260 one month later to Rs. 200 paid tomorrow, she should have also preferred Rs. 260 paid four months in the future to Rs. 200 paid three months in the future. This behavior is defined as "time consistent." Still, preference "reversals" may emerge. For example, when a subject prefers Rs. 260 one month later to Rs. 200 paid tomorrow, but the choice is reverted for the later rewards, the subject is said to display hyperbolic discounting, as shown by [Mahajan and Tarozzi \(2012\)](#). Conversely, when a subject prefers Rs. 260 one month later to Rs. 200 paid tomorrow, but this choice is reverted for the earlier rewards, the subject displays anti-hyperbolic discounting.⁴⁰

B.2 Risk Preferences

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

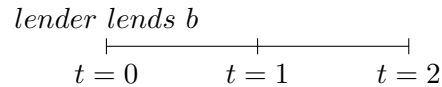
⁴⁰Although less documented in the behavioral economics literature, anti-hyperbolic discounting has been reported in a number of contexts (see [Read et al., 2013](#)).

C Theoretical Framework

In this section, we outline a simple theoretical model to guide the reader through the main predictions and empirical results from the experiment. As discussed in detail in Section 3, we hypothesise that the lender faces a pool of borrowers that differ in their knowledge and ability to take advantage of market opportunities, which translate in differences in the liquidity constraints they face. High-type (*H*) borrowers have better knowledge of market opportunities arising during the peak season of the business than Low-type (*L*) borrowers.

Borrowers live for three periods. At $t=0$ (**regular time** of the business), borrowers receive a unit of capital b from the lender they invest in a standard project S that yields a stream of income y_i , where $i = \{1, 2\}$ – that is, income is realised in every future period after the investment. We assume that, for project S , the following condition holds: $y_1 = y_2$. The income resulting from this investment opportunity is observable and hence pledgeable by the lender. However, since this income is the same across borrowers, irrespective of their type, it cannot be used by the lender as way to screen borrowers by their liquidity needs.

We discuss here the lender’s and borrowers’ payoffs when the two contracts are offered simultaneously – we already provide an intuition in Section 3 of how agents’ utility will be in case the lender only offers the rigid contract. The timeline of the model is as follows:



With some probability $p=\pi$, at time $t=1$ (**peak season** of the business), H borrowers will invest in a project I which requires an investment $i = y_1$ at $t = 1$ and will yield $i \cdot k$ at $t=2$, with $k > 1$. This ensures that the following condition holds: $k \cdot y_1 + y_2 > y_1 + y_2$. That is, at $t = 2$ the H type, if they decide to reinvest their income at $t = 1$ in project I , they will get a higher overall income than if they had just invested in project S . With probability $p=1-\pi$, H borrowers will invest in the same opportunity as L borrowers.

The intuition for the project I is as follows: during the festival season, a specific good becomes very popular and hence its demand increases considerably among customers. H -type borrowers will have knowledge of it and hence they will invest their revenues at time $t=1$, y_1 , to produce or market this good. This will yield $i \cdot k = y_1 \cdot k$ in $t = 2$. L -type borrowers will not have knowledge and hence they will not make any further investment. At $t=2$, they will simply receive $y_2 = y_1$.

C.1 Lender’s payoff

We first look at the payoff function of the lender. Lenders have a utility function that can be expressed as follows:

$$U_L = C_0 + \beta C_1 + \beta^2 C_2$$

where β is a subjective discount factor, $0 < \beta < 1$. Note that the lender is impatient and attributes more value to receiving money sooner rather than later. The lender offers two contracts, a standard, rigid one (Contract 1) and a flexible one (Contract 2). The utility the lender will derive from Contract 1, the standard one, is as follows:

$$-b + \beta(1 + r_1)b + \beta^2(1 + r_1)b \quad (4)$$

under Contract 2, it will be:

$$-b + (1 - \pi)[\beta(1 + r_2)b + \beta^2(1 + r_2)b] + \pi\beta^2 2(1 + r_2)b \quad (5)$$

Setting both equations equal to zero, we obtain the condition that ensures that Contract 2, the flexible one, is as preferred as Contract 1 by the lender:

$$r_2 = \Gamma r_1 + \pi(1 - \beta) \quad (6)$$

where $\Gamma \geq \frac{1 + \beta}{1 + \beta - \pi + \beta\pi} > 1$ since both π and β are positive and bounded to 1. Note that for $\beta = 0$ (the lender discounting cash flows equally through time) or $\pi = 0$ (no high-type borrowers in the pool willing to invest in the higher-return project), $r_2 = r_1$.

Condition (6) formally demonstrates that if the lender offers the two contracts simultaneously, in order to achieve positive utility in both, the flexible contract must be more expensive than the standard, rigid one.

In fact, if the contracts were offered at the same price, the utility the lender would derive from Contract 2 would be negative, as shown in the following:⁴¹

$$-b + (1 - \pi)[\beta(1 + r_1)b + \beta^2(1 + r_1)b] + \pi\beta^2 2(1 + r_1)b \quad (7)$$

Setting both equations equal to zero, we obtain that under the flexible contract the following condition should hold for the lender:

$$\beta - 1 = 0 \quad (8)$$

Which is never satisfied ■

⁴¹The utility under Contract 1 would be the same as in (4)

C.2 Borrowers' payoffs

We now study which borrower, based on their characteristics, is willing to take these two contracts. The H type expects future liquidity needs that will lead them to invest in project I at $t = 1$ with probability π . For the L type, $k = 0$ precisely because of their (low) ability and knowledge of the market.

We embed borrowers' preferences in the contract choice. First, we assume that borrowers' preferences are linear hence their utility function will be as follows:

$$U_B = c_0 + c_1 + c_2 \quad (9)$$

In every period, y_t equals consumption (c_t) plus loan repayment (ρ_t) plus investment (i , if any).

$$y_t = c_t + \rho_t + i \quad (10)$$

Given the type of business activities L invests in, they will prefer the rigid contract that is offered at a cheaper price r_1 . Hence, L type's utility at every period will be:

$$\begin{cases} c_1^{Low} = y_1 - (1 + r_1) \\ c_2^{Low} = y_2 - (1 + r_1) \end{cases} \quad (11)$$

H type's choice of contract depends on whether they decide to take up the additional investment opportunity during the peak season. If $\pi = 1$, H type's utility will be as follows:

$$\begin{cases} c_1^{High} = y_1 - i \\ c_2^{High} = y_2 + k \cdot i - (1 + r_2) \end{cases} \quad (12)$$

If $\pi = 0$, the high-type borrower's utility at time 2 will be the same as that of the low-type as shown in condition (9). We compare the utility in period 2 for H type under both contracts. For k high enough ($k \geq \frac{r_2 - r_1}{i}$), H type will prefer the flexible contract that allows them to invest in project I .