

Repayment Flexibility and Risk Taking: Experimental Evidence from Credit Contracts

Marianna Battaglia

University of Alicante, Spain

Selim Gulesci

Trinity College Dublin, Ireland

and

Andreas Madestam

Stockholm University, Sweden

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A widely held view is that small firms in developing countries are prevented from making profitable investments by lack of access to credit and insurance markets. One solution is to provide repayment flexibility in credit contracts. Repayment flexibility eases both the credit constraint, as it allows for increased spending during the start-up phase, and offers insurance, in case of fluctuations in income. In a field experiment among traditional microfinance clients and larger collateralized borrowers in Bangladesh, we randomly assign the option to delay up to 2 monthly repayments at any point during a 12-month loan cycle. The flexible contract leads to substantial improvements in the traditional microfinance clients' business outcomes, driven by borrowers in the upper tail of the distribution. In addition, we find a significant impact on socio-economic status, combined with lower default rates. We show theoretically and empirically that these effects are induced by an increase in entrepreneurial risk taking, implying that the primary mechanism is insurance provision. Repayment flexibility also attracts less risk-averse borrowers interested in business expansion. At the same time, the effects for the larger loan are much more modest. Our findings suggest that lack of insurance is an important constraint for small firms but that a simple financial product that increases repayment flexibility can be an effective tool for enabling enterprise growth.

Key words: Repayment flexibility, Insurance, Credit, Microfinance, Entrepreneurship

JEL codes: C93, D22, D24, D25, G21, G22, O12, O14, O16

1. INTRODUCTION

Starting or expanding a business often entails undertaking costly and risky investments. In developing countries, where credit and insurance markets are imperfect, entrepreneurs face constraints

on both fronts. It is well established that small enterprises are severely credit constrained (de Mel *et al.*, 2008; Banerjee and Duflo, 2014) and operate under high levels of risk, having to tackle frequent aggregate and idiosyncratic shocks (Samphantharak and Townsend, 2018). While improved availability of credit and insurance ought to help aspiring entrepreneurs, existing evidence shows that conventional microcredit has not generated substantial firm growth, at least on average (Banerjee *et al.*, 2015, 2019). In an environment where business growth requires access to capital and insurance against entrepreneurial risk, the ideal financial contract should cater to both of these constraints. In line with this, a large literature in corporate finance highlights the importance of financial flexibility for businesses (Graham and Harvey, 2001; Gamba and Trianti, 2008), but evidence from developing countries is scant.

In this article, we study an innovative loan product that provides credit and reduces uninsured risk and examine which constraint is more important. To this end, we experimentally alter the debt contract terms by making the repayment obligation more flexible. Improved flexibility eases the credit constraint, as it allows for increased spending during the start-up phase, and provides insurance, in case of fluctuations in income. We conduct the randomized evaluation of the flexible contract in Bangladesh together with one of the largest microfinance institutions in the world, BRAC. The regular product BRAC offers has a 12-month loan repayment cycle with monthly installments of equal size. By contrast, the flexible contract allows borrowers to delay up to 2 monthly repayments at any point during the loan cycle using repayment vouchers. On the day of their monthly repayment, borrowers can present a voucher, thereby postponing the repayment and extending the loan cycle. We study the effect of repayment flexibility on both collateral-free microfinance provided to women (*Dabi*), where BRAC reaches 4 million borrowers in Bangladesh alone, and larger collateral-backed debt (*Progoti*), available to female and male borrowers.¹

We begin our analysis by developing a financial contracting model to illustrate how repayment flexibility affects credit and insurance rationing as compared to the standard credit contract. In the model, entrepreneurs either invest in a safe liquid or a risky illiquid technology. Repayment flexibility can alleviate uninsured risk by covering loan payments in bad times, allowing entrepreneurs to increase their investments in illiquid assets more sensitive to aggregate uncertainty. Flexibility can also lessen the need to save for the first repayment, thus increasing upfront investment funds. This eases the credit constraint for poorer and (assuming skills and investment capital are complements) skilled entrepreneurs. If the credit-constraint channel is more important, flexibility primarily benefits the poor and skilled. By contrast, when the insurance mechanism prevails, borrowers take on more risk. If entrepreneurs have other external obligations in addition to the loan payment (such as recurrent costs), our theory further predicts that repayment flexibility may not be sufficient to induce risk taking but will still allow for an increase in the safer, low-return, technology. Finally, we show that repayment flexibility has an ambiguous effect on the share of risk-averse clients in the resulting borrower pool, with the degree of risk aversion decreasing if the flexible contract primarily attracts borrowers willing to take risks to expand their businesses.

In order to assess the effects of increased flexibility, we collaborated with BRAC to conduct a field experiment in Bangladesh. BRAC identified borrowers with good credit histories deemed to be eligible for the new contract in 50 of its branches. Following this, we surveyed a random sample of these borrowers. After our baseline survey, BRAC offered the flexible loan contract to eligible clients in 25 branches that we randomly selected. The same respondents were then

1. Both loans entail individual liability and a flat 22% annual interest rate. In the case of traditional microfinance (*Dabi*), borrowers attend monthly group meetings but are individually liable for their loans.

resurveyed 1 and 2 years after the baseline. The experimental variation captures the relative benefit of the flexible versus the standard credit contract and allows us to study the importance of credit and insurance constraints.

We find that repayment flexibility improves the business outcomes and socio-economic status of traditional microfinance (*Dabi*) clients. In particular, the flexible contract increases borrowing, business investments, and revenues relative to the control group. The intention-to-treat (ITT) estimates reveal that treated microfinance clients increase their borrowing from BRAC by 11%, the value of their business assets is 51% higher, they generate 87% more revenues, and have 25% higher profits. In terms of their socio-economic status, they end up with higher household income (17%), more household assets (25%), and own more land (26%). A natural question is whether these improvements came at a cost to the lender in terms of default rates. If anything, we find that the likelihood of default diminishes marginally among the treated microfinance clients. When we examine the corresponding impact on larger firms with collateral-backed (*Progoti*) loans, there are no significant effects, on average, in terms of business or other outcomes.

To understand if the treatment effects are primarily driven by credit or insurance constraints, we first test if the flexible contract increased risk taking among the eligible borrowers. Specifically, we investigate four pieces of evidence. First, we examine if the flexible contract affected sales volatility, as captured by the difference between the value of sales in the best versus the worst month, and find that treated *Dabi* clients' sales volatility doubled. In the same vein, we also compare the distribution of earnings in the treatment and control samples. We observe that *Dabi* borrowers in the left tail of the distribution experience lower revenue and lower income growth relative to the control group, while they do better in the upper quantiles. These two findings are consistent with flexibility leading to greater risk taking, causing some individuals in the treatment group to lose out (relative to control), while others gain. Second, we study how treated businesses are affected by demand uncertainty. Greater uncertainty should matter more for borrowers that take on additional risk. In particular, we find that the effects on the *Dabi* clients' revenues and profits are driven by borrowers in areas where expected demand uncertainty is higher at baseline. Third, we explore quasi-experimental variation in the form of local demand shocks. In Bangladesh, excessive flooding during the growing season of the main crop (Boro rice) is particularly harmful and constitutes an important downturn in local economic activity. We find that treatment effects on business profits and revenues for *Dabi* borrowers are significant and positive, only in locations that experienced favourable rainfall. In locations with extreme flooding, the treatment impact is indistinguishable from zero. This implies that the flexible contract induced a shift to activities more sensitive to aggregate uncertainty, at least among the *Dabi* clients. Finally, we show that *Dabi* borrowers increased their holdings across a range of illiquid business assets.

The findings agree with our theory's prediction that repayment flexibility induces risk taking, establishing the importance of insurance rationing among the smaller *Dabi* firms. When we study the same four dimensions for the larger *Progoti* borrowers, we do not see evidence of any meaningful heterogeneity nor an increase in the value of the business assets used. One explanation for these results rationalized by the model is that larger firms have other external commitments such that too much risk remains even with repayment flexibility. In this case, large insurance-rationed firms refrain from taking on additional risk (explaining the much more modest treatment effects).

In order to assess if the effects of the flexible contract are also driven by the credit-constraint mechanism, we examine the heterogeneity of the effects with respect to clients' baseline economic status and skills (as proxied by their schooling level). We find no evidence of significant heterogeneity along these dimensions for the *Dabi* sample. While this implies that credit rationing is less important in explaining the relative benefit of the flexible over the standard

contract for the *Dabi* borrowers, it does not necessarily mean that eligible *Dabi* clients would not be credit constrained if no external financing was available. We do, however, find that the lack of an average treatment effect on the *Progoti* borrowers masks important heterogeneity in the response across the skill level of the entrepreneur: treatment leads to an increase in the revenues and profits among *Progoti* clients with higher skills at baseline. This is consistent with the theoretical prediction that more able *Progoti* borrowers might be held back under the standard contract, indicating that repayment flexibility helped alleviate the credit constraint of the larger firms.

Finally, we consider how the new contract affected the selection of individuals into borrowing. In particular, we test if the introduction of the flexible loan attracted different types of clients in the treated branches relative to control. To do this, we conducted a census of small and medium enterprises (SMEs) operating in the 50 branches at baseline, surveying a random sample of the SMEs prior to branch randomization. We then compare, within this representative sample of SMEs, whether those borrowing from BRAC in the treatment branches at follow-up are significantly different in terms of their baseline characteristics. We find that the degree of risk aversion in the borrower pool declines as less risk-averse entrepreneurs with a desire to start a new business were more likely to become BRAC borrowers in the treated branches. According to our model, this suggests that the flexible contract primarily attracts borrowers willing to take risks to grow their businesses.

In sum, the results imply that repayment flexibility benefits traditional microfinance borrowers mainly through the provision of insurance, enabling riskier investments at lower default rates. To the extent other contractual obligations hold back the *Progoti* clients, there is some evidence that the flexible contract alleviates the credit constraint faced by the larger firms, with the returns to the flexible contract being higher for more able entrepreneurs. The contract also draws in borrowers that are less averse to risk and more willing to expand their business activities. The findings highlight the benefit of a novel product that simultaneously provides credit and insurance to microfinance clients, contributing to work examining the overall success of microfinance by focusing on the inframarginal borrowers (Banerjee *et al.*, 2015). At the same time, some caution is warranted as the effects for larger loans are less transformative.

The present paper builds on and adds to three main literatures. First, it provides causal evidence on the joint importance of capital constraints and incomplete insurance on the growth of non-agricultural firms. While a large literature has studied the role of credit constraints for firms (see, *e.g.* Fafchamps *et al.*, 2014), empirical work on insurance has mainly focused on the agricultural sector. Past studies show that the provision of (subsidized) access to insurance leads to higher farm investment and take up of new technologies, increasing farm profit through greater risk taking (Giné and Yang, 2009; Mobarak and Rosenzweig, 2013; Cai, 2016; Carter *et al.*, 2016; Cole *et al.*, 2017).² Our paper is related to Karlan *et al.* (2014) who evaluate the relative importance of credit and insurance constraints by providing cash grants and rainfall insurance to farmers in Ghana. They find that the binding constraint is uninsured risk, with farmers making riskier production choices when offered insurance. Our results complement (Karlan *et al.*, 2014)

2. Also, Groh and McKenzie (2016) evaluate an insurance against macroeconomic shocks provided to microfinance clients in Egypt. While demand was high, there are no effects on investments or firm growth. Similarly, Lane (2018) studies the impact of an emergency loan following floods in Bangladesh, showing that it increases consumption and asset levels and reduces default in the event of flooding. By contrast, we focus on the joint provision of credit and insurance (for both aggregate and idiosyncratic shocks) via repayment flexibility for a given loan.

by highlighting the role of risk taking in small firms.³ Another closely connected study is [Bianchi and Bobba \(2013\)](#) who find that cash transfers in Mexico increased entrepreneurship. Exploiting variation in the timing of the transfers they show that insurance as opposed to credit constraints drive this effect. While their focus is on entry into entrepreneurship, we study investments in and the growth of existing businesses.

Second, we link to a small but growing literature that investigates credit contract structure in microfinance, with the most notable precursor to our work being [Field *et al.* \(2013\)](#). They evaluate the effects of giving a 2-month grace period to microfinance clients and find that this leads to an increase in short-term investments and long-run business profits, but also in default rates. [Barboni and Agarwal \(2018\)](#) show that 3-month blocks of repayment holidays chosen in advance attracts financially disciplined clients and leads to higher repayment rates and higher sales.⁴ Unlike previous work, borrowers' complete flexibility over their voucher use allows us to evaluate the relative importance of credit and insurance constraints. As such, the contract we study not only encompasses an early grace period or planned blocks, but also caters to unexpected shocks occurring in any given month throughout the loan cycle.⁵

Finally, the analysis contributes to research in corporate finance on firms' ability to take advantage of opportunities and deal with shocks, and how this affects their capital structure. Work on financial flexibility ([Gamba and Trianti, 2008](#); [DeAngelo *et al.*, 2011](#)) and liquidity and risk management (see, *e.g.* [Holmström and Tirole, 1998, 2011](#)) emphasizes the capacity to restructure financing, hoard reserves, and hedge against risk to facilitate unexpected changes in cash flows or investment opportunities, especially in a volatile business environment.⁶ We provide causal evidence demonstrating that such flexibility can increase risk taking, and that this is more valuable when firms face aggregate uncertainty.⁷

2. THEORY

Our financial contracting model illustrates how repayment flexibility affects credit and insurance constraints as compared to the standard debt contract. We also discuss how the theory extends to account for entrepreneurial ability, other contractual obligations, and selection into borrowing. Formal proofs are in [Section A.1 of the Supplementary Appendix](#).

3. Unlike [Karlan *et al.* \(2014\)](#), we study the incremental effect of a contractual change rather than access to either credit or insurance or both for small retail and manufacturing firms, instead of farmers. While [Karlan *et al.* \(2014\)](#) experimentally investigate the relative importance of credit versus insurance constraints, the bundled nature of our treatment implies that our findings on mechanisms should be interpreted as theoretically guided suggestive evidence.

4. [Czura \(2015\)](#) investigates a loan targeted to dairy farmers that tailored repayments to the period when cattle produces milk, finding that it increased milk production and income as well as default rates.

5. Our findings further complement research ([Attanasio *et al.*, 2018](#)) showing how joint as opposed individual-liability contracts in microfinance reduce the negative effect of aggregate risk on loan take up by offering implicit insurance. Moreover, by providing evidence on the selection effects of introducing a new loan product with greater repayment flexibility, we also contribute to empirical work gauging selection in developing-country credit markets (see, *e.g.* [Karlan and Zinman, 2009](#); [Jack *et al.*, 2018](#); [Ahlin *et al.*, 2020](#); [Beaman *et al.*, 2020](#)).

6. We also link to studies on the timing of repayments in consumer mortgage products, where flexibility in choosing the monthly payments have been shown to smooth consumption ([Cocco, 2013](#)) but also increase delinquency rates ([Garmaise, 2013](#)).

7. The importance of aggregate risk, and its consequences for asset illiquidity, also rationalizes why businesses in our setting prefer the flexible over the standard credit contract. [Shleifer and Vishny \(1992\)](#) show that asset illiquidity resulting from economy-wide shocks lowers firms' debt capacity. With a flexible contract, borrowers avoid having to sell their assets at the same time as everyone else hit by the aggregate shock in order to cover the repayment. This may in turn increase firms' willingness to take on risk.

2.1. *Set-up*

We consider a risk-neutral entrepreneur with limited liability and assets A in a three-period economy ($t = 1, 2, 3$). The entrepreneur can finance a fixed investment I at date 1 using either a liquid short-term or an illiquid long-term technology. The liquid project returns φ at $t + 1$ per unit invested at t , subject to aggregate uncertainty in period 2, yielding φ_H with probability π and φ_L with probability $1 - \pi$. The illiquid project returns γ at date 2 and Γ at date 3 per unit of initial investment, with $\Gamma > \varphi_H > \varphi_L > \gamma > 1$. The period-2 return is uncertain, yielding γ or 0 with probabilities π and $1 - \pi$, respectively. If liquidated in period 2, the long-term project's salvage value is $\lambda < 1$ per unit of initial investment. The entrepreneur saves τ_t at $t = 1$ to cover (part of) consumption and reinvestment if faced with a project-return shortfall in period 2. In periods 1 and 3, she also receives income y to meet any remaining needs. Entrepreneurs have utility $U = u(c_1) + \beta E[u(c_2) + \beta u(c_3)]$, where c_t is consumption at date t and $\beta < 1$ is the discount factor.

An unconstrained entrepreneur prefers the riskier illiquid project over the safer liquid one, given $\pi\gamma + \beta\Gamma \geq \pi\varphi_H + (1 - \pi)\varphi_L - 1 + \beta\varphi_H$. However, due to insufficient wealth, $A < I + \tau_1$, she turns to the financial market for capital. Credit is limited as repayment is imperfectly enforceable. While the investment is fully contractible, the entrepreneur may divert project returns by defaulting on the loan (ex-post moral hazard), yielding benefit $\phi < 1$ per unit diverted.⁸ If she avoids diversion, she gains a net continuation value V , representing the utility of future credit access.⁹ The lender's marginal cost of funds is $\rho > 0$. Free market entry ensures all surplus goes to the borrower, subject to incentive compatibility.¹⁰ To fit our experimental context, the lender offers two contracts: a standard two-period repayment contract and a flexible contract allowing full payment deferral to the last period via a repayment voucher. Applying the compound interest formula, the standard contract requires two equal payments of $P_S \equiv bR^2/(1 + R)$ in periods 2 and 3, where b is the amount borrowed and R the gross, per-period interest rate (simplified as $R = 1/\beta < \gamma$). The flexible contract demands a single payment of $P_F \equiv bR^2$ in period 3.

With the addition of a repayment burden, the entrepreneur also enters an informal risk-sharing scheme to cover consumption, reinvestment, and repayment in case of a return shortfall in period 2. The arrangement, where all project-return risk is pooled ex-post, leaves each group member the investment's expected value plus savings. Without informal insurance, we assume savings constraints, $\tau_1 < \bar{\tau}$, hinder the entrepreneur from fully covering consumption, reinvestment, and the repayment.

2.2. *Discussion of assumptions*

The set-up incorporates our two main mechanisms. To capture the credit-constraint mechanism, we rely on the conventional idea that moral hazard at the repayment stage gives rise to credit rationing of poor entrepreneurs.¹¹ To this generic model, we add the need to save in period 1 to cover consumption, reinvestment, and repayment in the next period. Repayment vouchers

8. Without diversion opportunities ($\phi = 0$), perfect legal protection of creditors would allow even a wealthless borrower to fund the investment, eliminating credit rationing. To make our problem interesting, we assume $\phi > \underline{\phi}$ (defined in [Supplementary Appendix A.1](#)).

9. V reflects the common practice of microfinance institutions punishing default by denying future credit.

10. Alternatively, the lender could be a non-profit maximizing borrower welfare, subject to break-even.

11. See, e.g. [Hart \(1995\)](#), [Shleifer and Wolfenzon \(2002\)](#), and [Ellingsen and Kristiansen \(2011\)](#) for similar models of financial contracting under imperfect enforcement and [Blouin and Macchiavello \(2019\)](#) for empirical work on the prevalence of strategic default in developing markets.

reduce this need, allowing poor borrowers to allocate more funds for investment which relaxes the credit constraint.

To capture the insurance-constraint mechanism, entrepreneurs choose between a safe liquid and a risky illiquid investment.¹² Without informal risk sharing, we assume that uninsured revenue shocks promote investment in the safe technology under the standard contract. By insuring against costly liquidation (to repay the loan), the vouchers alleviate the insurance constraint and facilitate investment in riskier illiquid assets.

The key premise of the model is that entrepreneurs may need additional funds at various stages of the project: for the initial investment and/or to address earnings shortfalls later. To differentiate the credit from the insurance mechanism, we view constraints related to the initial investment as distinct from those tied to managing a state-contingent shock later in the loan cycle. While credit constraints might prevent the investment from taking place, insurance constraints could result in an inability to hedge against future income loss risks. However, a funds shortage is the common friction underlying both constraints.

By assuming constrained savings, we illustrate how the standard payment obligation limits the entrepreneur when no other means of insurance is available.¹³ While savings can supplement self-financed entrepreneurs' consumption and reinvestment in period 2, they cannot also cover the standard repayment. Thus, a negative period-2 shock forces the entrepreneur to either not reinvest the returns from the liquid project or liquidate if invested in the illiquid technology.¹⁴ When informal risk pooling is available, the assumption that the scheme eliminates all uninsurable risk allows us to study the implications of binding credit constraints without a risk-based motivation for saving across periods.

Figure 1 depicts the model stages and trade-offs in project choice and repayment/diversion decisions. Next, we analyse each contract (standard and flexible) to understand how credit and insurance market imperfections affect investment. The analysis, grouped by the completeness of the informal insurance market, starts with the standard contract.

2.3. Equilibrium

2.3.1. Imperfect insurance. Without informal risk pooling, a wealth-constrained entrepreneur opts for the safer technology, as the expected benefit of avoiding intermediate period liquidation exceeds the final period gain from the riskier illiquid project. We use backward induction to characterize the incentive constraint for the two-period loan, focusing on the low-return realization in $t = 2$, where diversion temptation is highest. In [Supplementary Appendix A.1](#), we show that it suffices to look at the second period constraint. The entrepreneur pays the lender if the residual return after repaying exceeds the benefit from diverting all resources

$$I\varphi_L + \tau_1 R - P_S + \beta(y - P_S) + \beta^2 V \geq \phi(I\varphi_L + \tau_1 R + \beta y). \quad (1)$$

12. Illiquid business assets, including special purpose tools, machinery but also certain types of inventory, are common in our setting. On average, 38% of the firms' asset value is lost in case of a fire sale. See Section 5.4 for more details.

13. There is abundant evidence that savings constraints, caused by transaction costs, social constraints, lack of trust, regulatory practices, informational gaps, and behavioural biases, prevent the poor from smoothing over time (see, e.g. [Dupas and Robinson, 2013](#); [Karlan *et al.*, 2014](#); [Casaburi and Macchiavello, 2019](#)).

14. Beyond limiting the entrepreneur's ability to hoard liquidity across periods, we also exclude the option of period-2 refinancing. This assumption is due to our partner organization not offering this option, few viable alternatives exist for most borrowers, and the incentive incompatibility of "finance-as-you-go" as new claims dilute old ones, a concern amplified for poorer borrowers with larger debt burdens ([Tirole, 2006](#), Chapter 5; [Holmström and Tirole, 2011](#)).

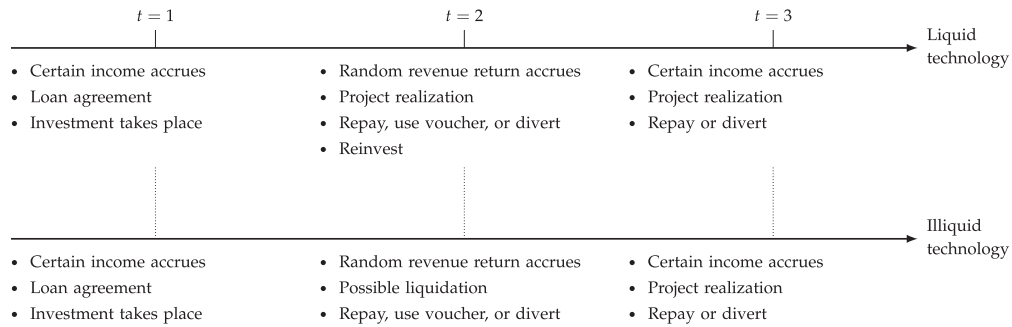


FIGURE 1
Timing of events

The entrepreneur only repays in the second period if she does not plan to default in the third.¹⁵ As there is no default in equilibrium, the equilibrium interest rate ensuring zero profit is $R = 1 + \rho$. The following proposition summarizes our first result.

Proposition 1. *When ex-post risk pooling is absent and lenders offer the standard contract, there is an asset threshold $\tilde{A}(\phi) > 0$ such that entrepreneurs with $A < \tilde{A}(\phi)$ make no investment. If $A \geq \tilde{A}(\phi)$, then entrepreneurs borrow and invest in the safe project.*

A poor entrepreneur with $A < \tilde{A}$ would need to borrow significantly to finance the investment. The large repayment obligation would yield a residual return below the payoff from diverting all resources. Consequently, only entrepreneurs with $A \geq \tilde{A}$ secure funding, while those with $A < \tilde{A}$ cannot obtain a loan.

With the flexible contract, borrowers can use a payment voucher in $t = 2$ to defer the full loan payment P_F to the final period. If the entrepreneur chooses the liquid project, the voucher enables reinvestment of project proceeds at date 2, even under the low-return realization. If she invests in the illiquid technology, she avoids the intermediate period liquidation risk and fully benefits from the high-return project. Given the (unconstrained) illiquid project's higher expected value, the availability of repayment vouchers encourages the entrepreneur to undertake the riskier project.

Unlike above, there is only one relevant incentive constraint to consider. In the final period, the temptation to divert all resources is resisted in favour of repaying the full loan if

$$I\Gamma + y - P_F + \beta V \geq \phi (I\Gamma + y). \quad (2)$$

Proposition 2. *When ex-post risk pooling is absent and lenders offer the flexible contract, there is an asset threshold $\tilde{\tilde{A}}(\phi) > 0$ such that entrepreneurs with $A < \tilde{\tilde{A}}(\phi)$ make no investment. If $A \geq \tilde{\tilde{A}}(\phi)$, then entrepreneurs borrow and invest in the risky project.*

Since vouchers increase the discounted project value, Proposition 2 also characterizes the outcome when both credit contracts are offered simultaneously. Repayment flexibility raises the return to both technologies, but in different ways. Vouchers alleviate the insurance constraint by eliminating the liquidation risk for the illiquid project, and they free up working capital for reinvestment in the liquid technology. As the illiquid project's expected value is higher, the

15. Diversion is an all-or-nothing decision, as we assume the lender claims all resources upon default.

former effect prevails, leading entrepreneurs to invest in illiquid assets with greater sensitivity to aggregate uncertainty.

If $\bar{A} > \tilde{A}$, vouchers also ease the credit constraint. Two opposing forces are at play. On one hand, vouchers eliminate the need to save for the first repayment, freeing more funds for the initial investment. Additionally, the gross return to honouring the contract is higher with the riskier project. Both effects increase the value of investment over diversion, making lending to poorer borrowers incentive compatible. On the other hand, the standard contract's spread-out payments reduce the instantaneous repayment burden and the temptation to divert. Overall, the inequality holds when the savings reduction and the illiquid project's higher return offset the larger one-time payment.

Lastly, while all borrowers take up the vouchers, they are indifferent between using them and adhering to the standard contract upon a positive period-2 realization. Essentially, vouchers offer an option value that protects entrepreneurs against future unforeseen fluctuations. The subsequent corollary collects these additional results.

Corollary 1. *When ex-post risk pooling is absent and lenders offer standard and flexible contracts: (1) entrepreneurs prefer the flexible contract and invest in the risky project; (2) a lower asset level is required to obtain a loan under the flexible contract if $\bar{A} > \tilde{A}$; (3) entrepreneurs weakly prefer using the vouchers independent of the state of nature.*

2.3.2. Perfect insurance. With a complete risk market and the standard contract on offer, ex-post risk pooling eliminates the liquidation risk, leading the entrepreneur to select the illiquid project. As before, we focus on the no-diversion constraint in $t = 2$ given by

$$I\bar{y} + \tau_1 R - P_S + \beta (I\Gamma + y - P_S) + \beta^2 V \geq \phi [I\bar{y} + \tau_1 R + \beta (I\Gamma + y)], \quad (3)$$

where $I\bar{y}$ is the expected period-2 return under risk pooling. With vouchers, entrepreneurs still invest in the riskier project but defer the full payment to $t = 3$, altering the incentive constraint to equation (2). Like above, the credit constraint eases if $\bar{A} > \tilde{A}$ (the minimum incentive-compatible asset size under the standard and flexible contract, respectively). This condition holds if the savings from postponing the first repayment outweigh the increased diversion cost due to the higher repayment burden. Formally

Proposition 3. *Suppose $\bar{A} > \tilde{A}$ and lenders offer standard and flexible contracts. Then there are asset thresholds $\bar{A}(\phi) > \tilde{A}(\phi) > 0$ such that entrepreneurs with $A < \bar{A}(\phi)$ make no investment, those with $A \in [\tilde{A}(\phi), \bar{A}(\phi))$ prefer the flexible contract and invest in the risky project, and those with $A \geq \bar{A}(\phi)$ are indifferent between the contracts and invest in the risky project.*

2.4. Extensions

In the current model, the entrepreneur's only input is her assets. However, if ability and investment capital are complements, then more able entrepreneurs will have a higher productivity for a given level of assets. Since vouchers ease the credit constraint, the return to relaxing this constraint is higher for entrepreneurs of greater ability (the formal argument is detailed in [Supplementary Appendix A.1](#)).

We have so far assumed that the loan payment is the primary obligation. However, there could be other commitments (on top of the repayment), such as recurrent costs. Particularly, larger firms are often committed to periodic expenses like rent, utilities, and salaries. In [Supplementary Appendix A.1](#), we show that even with vouchers, entrepreneurs may still face considerable risk

under the illiquid project due to these additional obligations. While vouchers release liquidity that can be reinvested in the safe project, the net gain from introducing more flexibility is reduced, especially if the return to the liquid technology is low.¹⁶

In the basic model, vouchers provide an insurance mechanism, even in the context of universal risk neutrality. To explore how repayment flexibility affects the selection of individuals into borrowing along the risk dimension, we modify the model to incorporate risk aversion. In line with our empirical setting, we assume a smaller self-financed project is available, which appeals to less risk-averse individuals interested in business expansion and thus, in need of external credit.¹⁷ To capture that the self-funded entrepreneurs who want to expand are more prone to risk, the smaller project is a scaled-down version of the illiquid technology, now referred to as a large project.

In [Supplementary Appendix A.1](#), we demonstrate that the effect of repayment flexibility on the borrower pool's level of risk aversion is ambiguous. While it attracts clients deterred by the risk of existing investment technologies, it also appeals to borrowers who find the large illiquid project too risky and the large liquid project too safe. If the latter group of entrepreneurs, keen on expanding their risky but smaller businesses, predominantly selects the flexible contract, the borrower pool's risk aversion level may decrease.¹⁸

3. THEORETICAL PREDICTIONS

Table 1 summarizes the theory's main predictions, conditional on different market imperfections. We start with the case when the loan payment is the key outstanding obligation (Panel A). When insurance is imperfect and firms are credit rationed under the standard contract (row 1), repayment flexibility increases risk taking by enabling illiquid investments more exposed to aggregate uncertainty for $A \geq \tilde{A}$. It is especially beneficial for the least wealthy by allowing more upfront investment funds, thus lowering the incentive-compatible asset level for $A \in [\tilde{A}, \tilde{A}]$. High-ability entrepreneurs also see greater benefits when $A = \tilde{A}$. If only the risk market imperfection is a constraint for $A \geq \tilde{A}$ (row 2), the flexible contract mainly boosts risk-taking, with potential positive or negative selection with respect to risk aversion (similar to row 1). When only credit is rationed (row 3), repayment flexibility improves conditions for poorer and more able borrowers for $A \in [\bar{A}, \bar{A}]$ and $A = \bar{A}$, respectively, who now undertake risky investments. With complete credit and insurance markets (row 4), repayment vouchers have no impact on outcomes.

We then consider the case when other contractual obligations are important (Panel B). The theory suggests that vouchers lead credit and risk-rationed firms to boost their safe investments

16. An alternative explanation related to recurrent costs is that larger firms, unconstrained by risk, use vouchers to smooth consumption. These firms, already undertaking risky projects, will demand more flexibility as recurrent costs rise, without affecting firm outcomes. Conversely, our extension shows that when higher recurrent costs prevent riskier projects (due to too low net income in the bad state even with vouchers), repayment flexibility can still boost low-return liquid investments.

17. In our SME sample, less risk-averse firm owners are significantly more willing to start a new business, aligning with literature dating back to [Cantillon \(1755\)](#), [Knight \(1921\)](#), and more recently [Kihlstrom and Laffont \(1979\)](#), where business risk bearers are less risk averse than the general population.

18. Other aspects of selection, independent of risk aversion, could affect investments. The flexible loan may increase the default temptation for present-biased borrowers (see, e.g. [Bauer et al., 2012](#); [Fischer and Ghatak, 2016](#); [Barboni, 2017](#)), who prefer the standard contract's smaller, spread-out payments. Additionally, the contract's complexity could impose a cost on financially illiterate borrowers, potentially inducing them to overconsume early in the loan cycle. If a large share of new borrowers has time-inconsistent preferences or is financially illiterate, this could result in tighter credit constraints and reduced investment in equilibrium.

TABLE 1
Summary of predictions

Market environment under the standard contract		Predicted change under repayment flexibility				
Credit is rationed	Insurance is rationed	Increase in risky investment	Increase in safe investment	Poor benefit more	Able benefit more	Selection w.r.t. risk aversion
<i>Panel A: Other contractual obligations do not matter</i>						
✓	✓	+	0	+	+	≥ 0
	✓	+	0	0	0	≥ 0
✓		+ ^a	0	+	+	0
		0	0	0	0	0
<i>Panel B: Other contractual obligations may matter</i>						
✓	✓	0	+	≥ 0	+	≥ 0
	✓	0	+	0	0	≥ 0
✓		0	+ ^b	+	+	0
		0	0	0	0	0

Notes: The table summarizes the predictions of the theoretical model, conditional on the different market imperfections.

^aIn contrast to row 1 of Panel A, the increase in risky investment in row 3 is confined to poor borrowers. ^bContrary to row 1 of Panel B, the increase in safe investment in row 3 is limited to poor borrowers.

(row 1). While flexibility still benefits able entrepreneurs, poorer individuals may not gain due to the low investment return. If insurance provision is imperfect (row 2), the theory predicts a rise in the safe investment. Similar to Panel A, risk aversion can induce borrower selection (rows 1 and 2). Vouchers benefit poor and high-ability entrepreneurs now making safe investments if only credit constraints bind (row 3). With well-functioning markets, vouchers have no effect (row 4).

The model guides our understanding of small firms' financial environment by allowing us to assess whether imperfect insurance, credit constraints, or both are binding. A key prediction is that increased risk taking is the single most important response if entrepreneurs are limited by imperfect risk markets. However, the theory also suggests that if firms have other contractual obligations beyond the loan payment, repayment flexibility alone may not increase risk taking. We use this framework to structure our empirical analysis and interpret the results in the subsequent sections.

4. EXPERIMENT

4.1. Context

Our study is set in Bangladesh where our partner, BRAC, is one of the main providers of microfinance services. BRAC's microfinance programme mainly targets two types of clients.¹⁹ The most common microfinance product is the "Dabi loan," which is meant to finance microenterprises, typically with no employees except for family workers (*e.g.* tailoring, small retail shops, poultry and livestock rearing, and carpentry). The average size of a *Dabi* loan is 275 nominal USD (range between 100 and 1,000). Currently, BRAC has 4 million *Dabi* borrowers in Bangladesh. BRAC also offers "Progoti loans" for small and medium-sized enterprises. The *Progoti* loans are intended for working capital in shops, agricultural businesses, and small-scale manufacturers and have an average loan size of \$2,200 (range between 1,000 and 10,000).

19. BRAC also has specialized loans for sharecroppers, migrant workers' households, and students. We do not study these products. Further details about the loan products BRAC offers are available from BRAC's microfinance programme's website (<http://www.brac.net/program/microfinance/>).

They require collateral of equal value to the loan and a guarantor. Both types of loan products entail individual liability (with group meetings in the case of *Dabi* loans), a flat 22% annual interest rate, and a 12-month loan repayment cycle with monthly installments of equal size.

We collaborated with BRAC to implement a pilot assessing the viability of a flexible loan product. The flexible contract allowed borrowers to delay up to 2 repayments within their loan cycle through the use of repayment vouchers. BRAC decided to offer the option to borrow under the flexible contract to *Dabi* and *Progoti* clients with good credit histories. The eligible clients were selected by credit officers at the branch office level on the basis of having no defaults and few or no arrears. Under the flexible contract, borrowers had 2 vouchers that enabled them to postpone 2 monthly repayments in their loan cycle. On the day of the repayment, borrowers could present the voucher thereby postponing the repayment and extending the loan cycle. Specifically, by extending the cycle to 14 instead of 12 months the borrowers had 2 months during which they were not required to make any payments to BRAC. For example, if borrowers skipped the first two installments, the repayments started in month 3 and continued up to month 14 (corresponding to a contract that provides a 2-month grace period). If clients decided to use their vouchers to avoid any other installment(s), the repayment in that month would be skipped and the full loan cycle was extended by an additional month. Hence, the contract provided the borrowers with full flexibility to tailor-make their loan cycle according to their expected and unexpected cash-flow needs (they were still limited to delaying no more than 2 repayments). Moreover, if borrowers wanted, they could skip 2 repayments and pay up their remaining balance within the 12th month, thus keeping the length of the loan cycle unchanged. As such, the vouchers offered considerable payment flexibility.²⁰ No extra cost was charged for the use of the voucher(s).

4.2. *Evaluation and data*

To evaluate the effects of the new loan contract, we randomized the introduction of the flexible loan at the BRAC branch office level. The typical branch office covers an area of a roughly 6-km radius with 200 *Progoti* and nearly 1,200 *Dabi* borrowers. BRAC selected fifty branches for the study and credit officers in each branch identified *Dabi* and *Progoti* borrowers that they deemed eligible for the flexible loan. BRAC subsequently provided us with a list of the eligible clients in each branch. From this list, we randomly sampled 2,717 eligible borrowers; 1,115 *Dabi* and 1,602 *Progoti* clients. We also obtained a list of all ineligible clients in the same 50 branches.

In addition to eligible BRAC clients, we collected information on a representative sample of SMEs (independent of their borrowing status with BRAC). For this, we first conducted a census within the geographic location of each BRAC branch office by going door-to-door, capturing a comprehensive listing of all SMEs operating in selected sectors in the study branches. The objective was to identify microenterprises with fewer than 10 workers operating in light manufacturing and retail. These characteristics were chosen to make them comparable with potential BRAC borrowers.²¹ This provided us with a listing of 7,270 firms. From the census, we randomly sampled and surveyed 3,504 firms at baseline (the “SME sample”).²²

20. Note that while there may be some de facto flexibility in BRAC’s modus operandi, the extent of this flexibility is rather limited (see [Section A.2.2 in the Supplementary Appendix](#)). Nevertheless, the flexible contract that we evaluate should be interpreted as comparing the effects of introducing explicit flexibility (in the form of allowing 2 monthly repayments to be delayed at no cost to the borrower) relative to any de facto flexibility that BRAC already provided.

21. Manufacturing includes SMEs active in food processing, carpentry, plumbing, handicraft, and garments while retail comprises grocery, supermarkets, wholesale shops, clothing, and hardware.

22. By construction, the SME sample contains both current BRAC clients (about 10%) and non-client firms located within each study location.

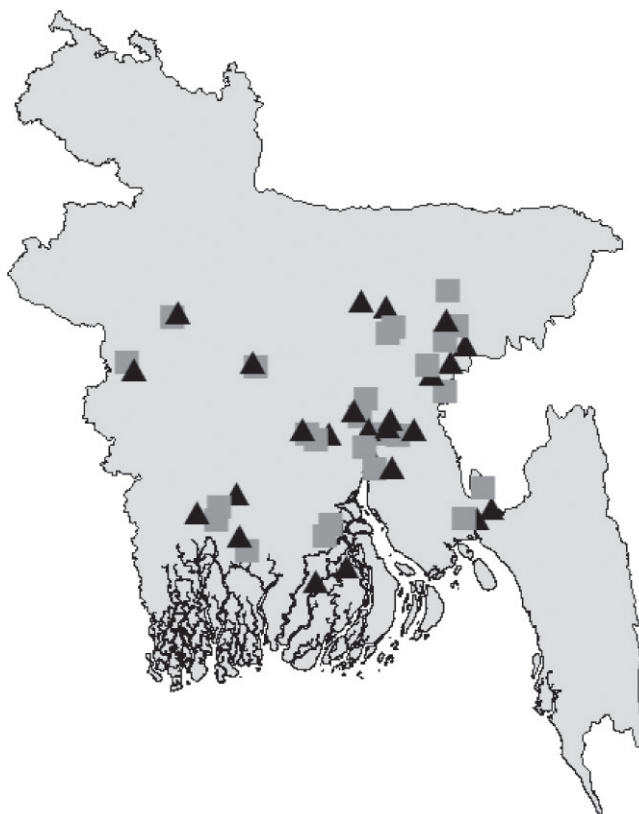


FIGURE 2
Locations

Notes: The map shows the locations of the BRAC branch offices that were part of the study. The treatment branches are represented with triangles, while the control branches are denoted with squares.

The baseline survey for our two samples was conducted between January and June 2015. After the baseline, we randomly selected half of the 50 branches as treatment and the rest as control. The randomization was stratified by district (15 randomization strata), each containing 2–5 of the branch offices in our study. Figure 2 shows the locations of the BRAC branches included and their randomization status. The flexible loan product was launched in mid-August 2015. By the end of September 2015, the intervention had been introduced in all branches. Immediately following the product launch, we collaborated with BRAC to implement an information campaign in the treatment branches. Its goal was to ensure that information regarding the new loan that BRAC was piloting reached the firms in the SME sample. This was achieved through: (i) phone calls, conducted by BRAC’s phone call centre, to every business owner in our SME sample. During these phone calls, the terms of the new loan product were explained; and (ii) leaflets, describing the same information, delivered by BRAC credit officers to the firms in the SME sample and to firms in the eligible-borrower sample.²³

23. For most eligible *Dabi* clients, the information on the flexible contract was provided during their regular group meetings. At the end of the meeting, the credit officers described the new product and its features to the eligible borrowers. In order to make sure that it was well understood, they also gave them a leaflet. For eligible *Progoti* clients, the credit officers visited their business to provide them the same information. These meetings/visits were part of the routine operations that BRAC’s credit officers conduct for their borrowers.

Approximately 1 year after the baseline, between May and July 2016, we implemented the first follow-up survey (the mid-line). Since the intervention was launched in August 2015, the effects at mid-line capture short-run impacts (8–10 months after treatment started). Nearly 1 year after the mid-line (and 2 years after the baseline), we conducted the endline survey.²⁴ At the end of that survey (August 2017), we received BRAC's administrative records on its borrowers (eligible and ineligible borrowers at baseline, as well as the new borrowers that joined BRAC after the launch of the experiment). The records contain data on the last as well as past loans of current or past borrowers, providing us with detailed reports on borrowers' repayment behaviour.

Finally, to measure local rainfall shocks, we use monthly rainfall data at 0.25-degree resolution obtained from the NOAA-maintained PERSIANN-CDR dataset which covers the period 1983–2017.²⁵ The information on precipitation is used to construct local demand shocks across the 50 branches under study.

4.3. Descriptives and validity checks

Supplementary Table A.1 provides descriptive statistics on the baseline characteristics of the eligible *Dabi* clients, while Supplementary Table A.2 does the same for the eligible *Progoti* borrowers.²⁶ The average eligible *Dabi* client in our sample is 38–39 years old, has 4.5 years of schooling, approximately half of them own some land, and the typical household labour income is about 7,000 USD PPP per year. In terms of business ownership, 45% of *Dabi* clients report having a business at baseline.²⁷ The average *Dabi* borrower owns 4,300 USD PPP worth of business assets, employs 0.5 workers (excluding the owner of the business but including other family workers) and generates 4,200 USD PPP worth of annual profits.²⁸ In contrast to the *Dabi* clients, *Progoti* borrowers are older (44 years old), more educated (7.5 years of schooling) and wealthier (83% own land and average annual household income is above 20,000 USD PPP). They are also more likely to be business owners (87%), and their businesses are larger in terms of capital (around 25,000 USD PPP), number of workers (1.9 workers on average), and profits.

For all of the outcome variables we study as well as other key characteristics, Supplementary Tables A.1 and A.2 report balance tests where we compare the sample means by treatment status. In particular, column (3) shows the standard difference, column (4) the randomization inference *p*-values, and column (5) reports the normalized difference (Imbens and Wooldridge, 2009). With the exception of two characteristics (out of 31), none of the baseline differences are statistically significant at conventional levels and the normalized differences are smaller than one-fourth of the combined sample variation. Hence, we conclude that the randomization

24. The mid- and endline surveys were planned to be in the same period of the year in order to appease concerns about seasonality in profits and other outcomes.

25. See <https://www.ncei.noaa.gov/products/climate-data-records/precipitation-persiann> for more details about the rainfall data.

26. Throughout the paper, all monetary values are deflated to 2015 prices, using CPI figures published by the Central Bank of Bangladesh, and converted to USD PPP terms using conversion rates published by the World Bank's International Comparison Program database (1 USD PPP \approx 28.25 TAKAs).

27. This is similar to the rates of business ownership among microfinance clients in other studies (see, e.g. Field *et al.*, 2013). Among the *Dabi* clients in our sample, only 5% reported owning multiple businesses. In the analysis, we focus on the main household business reported by the respondent (the borrower), but the results are similar if we aggregate all business-related variables at the household level.

28. The measure of profits we use is based on a direct question on the level of profits as opposed to subtracting costs from revenues. de Mel *et al.* (2009) show that for small businesses, this method provides a more accurate measure of profits compared to calculations based on detailed questions on revenues and costs.

was successful in achieving baseline balance in key observable characteristics. In [Supplementary Table A.3](#), we test for differential attrition at the mid- and endline surveys. At mid-line, the attrition rate was 5% among eligible *Dabi* clients, 9% among eligible *Progoti* borrowers, and 11% in the SME sample. At endline, the rates were slightly higher (8% among eligible *Dabi* clients, 15% among eligible *Progoti* borrowers, and 17% in the SME sample). The attrition rates are balanced by treatment status in both follow-up surveys. Thus, it is unlikely that differential attrition drives the treatment effects we find in the empirical analysis.

5. RESULTS

5.1. Estimation

To identify the effects of the flexible loan contract on eligible borrowers, we estimate an analysis of covariance (ANCOVA) model ([McKenzie, 2012](#)) of the form:

$$y_{it} = \beta \cdot T_i + \lambda \cdot y_{i0} + E_t + \sum_{s=1}^{15} \gamma_s + \epsilon_{it}, \quad (4)$$

where y_{it} is the outcome of interest for respondent i at mid- ($t=1$) or endline ($t=2$), T_i is a dummy variable equal to 1 if the respondent is located in a treated branch, y_{i0} is the baseline level of the outcome for individual i , E_t is a survey-wave fixed effect, and γ_s are district (randomization strata) fixed effects. Since our randomization was conducted at the branch office level, we cluster standard errors by BRAC branch office (50 clusters). In addition, we report randomization inference p -values (Fisher's exact test), estimating the coefficient of interest in 1,000 alternative assignments chosen randomly with replacement from the set of possible assignments given our stratified randomization procedure. The randomization inference p -values report the percentile of the coefficients found under actual treatment in the distribution of coefficients identified under the alternative treatment assignments ([Young, 2018](#)). The parameter of interest is β , the average difference between treatment and control observations at mid- and endline. Under the assumption that the control observations constitute a valid counterfactual for the treatment sample, this identifies the causal effect of the offer of the flexible loan contract to eligible client i . In other words, this is the ITT estimate.

5.2. The effect of repayment flexibility

We first examine the treatment effects on the eligible borrowers' credit market outcomes. [Table 2](#) presents the results for the *Dabi* (Panel A) and *Progoti* clients (Panel B), respectively. Columns (1) and (2) show the impact on borrowing from BRAC, where the information is obtained from BRAC's administrative records. In the control group, 57% of the eligible *Dabi* clients were borrowing from BRAC under the standard contract at mid- or endline [column (1)]. Compared to this, the introduction of repayment flexibility increased borrowing from BRAC by 6.3 percentage points (*ppt*), or 11% relative to the control group. For *Progoti* clients, the flexible loan offer increased take up from BRAC by 2 *ppt*, but this effect is imprecisely estimated. We also note that 55% of the eligible clients accepted the offer. The take-up rate was slightly higher among eligible *Dabi* (57%) relative to *Progoti* borrowers (53%), but the difference is not significant at conventional levels (p -value = 0.123). On the intensive margin, column (2) of [Table 2](#) shows that the value of BRAC borrowing increased by 302 USD PPP or 26% relative to the control

TABLE 2
Effects on credit market outcomes

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	Yes = 1	Value	BRAC loan	Value	Yes = 1	Value	Non-BRAC loan	Value	Transfers received	Transfers or loans given	Net borrowing or transfers	Aggregate index				
<i>Panel A: Dabi</i>																
Treatment	0.063** (0.024)	302.413*** (73.246)		-28.041 (95.669)	-0.041* (0.023)	336.187 (283.589)		122.002*** (42.091)	510.867* (272.666)		0.172*** (0.051)					
Observations	2,168	2,168		2,168	2,168	2,168		2,168	2,168		2,168					
Mean in control	0.571	1,181.671		543.632	0.234	1,449.935		165.716	3,009.522		0.000					
<i>Panel B: Progoti</i>																
Treatment	0.024 (0.024)	258.669 (257.204)		-306.144 (509.519)	-0.038** (0.015)	-558.212 (388.486)		13.723 (56.182)	-1078.712 (843.309)		-0.034 (0.046)					
Observations	3,066	3,066		3,066	3,066	3,066		3,066	3,066		3,066					
Mean in control	0.522	4,793.960		2,681.145	0.227	3,277.109		391.655	10,360.559		0.000					

Notes: The table presents the treatment effects on loans and transfers of eligible *Dabi* and *Progoti* borrowers. Data comes from the mid-line (2016) and endline (2017) surveys, except in columns (1)–(2) where the data comes from BRAC’s administrative records. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (strata) fixed effects. “Treatment” is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. The regressions are ordinary least squares (OLS) regressions based on specification (4). Standard errors are clustered at the BRAC branch office level ($\hat{\gamma} < 0.10$, $**p < 0.05$, $***p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. In column (1), the dependent variable is a dummy = 1 if the respondent had a BRAC loan at the mid-line or endline survey. In column (2), the dependent variable is the principal amount (in USD PPP) of the BRAC loan the respondent had at the mid-line or endline survey. In column (3), the dependent variable is a dummy = 1 if the respondent had a *Non-BRAC loan* at the mid-line or endline survey. *Non-BRAC loan value* is the monetary value (in USD PPP) of all formal and informal loans taken from other lenders (banks, MFIs other than BRAC, informal money-lenders or relatives and friends) during the past 12 months. *Transfers received* is the monetary value (in USD PPP) of any cash or in-kind informal transfers that the respondent’s household received over the last 12 months. *Transfers or loans given* is the total monetary value (in USD PPP) any cash or in-kind informal transfers and any loans that the respondent’s household gave to others over the last 12 months. *Net borrowing or transfers* is the monetary value (in USD PPP) of net borrowing (loans borrowed minus loans lent) and net transfers (transfers received minus transfers given) combined. “Aggregate index” is constructed by first standardizing all outcome variables in columns (1)–(7) with respect to the control group in the relevant survey wave (subtracting the mean in the control and dividing by the standard deviation of the control group), then taking their average and standardizing again with respect to the control group.

group among the *Dabi* clients, with a randomization inference (RI) p -value of 0.001. The corresponding effect for the *Progoti* borrowers is an insignificant 259 USD PPP (5%) increase in the value of BRAC loans.

The rest of Table 2 explores other outcomes related to credit and transfers. Starting with *Dabi*, while the treatment decreased the likelihood of having a non-BRAC loan by 4 *ppt* [column (3)], the impact on the intensive margin is small and imprecisely estimated [column (4)], barring any definitive conclusions on substitution effects away from non-BRAC lenders toward BRAC. Eligible *Dabi* borrowers also receive more informal transfers from their social networks (with the point estimate similar in size to the effect on the BRAC loan), albeit insignificantly so [column (5)]. Column (6) examines transfers and loans provided to the social network. It shows that the financial outflow from the average *Dabi* client in the treatment group went up by 122 USD PPP or a 73% boost relative to the control sample (RI p -value < 0.01). Overall, net borrowing and transfers combined increased by 511 USD PPP or 17% relative to the control group (RI p -value = 0.121). Together, this implies that access to the flexible contract led to important changes in the *Dabi* clients' credit market outcomes. The last column presents the effect on an aggregate index that combines the 7 indicators related to the credit market outcomes of the *Dabi* clients. We find that the aggregate index is significantly higher by 0.172 standard deviations (SDs) among the treatment group relative to control (RI p -value = 0.009). By contrast, Panel B indicates that the impact on the eligible *Progoti* borrowers is insignificant [with the exception of one outcome: the likelihood of having a non-BRAC loan in column (3)]. As the aggregate index in column (8) is indistinguishable from zero, we conclude that the treatment did not significantly affect the credit market outcomes of the eligible *Progoti* clients.²⁹

Next, we examine the impact of repayment flexibility on a range of business outcomes. The upper panel of Table 3 shows effects for the eligible *Dabi* clients, starting with business ownership in column (1).³⁰ Eligible *Dabi* clients in the treatment branches are 3 *ppt* more likely to own a business at follow-up relative to control, but this effect is imprecisely estimated. In terms of inputs, the treated *Dabi* borrowers invest significantly more in their business assets but not in labour. The treatment impact on business assets (1,881 USD PPP) is equivalent to a 51% increase relative to the mean in the control group. We do not find any significant effect in terms of labour inputs (number of workers, business operating hours, and hours worked by the business owner). Column (6) shows that treatment raised revenues by 28,153 USD PPP (annually) relative to the control sample. This corresponds to a statistically and economically significant increase of 86% (RI p -value < 0.01). Eligible clients also had higher costs which is likely related to the larger investments in their business capital (*e.g.* cost of purchasing tools, machines, or inventories). The ITT estimate on annual business profits [column (8)] shows a sizable increase (of 25%) relative to the control group, but this is imprecisely estimated at conventional levels (RI p -value = 0.171). Column (9) indicates that the effect on monthly profits (during the month preceding the survey) is similar in magnitude with the point estimate corresponding to a 26% increase relative to the control group (RI p -value = 0.182). Column (10) shows that *Dabi* businesses in the treatment group had more volatile revenues. As a proxy for volatility, we use the range of monthly revenues. The ITT estimate reveals that the treatment group had 106% higher sales volatility relative to the control group (RI p -value = 0.066). Finally, column (10) shows that the aggregate index is up by 0.183 SDs among the treatment group relative to control (RI p -value = 0.050). Overall, these findings suggest that the flexible contract not only led to more business

29. In [Supplementary Table A.3](#), we test and reject the null hypothesis of equality of the treatment effects of the *Dabi* versus the *Progoti* borrowers for the aggregate index but not for most of the individual outcomes.

30. All business outcomes are coded as zero for respondents who do not own a business.

TABLE 3
Effects on business outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Business owner	Business assets	Number of workers	Business hours	Owner's hours worked	Revenues (annual)	Costs (annual)	Profits (annual)	Profits (month)	Range of revenues	Aggregate index
<i>Panel A: Dabi</i>											
Treatment	0.026 (0.025) [0.350]	1, 881.254** (926.570) [0.064]	0.172 (0.326) [0.680]	127.789 (83.059) [0.187]	71.219 (69.523) [0.389]	28, 153.189*** (8, 716.036) [0.006]	24, 392.605*** (8, 099.027) [0.003]	1, 087.586 (651.456) [0.171]	96.576* (56.069) [0.182]	2, 801.612** (1, 215.694) [0.066]	0.183** (0.079) [0.050]
Observations	2,087	2,087	2,087	2,087	2,087	2,087	2,087	2,087	2,087	2,087	2,087
Mean in control	0.549	3, 685.413	1.091	1, 577.286	1, 474.800	3, 2561.844	26, 870.630	4, 275.948	358.718	2, 647.696	-0.000
<i>Panel B: Progoti</i>											
Treatment	-0.004 (0.013) [0.844]	1, 740.773 (1, 653.815) [0.426]	1.068** (0.438) [0.035]	74.965 (73.042) [0.407]	38.695 (55.291) [0.588]	6, 851.723 (18, 148.570) [0.752]	-1.33e+04 (15, 979.711) [0.486]	145.652 (880.334) [0.879]	-6.950 (77.065) [0.938]	-8073.473 (5, 411.127) [0.295]	0.015 (0.054) [0.812]
Observations	2,854	2,854	2,854	2,854	2,854	2,854	2,854	2,854	2,854	2,854	2,854
Mean in control	0.893	20, 936.624	2.428	2, 923.813	2, 615.572	1.68e+05	1.69e+05	13, 521.567	1, 101.980	22, 956.038	0.000

Notes: The table presents the treatment effects on business outcomes of eligible *Dabi* and *Progoti* borrowers. Data comes from the mid-line (2016) and endline (2017) surveys. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (strata) fixed effects. "Treatment" is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. "Flexible loan" is a dummy variable equal to 1 if the respondent borrowed under the new, flexible loan contract and 0 otherwise. The regressions are OLS regressions based on specification (4). Standard errors are clustered at the BRAC branch office level ($\hat{p} < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. *Business owner* is a dummy variable equal to one if the respondent owns a business. *Business assets* is the monetary value (in USD PPP) of business assets (tools, machinery, furniture, vehicle and inventories) at the time of the survey. *Number of workers* is the number of workers (other than household members) who work in the business on a typical working day. *Business hours* is the number of hours that the enterprise was in operation over the last 12 months. *Owner's business hours* is the number of hours that the business owner worked in the business over the last 12 months. *Revenues* is the monetary value (in USD PPP) of sold products or delivered services of the business over the last 12 months. *Costs* is the monetary value (in USD PPP) of the total amount the enterprise spent on personnel expenses, machines, tools, equipment, space, transportation, electricity, fuel for machines, and total purchase of stock over the last 12 months. *Profits (annual)* is profit (in USD PPP) of the business over the last 12 months. *Profits (month)* is profit (in USD PPP) of the business over the month preceding the survey. *Range of revenues* is the difference between the level of revenues during the worst month in terms of sales and the level of revenues during the best month in terms of sales during the past year. If the respondent reported that revenues did not fluctuate throughout the year, the range of revenues is set equal to zero. "Aggregate index" is constructed by first standardizing all outcome variables in columns (1)-(10) with respect to the control group in the relevant survey wave (subtracting the mean in control and dividing by the standard deviation of the control group), then taking their average and standardizing again with respect to the control group.

activity and greater business investments, but also increased the volatility of the monthly business revenues among the *Dabi* borrowers.³¹ When we study the effects on the *Progoti* clients, we find a strikingly different pattern. In particular, there are no significant effects on any of the business outcomes except for the number of workers, and the overall impact on the aggregate index in column (11) is close to zero and insignificant.^{32,33}

The third and final set of outcomes are related to the socio-economic status of the eligible borrowers. Panel A of Table 4 shows that eligible *Dabi* clients in the treatment group had higher household (labour) income, corresponding to an increase of 17% relative to the control sample. The rest of the panel indicates that, while there was no significant impact on per-capita consumption, the value of non-business assets owned by the respondent's household increased by 18% compared to control (RI p -value = 0.039). Treated clients were also 8 *ppt* more likely to own land (RI p -value < 0.01), with land size increasing by 10 decimals (0.04 hectares) or 27% relative to the control group mean (RI p -value = 0.012).³⁴ Assessing land use reveals that most of the new, larger landholdings, were rented out (see Supplementary Table A.9). Treated borrowers are twice as likely to rent out land and hold four times as much land for this purpose, increasing the land rent received by about 47 USD PPP (RI p -value = 0.011)—nearly a 100% increase relative to the control group. Given that land ownership is a key indicator of socio-economic status in rural Bangladesh, this is an important sign that the status of the eligible *Dabi* clients improved as a result of the intervention. The aggregate index in column (6) also shows a significant increase of 0.165 SDs (RI p -value = 0.026). In contrast to the *Dabi* borrowers, there are no significant effects on any of the outcomes nor on the aggregate index for the *Progoti* clients (Panel B of Table 4).³⁵

Figure 3 provides a visual summary of the treatment impact on the eligible clients. It plots the ITT effects on standardized indicators related to the three families of outcomes we study (credit market, business, and household economic status). All the *Dabi*-related outcomes (shown in Figure 3A), with the exception of non-BRAC loan value and per-capita consumption expenditure, are positively affected, with a majority of them being statistically significant. In particular, we observe large effects on business revenues (0.24 SDs), profits (0.13 SDs), and household

31. As noted in Section 4.3 above, only 45% of the eligible *Dabi* clients reported having a business at baseline. In order to understand whether the effects in Table 3 are driven by business survival and growth versus starting up of new businesses, we tested for the heterogeneity of the business outcomes with respect to baseline business ownership (see Supplementary Table A.5). Overall, results show that the treatment did not have a significant impact on business ownership and most of the effects on revenues, costs, and profits are observed in households who already had a business at baseline. This suggests that the treatment effects are mainly driven by growth of existing businesses as opposed to starting up of new ones.

32. Similar to the credit market outcomes, we can reject the null hypothesis of equality of the treatment effects of the *Dabi* versus the *Progoti* borrowers for the aggregate index but not for most of the individual outcomes (see Supplementary Table A.6).

33. Firm outcomes, such as profits and revenues, are notoriously noisy. In Supplementary Tables A.7 and A.8, we assess the sensitivity of the treatment effects on all monetary business outcomes with respect to outliers. Each table reports estimates where the data is winsorized at the 99.5th (Panel A), 99th (Panel B), 98th percentile (Panel C). Qualitatively, the estimates confirm those reported in Table 3. The only outcome variable for which we lose significance is the range of revenues—when we winsorize the data at the 99th or 98th percentile, the effect on the range of monthly revenues is still positive but no longer precisely estimated for the *Dabi* sample. In terms of magnitude, the treatments effects on many outcomes diminish considerably when winsorizing the top 2%. This alludes to there being considerable heterogeneity in the treatment effects on *Dabi* clients, which we discuss in detail in Section 5.4.

34. The findings are in line with existing evidence on land ownership and land transactions in Bangladesh (see Section A.2.3 in the Supplementary Appendix).

35. In Supplementary Table A.10, we test for and reject the null hypothesis of equality of the treatment effects on household socio-economic status of the *Dabi* versus the *Progoti* borrowers for the aggregate index, household income, and land ownership, but not for the other outcomes.

TABLE 4
Effects on household socio-economic status

	(1)	(2)	(3)	(4)	(5)	(6)
	Household income	Consumption per capita	Non-business assets value	Land owner (Yes = 1)	Size of land owned	Aggregate index
<i>Panel A: Dabi</i>						
Treatment	1,309.195* (774.989) [0.194]	12.417 (82.422) [0.888]	610.540** (243.284) [0.039]	0.076*** (0.022) [0.002]	10.366*** (3.319) [0.012]	0.165*** (0.056) [0.026]
Observations	2,168	2,085	2,168	2,087	2,168	2,168
Mean in control	7,820.156	1,613.159	3,433.611	0.472	37.953	-0.000
<i>Panel B: Progoti</i>						
Treatment	-667.980 (918.048) [0.576]	-119.154 (118.311) [0.346]	-392.274 (397.728) [0.382]	-0.005 (0.017) [0.778]	-13.853 (14.714) [0.438]	-0.050 (0.037) [0.260]
Observations	3,066	2,853	3,066	2,854	3,066	3,066
Mean in control	18,641.784	2,296.669	7,954.081	0.820	168.575	-0.000

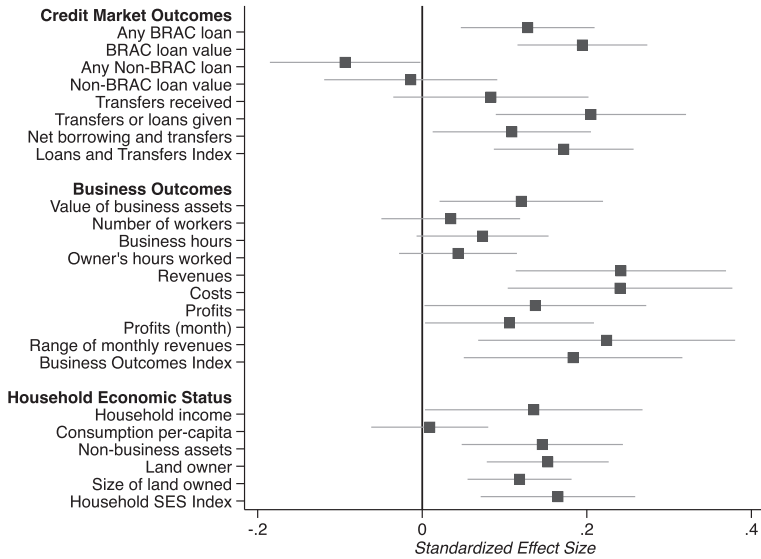
Notes: The table presents the treatment effects on indicators of household socio-economic status outcomes of eligible *Dabi* and *Progoti* borrowers. Data comes from the mid-line (2016) and endline (2017) surveys. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (randomization strata) fixed effects. “Treatment” is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. The regressions are OLS regressions based on specification (4). Standard errors are clustered at the BRAC branch office level (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. *Household income* is the monetary value (in USD PPP) of the household members’ total earnings from wage-employment over the past 12 months and the profit(s) of any household business(es) operated by the household. *Consumption per capita* is the monetary value (in USD PPP) of the total household expenditure per capita (in PPP USD) over the last 12 months divided by the household size on consumption measures). *Non-business assets value* is the monetary value (in USD PPP) of durable non-business assets owned by the respondent’s household at the time of the survey. *Land owner* is a dummy variable = 1 if the household owns any land (excluding the homestead). *Size of land owned* is the amount (in decimals) of land owned by the household (excluding the homestead). “Aggregate index” is constructed by first standardizing all outcome variables in columns (1)–(5) with respect to the control group in the relevant survey wave (subtracting the mean in control and dividing by the standard deviation of the control group), then taking their average and standardizing again with respect to the control group.

income (0.14 SDs).³⁶ The corresponding effects on the eligible *Progoti* clients are depicted in Figure 3B. Overall, we do not find evidence of a significant average impact on the outcomes of the *Progoti* clients. As noted above, one business outcome where we do observe a significant treatment effect is the number of workers employed in the *Progoti* clients’ businesses. The borrowers in the treatment group hire on average 1 additional worker, which implies a 42% increase relative to the control group (RI p -value = 0.035). Nevertheless, since the effect is observed on only 1 out of a number of business outcomes, we conclude that repayment flexibility did not have a significant impact on *Progoti* clients’ businesses, at least on average.

A possible concern with the large treatment effects detected among the *Dabi* clients is whether the results are driven by some peculiarity of our context or the eligible sample itself.

36. In the [Supplementary Appendix](#), we present the results of estimating the treatment effects at mid- and endline separately and test for the differential impact between the two surveys to shed light on the dynamics. [Supplementary Table A.11](#) shows this for the ITT estimates for *Dabi* and [Supplementary Table A.12](#) for *Progoti* clients. Overall, the treatment impact does not appear to be significantly different for most outcome variables across the two surveys. Notably, there is no significant difference in the aggregate indices for the three families of outcomes across mid- and endline.

A



B

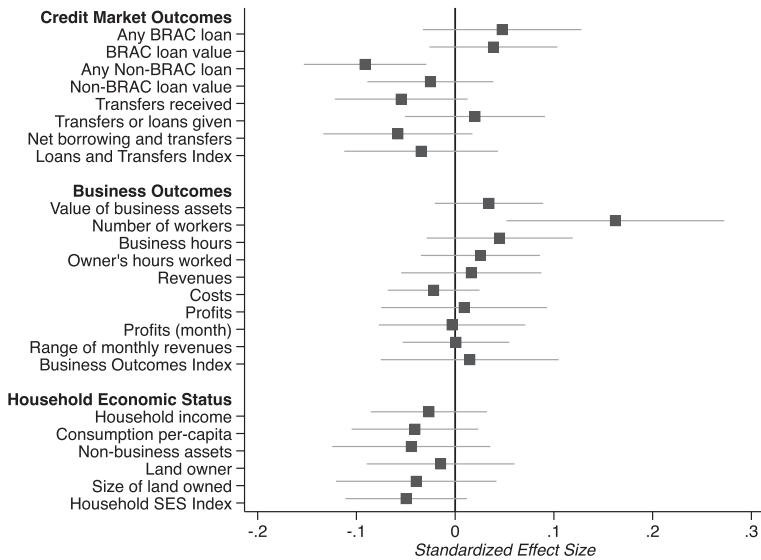


FIGURE 3

ITT effects: (A) effects on *Dabi* borrowers and (B) effects on *Progoti* borrowers

Notes: The figures plot the standardized effect sizes and 90% confidence intervals around the treatment effects estimated using ordinary least square estimates based on specification (4). The sample includes eligible *Dabi* borrowers in Panel A; and eligible *Progoti* clients in Panel B. Data comes from the mid-line (2016) and endline (2017) surveys. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (randomization strata) fixed effects. Standard errors are clustered at the BRAC branch office level.

To assess this, we compare our estimates to the treatment effects found in [Field *et al.* \(2013\)](#) who evaluate the impact of an initial 2-month grace period provided to microfinance clients in India. Even though the product we examine is quite different, allowing borrowers to manage payments freely over the loan cycle in a state-contingent manner, [Field *et al.* \(2013\)](#) is the most similar study to ours that we are aware of in terms of context (traditional microfinance borrowers), methodology, and the type of contractual deviation analysed. The grace period increased the business assets by 81%, weekly profits by 57%, and monthly household income by 22%. Our ITT estimates correspond to a 51% increase in business assets, 26% increase in monthly profits, and 17% increase in annual household income. As the grace period was mandatory, take up was 100% by design. Considering that the take-up rate of the flexible loan product is 57% among our eligible *Dabi* clients, the ITT estimates are very similar to the effects found in [Field *et al.* \(2013\)](#) (assuming no spillover effects on borrowers who did not take up the flexible loan). This builds confidence in the external validity of our findings and suggests that the large treatment effects are not driven by some special feature of our context or sample.

5.3. Client retention and default rates

To study the effect on the eligible borrowers' repayment behaviour, we use BRAC's administrative records. In particular, we test if the repayment rates of the eligible clients and their demand for BRAC loans are affected by the introduction of the flexible loan contract.

Table 5 reports the impact on client retention and default for the eligible borrowers. Column (1) shows that treated *Dabi* clients are 6.8 *ppt* less likely to have left BRAC by August 2017, 2 years following the start of the experiment. The effect on *Progoti* borrowers is also negative but imprecisely estimated.³⁷ In the remaining columns we investigate the repayment rates. We first present the official default classification used by BRAC [column (2)] and then assess how repayments change depending on the time elapsed since the start of the contract [columns (3) and (4)] or since the end of the loan cycle [columns (5)–(7)]. Specifically, column (2) reports the effect on the official default rate defined as the likelihood of not having repaid the loan by the end of the loan cycle. We find that the provision of repayment flexibility leads to a significant reduction in the rate of default for eligible *Dabi* borrowers (RI *p*-value = 0.095). In the treatment branches, they are 1.7 *ppt* (or 35% at the mean) less likely to default. The corresponding impact is close to zero for the *Progoti* clients.³⁸

Next, we examine the likelihood that the loan was not fully paid in 12 months to quantify the proportion of borrowers who extended the loan by using at least one voucher. Treated *Dabi* borrowers are 8.2 *ppt* more likely to not repay the loan within 12 months relative to the control group, suggesting an increase in the likelihood to extend the loan by 8.2 *ppt*. Similarly, we see a 5.2 *ppt* increase for treated *Progoti* borrowers. Column (4) investigates the actual end of the loan cycle, defined as 12 months in the control and 14 months in the treatment branches.³⁹ *Dabi*

37. We define leaving BRAC as a dummy equal to one if the borrower repaid her loan(s) and had not taken a new one by August 2017; and equal to zero if the borrower has a current loan or remain in default by August 2017. As the default rate decreased, columns (2) and (4)–(7) in Table 5, the probability of remaining with BRAC is driven by a higher likelihood of taking up a new loan.

38. The default indicator in column (2) is based on a classification entered into the system by BRAC's credit officers. While the officers were instructed to account for the possibility of extending the loan cycle (up to 2 months) for borrowers with flexible loans, it is possible that they may not have implemented this 100% correctly. That is why we use an alternative classification in columns (5)–(7), which yields similar results.

39. Thus, in columns (4)–(7), the end of the loan cycle is computed starting 2 months after the expected last collection date in the treatment branches (to account for the extension possibility induced by the vouchers) and by the expected last collection date in the control branches.

TABLE 5
Effects on repayment behaviour

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Loan not fully paid		Full loan not repaid within		
	Borrower no longer with BRAC	Classified as "Default"	in 12 months	by the end of the loan cycle	2 months after the end of the loan cycle	6 months after the end of the loan cycle	12 months after the end of the loan cycle
<i>Panel A: Dabi</i>							
Treatment	-0.068* (0.036) [0.152]	-0.017** (0.008) [0.095]	0.082*** (0.025) [0.007]	-0.064*** (0.017) [0.001]	-0.018 (0.013) [0.269]	-0.019 (0.013) [0.217]	-0.019 (0.013) [0.218]
Observations	945	945	914	914	914	914	914
Mean in control	0.371	0.048	0.109	0.109	0.046	0.042	0.040
<i>Panel B: Progoti</i>							
Treatment	-0.025 (0.028) [0.478]	-0.003 (0.007) [0.712]	0.052*** (0.018) [0.023]	-0.094*** (0.016) [0.000]	0.004 (0.009) [0.725]	0.007 (0.008) [0.473]	0.006 (0.007) [0.412]
Mean in control	0.48	0.03	0.145	0.145	0.031	0.027	0.023
Observations	1,467	1,467	1,402	1,402	1,402	1,402	1,402

Notes: The table presents the treatment effects on retention and loan repayment of eligible *Dabi* and *Progoti* borrowers. Data comes from BRAC's administrative records collected at endline (2017). "Treatment" is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. *Borrower no longer with BRAC* is a dummy variable taking the value of one if the client has repaid the loan and not taken out a new one (as opposed to having a current loan or having defaulted). *Default* is a dummy variable taking the value of one if the borrower was categorized by the credit officer as not having repaid the loan by the end of the loan cycle. *Loan not fully paid in 12 months* is a dummy variable taking the value of one if the borrower does not repay the full loan by the end of the loan cycle (12 months). *Loan not fully paid by the end of the loan cycle* is a dummy variable taking the value of one if the borrower does not repay the full loan within the 14th month in the treatment branches and by the 12th month in the control branches. *Full loan not repaid within 2 (6) [12] months after the end of the loan cycle* are dummy variables taking the value of one if the borrower did not repay the full loan by the second (sixth) [twelfth] month after the end of the loan cycle. For eligible clients in treatment branches, the end of the loan cycle is computed starting 2 months after the expected last collection date; in control branches from the expected last collection date (see [Supplementary Appendix B](#) for further details). Robust standard errors clustered at the branch level in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets.

clients are 6.4 *ppt* less likely to not repay the full loan by the end of the loan cycle, while the *Progoti* borrower are 9.4 *ppt* less likely to do so (RI p -value < 0.01 for both). Hence, by the end of the contract, the de facto default rate was significantly lower in the treatment branches. The remaining columns report the effects on the probability of not having repaid the full loan within 2, 6, and 12 months [columns (5), (6), and (7)] after the end of the loan cycle as defined in column (4). Eligible *Dabi* clients are 1.9 *ppt* less likely not to have repaid the full loan up to 12 months later. While imprecisely estimated, the effect is similar in magnitude to the default indicator [column (2)] used by BRAC. Overall, the patterns imply that the flexible contract improved repayment among the eligible clients in the treatment branches, at least in the short run, while loan repayment rates were more similar in the treatment and control groups in the longer term.

5.4. Credit or insurance rationing?

The results so far demonstrate that repayment flexibility led to improvements in business outcomes and socio-economic status without an increase in the default rates for the *Dabi* clients, with much more modest and insignificant effects for the *Progoti* borrowers. Viewed through the

lens of our model, these findings provide some initial evidence of the mechanisms at play. The relatively large impact experienced by the *Dabi* clients is consistent with increased risk taking because of imperfect insurance markets and, possibly, credit rationing. By contrast, the absence of discernible effects for *Progoti* either implies that these firms were unconstrained or that they face too much risk even with the vouchers due to other external commitments. In the latter case, the model shows that the flexible contract induces safer low-return investments, again owing to imperfect insurance, binding credit constraints, or an incompleteness in both markets. To shed light on the channels, we now test more directly for the presence of insurance and credit rationing.

5.4.1. Insurance rationing. According to our theory, repayment flexibility should increase risk taking if insurance markets are imperfect and the loan payment is the main outstanding obligation. To examine this link empirically, we explore four pieces of evidence. First, an implication of greater risk taking is that some firms will flourish while others, if unsuccessful, may fail. The finding that treatment increases sales volatility [column (10), Table 3] is supportive of this, at least for the sample of eligible *Dabi* clients. To probe the idea further, we study the heterogeneity of the treatment effects.

Average treatment effects in terms of business growth and household economic wellbeing may mask considerable heterogeneity that can tell us something more about whether the flexible contract induces risk taking, resulting in success as well as failure. To explore this, we estimate the following quantile treatment effect (QTE) specification:

$$\text{Quant}_\tau(\Delta y_{it}) = \beta_\tau T_i + \phi_\tau E_t + \sum_{s=1}^{15} \psi_{s\tau} \gamma_s, \quad (5)$$

where Δy_{it} is the change in the outcome of interest for individual i at survey t (mid- or endline) relative to the baseline and the rest of the parameters are defined as in equation (4) above. One caveat to bear in mind is that, due to the small sample size, we lack the power to estimate precise treatment effects across the distribution.

Figure 4 displays the results for the eligible *Dabi* clients. The QTE estimates reveal substantial heterogeneity in the effects of the flexible contract. While we observe a positive impact on business asset value at any centile above the median (Figure 4A), the treatment effect at the lowest centile is negative (although insignificant). The pattern is even more striking when we study the QTEs on business revenues and household (labour) income (Figure 4B and C). While most treated clients raise their revenue and household income, those at the lower end of the distribution do worse relative to the control group. As an alternative way of exploring the effects throughout the distribution, we also plot the cumulative distribution function (CDF) of log household income in Figure 4D.⁴⁰ The CDF of log income for the control group lies to the right of the treatment group until the income level reaches about 9 log-points, but after that the CDFs of the two samples reverse position. This is consistent with repayment flexibility leading to greater risk taking among treated clients, causing some households in the treatment group to lose out (relative to control) while others do better. By contrast, when we conduct the same analysis for the *Progoti* borrowers, we find no evidence of any heterogeneity.⁴¹

40. We use the log transformation in order to smooth outliers and make the pattern clearer and add 1 to household (labour) income as some households (about 17% of the sample) report zero income.

41. The corresponding figures for the *Progoti* sample are reported in Supplementary Figure A.1. There is no evidence of heterogeneity, neither in the QTEs nor in the distribution of log income.

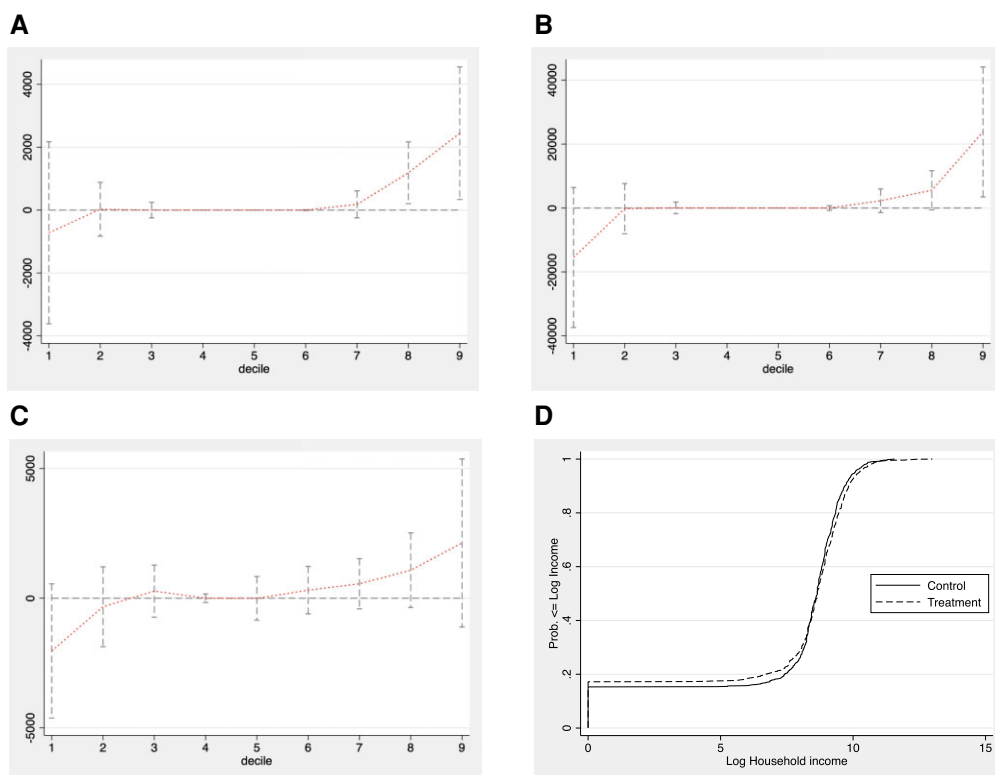


FIGURE 4

Heterogeneity of treatment effects among Dabi borrowers: (A) business assets value; (B) business revenues (annual); (C) household income (annual); and (D) CDF of Log household income

Notes: The sample includes eligible *Dabi* borrowers. Data comes from the mid-line (2016) and endline (2017) surveys. Panels A–C plot QTEs estimated according to specification (5). 90% confidence intervals are based on bootstrapped (with 500 replications) standard errors clustered at the BRAC branch office level (unit of randomization). Each specification controls for the survey wave. Values are in PPP USD. Panel D plots the CDF of log household income (plus 1) in the treatment and control samples.

Second, we estimate the heterogeneity of the treatment effect with respect to the uncertainty of the local business environment. As implied by the model, the flexible contract should facilitate riskier investments more exposed to aggregate uncertainty in the case insurance constraints bind. As an indicator of business uncertainty, we rely on the baseline data from the SME sample.⁴² Every firm owner in this sample was asked about the subjective probability distribution of future demand for their product(s), similar to the method used by Guiso and Parigi (1999). Using this information, we calculate the average coefficient of variation (CV) of expected demand growth among SME owners within a cluster (BRAC branch office) and divide the clusters into two groups: those where the average CV of expected demand growth is high (above median) or low (below median) at baseline. If the flexible contract helps eligible borrowers undertake riskier investments, we expect the effects to be larger in clusters with greater demand uncertainty. Table 6 shows that this is indeed the case among the *Dabi* borrowers. In branches with higher volatility in expected demand growth, the ITT estimates on business revenues and costs increase:

42. As this is a representative sample, it provides a sense of the business uncertainty facing the typical small firm in the local market at baseline.

TABLE 6
Heterogeneity w.r.t. expected demand growth uncertainty

	(1)	(2)	(3)	(4)	(5)
	Business owner	Revenues (annual)	Costs (annual)	Profits (annual)	Profits (month)
Treatment	0.01 (0.03) [0.78]	3860.08 (12, 064.47) [0.72]	-1957.58 (9, 969.81) [0.84]	44.02 (1, 016.88) [0.97]	11.06 (106.32) [0.92]
High expected demand uncertainty	-0.09 (0.06)	-3, 497.83 (18, 192.53)	-2, 876.41 (15, 049.16)	-618.39 (1, 231.53)	-50.12 (124.35)
Treatment × High expected demand uncertainty	0.05 (0.05) [0.40]	42, 985.55** (17, 607.55) [0.02]	46, 482.92*** (15, 114.98) [0.00]	1, 927.03 (1, 406.95) [0.16]	157.90 (138.89) [0.20]
Observations	2,087	2,087	2,087	2,087	2,087
Mean in control	0.55	32, 561.84	26, 870.63	4, 275.95	358.72
Treatment effect under high uncertainty	0.06 (0.04)	46, 845.62*** (11, 045.76)	44, 525.34*** (9, 968.73)	1, 971.05** (872.49)	168.96** (71.80)

Notes: The table presents the heterogeneity of the treatment effects on key business outcomes of the eligible *Dabi* borrowers with respect to uncertainty of demand growth at baseline among local businesses. “High expected demand uncertainty” is a dummy variable = 1 if the respondent is located in a branch where the average coefficient of variation (CV) of expected sales growth among a representative sample of SMEs at baseline was high (above the sample median). All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (randomization strata) fixed effects. “Treatment” is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. Standard errors are clustered at the BRAC branch office level ($*p < 0.10$, $**p < 0.05$, $***p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. “Treatment effect under high uncertainty” corresponds to the sum of the coefficients of “Treatment” and “Treatment × High exp. demand uncertainty.” *Business owner* is a dummy variable equal to one if the respondent owns a business. *Revenues* is the monetary value (in USD PPP) of sold products or delivered services of the business over the last 12 months. *Costs* is the monetary value (in USD PPP) of the total amount the enterprise spent on personnel expenses, machines, tools, equipment, space, transportation, electricity, fuel for machines, and total purchase of stock over the last 12 months. *Profits (annual)* is profit (in USD PPP) of the business over the last 12 months. *Profits (month)* is profit (in USD PPP) of the business over the month preceding the survey.

the interaction effect on revenues is 42,986 USD PPP (RI p -value = 0.02). Moreover, the impact on profits seems to be concentrated among borrowers located in clusters with higher demand growth uncertainty (the interaction terms in columns (4) and (5) are large and positive though somewhat imprecise). This implies that among the *Dabi* borrowers, repayment flexibility helped borrowers particularly in markets with high demand uncertainty at baseline. Importantly, the corresponding analysis for the *Progoti* clients shows no detectable heterogeneity.⁴³

Third, in addition to expectations about future demand, the realization of actual shocks should be particularly important for borrowers who take on more risk. To test this, we explore variation in local demand shocks caused by changes in agricultural productivity. In Bangladesh, agriculture is the key economic sector, accounting for 20% of GDP and 65% of the labour force, with rice subsuming 90% of total agricultural production (World Bank, 2008; Yu *et al.*, 2010). In addition, Bangladesh is one of the most climate-vulnerable countries in the world, with droughts and heavy floods having a strong negative effect on rice yields and subsequent income

43. The results for the *Progoti* sample are report in [Supplementary Table A.13](#). They show that the treatment effects are, if anything, lower in markets with higher demand uncertainty. However, with the exception of the differential effect on revenues, all estimates are imprecisely estimated at conventional levels.

(Khandker, 2012; Bandyopadhyay and Skoufias, 2015; Rahman *et al.*, 2017). To capture sharp changes to rice productivity and thus to the local economy, we explore the occurrence of heavy floods during the growing season (December to May) of the most important rice variety, Boro. As Boro contributes to over 50% of total rice production, and as extreme flooding or drought during this period causes fatal damage to crop yields, the flooding constitutes an important downturn in local economic activity (Sarker *et al.*, 2012; Bangladesh Bureau of Statistics, 2016; Ara *et al.*, 2017).⁴⁴ While the firms in our sample operate in non-agricultural sectors, large agricultural productivity shocks that lower aggregate income are likely to lower demand for their products and services (Santangelo, 2019).

To construct the shocks, we compute the rainfall distribution for a 25 km radius from the centroid of each branch separately over the period 1983–2017. A negative shock is proxied by a one standard deviation increase in rainfall within the 25 km buffer zone. To match our mid- and end-line survey, collected in May through August of 2016 and 2017, we measure shocks in December to May in 2016 and in 2017 relative their historical distribution. Importantly, this implies that the extreme floods occur unexpectedly after the announcement of the flexible credit contract offer in September 2015. Moreover, the closeness in time to each of our survey rounds minimizes concerns of recall bias when measuring the shocks' effect on business outcomes. In Table 7, we study the riskiness of the business activity by interacting the rain shock with the treatment indicator as well as adding an independent shock variable. A negative coefficient on the interaction term implies that activities undertaken with access to vouchers were more sensitive to demand shocks (as captured by the undesirable rainfall shock). The effect of the shock itself should also be negative as it lowers overall demand.⁴⁵ Columns (2)–(5) support the idea that excessive rainfall in the growing season constitutes a negative shock to the business, especially in treatment branches. We have a negative and significant interaction term for business revenues, costs, and profits. Specifically, the treatment effect on revenues is 38,886 USD PPP in the absence of the negative rainfall shock, while the impact is only 7,200 USD PPP and imprecisely estimated for borrowers exposed to the shock. The difference between the two effects is statistically significant at $-31,685$ USD PPP (RI p -value = 0.03). When we look at the impact of the negative rainfall realization alone, we see that in control branches the effect is $-31,982$ USD PPP and marginally significant. This is in line with the shock lowering sales in general. In treatment branches, the effect of the rainfall shock almost doubles. The impact in the treatment group is $-63,667$ USD PPP. Similarly, the responsiveness is also sizable in terms of costs and profits. Annual profits are up by 1,454 USD PPP (or over 30% at a mean of 4,276 USD PPP) in treated businesses who did not experience the rainfall shock, while for those who did, the treatment effect is indistinguishable from zero. A similar pattern is observed for monthly profits, but the interaction term (of treatment with the rainfall shock) is imprecisely estimated at conventional levels.

Overall, the interaction effect with the negative rainfall shock entirely removes the positive impact of treatment on revenues, costs, and profits which in absence of floods is significantly greater among *Dabi* clients in the treatment group relative to control. We also see a negative effect on the extensive margin, as fewer individuals are business owners in treated branches who experienced the negative rainfall realization. Together, these findings imply that *Dabi* clients

44. While normal floods may increase productivity and income, heavy floods have devastating effects on households (Bandyopadhyay and Skoufias, 2015).

45. To account for the possibility that climate change affects the probability of rainfall, and that this change is correlated with changes in investment behaviour, we include district-by-survey year fixed effects in the regressions. To further ensure that we exploit weather variation across branches with similar baseline likelihood of flooding, we also control flexibly for rainfall by including dummy variables corresponding to the quartiles in the rain probability distribution of the two most recent years prior to baseline.

TABLE 7
Heterogeneity w.r.t. rain shocks

	(1)	(2)	(3)	(4)	(5)
	Business owner	Revenues (annual)	Costs (annual)	Profits (annual)	Profits (month)
Treatment	0.03 (0.02) [0.30]	38,886.00*** (10,087.61) [0.00]	33,632.15*** (9,070.40) [0.00]	1,453.54* (760.79) [0.10]	125.21** (59.75) [0.09]
Rain shock	-0.01 (0.06)	-31,981.57* (18,275.70)	-30,197.79** (13,993.84)	-2,976.85* (1,483.50)	-277.95* (157.51)
Treatment × Rain shock	-0.10** (0.05) [0.16]	-31,685.31** (12,751.50) [0.03]	-21,644.12** (8,399.06) [0.05]	-1,471.06* (778.66) [0.12]	-107.77 (82.14) [0.25]
Observations	2,087	2,087	2,087	2,087	2,087
Mean in control	0.55	32,561.84	26,870.63	4,275.95	358.72
Treatment effect with Rain shock	-0.06 (0.05)	7,200.69 (13,767.09)	11,988.03 (10,114.93)	-17.52 (857.76)	17.45 (85.91)
Rain shock effect in Treatment	-0.10 (0.05)	-63,666.88*** (18,751.91)	-51,841.91*** (14,319.25)	-4,447.9*** (1,399.19)	-385.72** (150.15)

Notes: The table presents the heterogeneity of the treatment effects on key business outcomes of the eligible *Dabi* borrowers with respect to the likelihood of having experienced an excessive rainfall shock. Data comes from the midline (2016) and endline (2017) surveys. “Rain shock” is a dummy variable = 1 if the amount of rainfall in the months of December to May preceding the survey (2016 or 2017) was one standard deviation above rainfall in December to May over the period 1983–2015. The geographical area over which the rainfall amount was calculated corresponds to a 25 km radius around the branch where the firm is located. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey, district-by-survey year fixed effects, and flexible controls for the probability of rain. “Treatment” is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. Standard errors are clustered at the BRAC branch office level ($^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. “Treatment effect with Rain shock” corresponds to the sum of the coefficients of “Treatment” and “Treatment × Rain shock.” “Rain shock effect in Treatment” corresponds to the sum of the coefficients of “Rain shock” and “Treatment × Rain shock.” *Business owner* is a dummy variable equal to one if the respondent owns a business. *Revenues* is the monetary value (in USD PPP) of sold products or delivered services of the business over the last 12 months. *Costs* is the monetary value (in USD PPP) of the total amount the enterprise spent on personnel expenses, machines, tools, equipment, space, transportation, electricity, fuel for machines, and total purchase of stock over the last 12 months. *Profits (annual)* is profit (in USD PPP) of the business over the last 12 months. *Profits (month)* is profit (in USD PPP) of the business over the month preceding the survey.

with access to the flexible contract shift their activities to take on more demand-related risk.⁴⁶ When we implement the analogous analysis on the sample of *Progoti* borrowers, we find no significant treatment heterogeneity with respect to the rain shocks.⁴⁷

46. There can be alternative mechanisms through which local rain shocks affect non-agricultural firms. For example, [Bustos et al. \(2020\)](#) show that agricultural productivity may influence the supply of capital available to firms in the non-agricultural sector. If this was the relevant mechanism, then the pattern in Table 7 could be interpreted as treated firms being more exposed to capital shocks (caused by the flooding). Alternatively, treated firms may have invested in inputs, such as machines, that are more dependent on infrastructure (e.g. electricity or roads) that becomes less accessible during heavy rains. Both of these channels are in line with the interpretation that treated firms are more exposed to aggregate risk (relative to firms in the control group).

47. The results for the *Progoti* clients are reported in [Supplementary Table A.14](#). In [Supplementary Tables A.15 and Table A.16](#), we assess the robustness of the results on heterogeneity of the treatment effects on the *Dabi* sample with respect to expected demand uncertainty and rainfall shocks. Overall, the results of the heterogeneity analysis are robust to winsorizing the data at the top. This rules out the concern that the heterogeneity results could be driven by a handful of outliers.

Fourth, the theory is based on the idea that the flexible contract raises investments in illiquid and thus riskier business assets if the insurance market is incomplete. Hence, as a final test of risk taking, we examine how access to repayment flexibility affects the eligible borrowers' asset holdings. According to Table 3, treatment increased the eligible *Dabi* clients' business assets' value by over 50% relative to control. We begin by breaking down this effect (for the *Dabi* borrowers) into 6 different categories: tools and utensils, furniture, machines, vehicles, inventories, and buildings. While Panel A of Table 8 shows that treatment and control were as likely to own an asset within each group, Panel B reveals that the aggregate value increased across the majority of categories. Specifically, treatment increased the ownership of tools and utensils by 73 USD PPP [column (1)], furniture by 57 USD PPP [column (2)], machinery by 148 USD PPP [column (3)], and inventories by 1,105 USD PPP [column (5)]. These effects correspond to a 63% increase in tools and utensils (RI p -value = 0.032), a 45% increase in furniture (RI p -value = 0.020), a 154% increase in machines (RI p -value = 0.194), and a 41% increase in inventories (RI p -value = 0.043) relative to the mean in the control group. The point estimates for vehicles and buildings are negative but imprecisely estimated.

To better understand borrowers' ability to liquidate these assets and also to validate the model's assumption on asset illiquidity, we collected additional information on the value lost in case eligible clients were forced to rapidly sell their assets.⁴⁸ Specifically, all eligible borrowers were asked to report how much they could sell their assets for if they had 1 month to sell them versus if they were to sell the assets within 24 h. In Figure 5, we plot the percentage of the asset value that respondents reported they would lose in case of a rapid sale (conditional on having a given type of asset). On average, respondents stated that they would obtain 38% less if they had to sell their assets in 1 day as opposed to 1 month. For all types of assets, the eligible borrowers reported that they would lose more than 30% of the value under a fire sale, with the highest value lost for tools (42%), followed by inventories (38%), and other assets (37%). While these findings need to be interpreted with some caution (with data collected 5 years after the baseline survey and during the Covid-19 pandemic), the evidence suggests that business assets in general are difficult to liquidate in this setting and, as such, investing in them entails substantial risk for small businesses.

Returning to Table 8, in Panel C we explore the variety of business assets held by the eligible *Dabi* clients by counting the number of different asset types within tools and utensils, furniture, machines, and vehicles.⁴⁹ The results show that eligible *Dabi* borrowers in treated branches increased the variety of tools and furniture they own by about 13% compared to the control group (RI p -values = 0.067–0.072). Finally, Panel D of Table 8 reports differences in terms of the unit value of the business assets held in each category.⁵⁰ We find that the unit value of tools and utensils goes up by 25 USD PPP (43%) and that of furniture by 9 USD PPP (14%), but these effects are somewhat imprecisely estimated as the RI p -values are above 10%. To the extent that the wider variety of inputs captures increased experimentation with the production process (Panel C) and that these (possibly less common) inputs carry a higher unit price (Panel D), it is a

48. For this, we resurveyed all eligible borrowers in our sample in May 2020. Due to the ongoing Covid-19 pandemic, the survey was conducted via phone. The attrition rate was 33% (26%) among the *Dabi* (*Progoti*) clients, but balanced by treatment status [RI p -value = 0.493 (0.717) for the *Dabi* (*Progoti*) samples].

49. Asset type was not recorded for the inventory and building categories.

50. The sample size shrinks, as the value per unit is undefined for respondents who do not own any assets of a given category. While Panel A of Table 8 shows that there is no selection into a specific asset category, it is still possible that the results in Panel D are partly driven by selection into a particular asset type. As we lack data on the unit value of inventories and buildings, we omit these categories.

TABLE 8
Effects on business assets

	(1)	(2)	(3)	(4)	(5)	(6)
	Tools	Furniture	Machines	Vehicles	Inventories	Buildings
<i>Panel A: Likelihood of having assets</i>						
Treatment	0.029 (0.021) [0.207]	0.022 (0.014) [0.168]	0.005 (0.011) [0.666]	-0.004 (0.009) [0.763]	0.019 (0.020) [0.418]	0.025 (0.017) [0.221]
Observations	2,087	2,087	2,087	2,087	2,087	2,087
Mean in control	0.436	0.294	0.102	0.084	0.414	0.150
<i>Panel B: Value of assets</i>						
Treatment	72.957** (31.429) [0.032]	57.567** (25.784) [0.020]	148.011* (86.854) [0.194]	-259.199 (208.002) [0.230]	1,105.186** (444.002) [0.043]	-1,892.675 (1,614.798) [0.271]
Observations	2,087	2,087	2,087	2,087	2,087	2,087
Mean in control	112.677	124.653	96.139	697.062	2,642.783	6,899.173
<i>Panel C: Types of assets</i>						
Treatment	0.116** (0.054) [0.072]	0.109** (0.049) [0.067]	0.009 (0.019) [0.665]	-0.004 (0.010) [0.735]		
Observations	2168	2168	2168	2168		
Mean in control	0.897	0.852	0.137	0.083		
<i>Panel D: Unit value of assets</i>						
Treatment	24.675* (12.496) [0.143]	8.831* (4.718) [0.113]	677.479 (562.900) [0.386]	-1,739.745 (1,092.355) [0.192]		
Observations	975	698	252	202		
Mean in control	57.688	50.691	497.587	5,010.280		

Notes: The table presents the treatment effects on business assets of the eligible *Dabi* borrowers. Data comes from the mid-line (2016) and endline (2017) surveys. All regressions control for the baseline (2015) value of the outcome, an indicator variable for the endline survey and district (randomization strata) fixed effects. “Treatment” is a dummy variable equal to 1 if the respondent was based in one of the treatment branches where BRAC introduced the flexible loan contract and offered it to the eligible clients. Panel A reports estimates of the extensive margin (likelihood of owning assets of each type), Panel B on the intensive margin (monetary value of assets owned of each type). In Panel C, the dependent variable is the number of distinct types of assets owned within each asset category, and in Panel D the outcome is the per unit value of assets of each type owned by the firm. Standard errors are clustered at the BRAC branch office level (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets.

further indication of more risk taking.⁵¹ Finally, we note that there is no evidence of an increase in the value or variety of types of business assets for the *Progoti* sample.⁵²

While the results square well with the theoretical prediction that repayment flexibility induces risk taking, pointing to the presence of insurance rationing at least for the *Dabi* clients, they are open to interpretation for the *Progoti* borrowers. The lack of increased risk taking among the larger firms either suggests that insurance constraints are less important to them or that too much risk remains because of other (periodical) external commitments, such as rent,

51. An alternative interpretation of the findings in Panel D is that the eligible *Dabi* clients buy higher-quality inputs.

52. The results for the *Progoti* borrowers are presented in [Supplementary Table A.17](#).

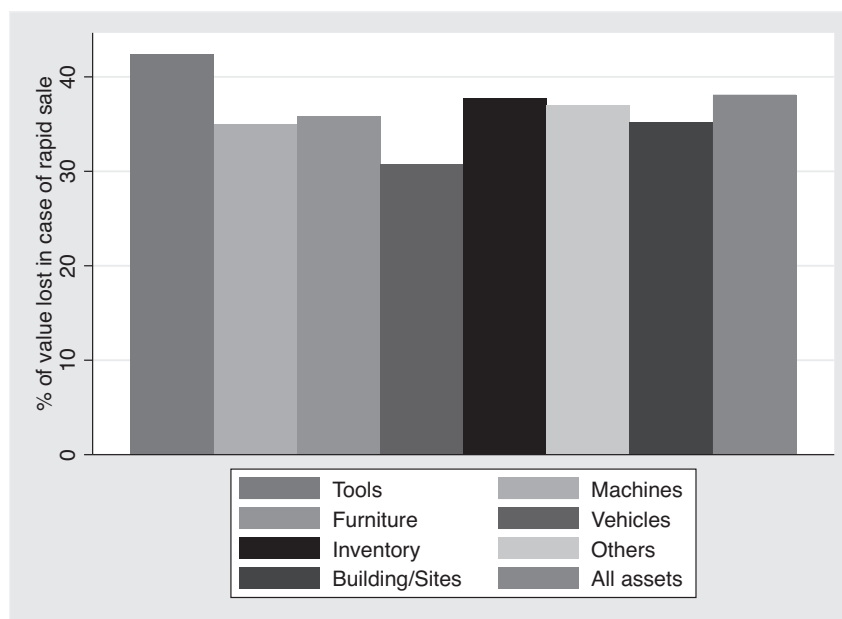


FIGURE 5

Liquidity of business assets

Notes: The figure shows the liquidity of business assets owned by eligible borrowers (*Dabi* or *Progoti*) by category, and overall. The information comes from a phone survey that was conducted in May 2020. The figure plots the mean level for the percentage of value lost if a firm has to liquidate assets in 1 day as opposed to 1 month (conditional on having any assets of a given type).

utilities, transportation, and salaries. To investigate this last point, we compare annual recurrent costs across the *Progoti* and *Dabi* firms. On average, *Progoti* respondents report recurrent expenses over the last 12 months (including building and land rent, electricity, transportation, and wages/benefits) corresponding to 7,238 USD PPP compared to 1,394 USD PPP for *Dabi* respondents at baseline.⁵³ The more than 5-fold difference offers a possible explanation in line with our theory for why the *Progoti* borrowers, who take up the flexible contract at a similar rate to the *Dabi* clients, refrain from undertaking riskier projects.

5.4.2. Credit rationing. If the effects of the flexible contract are driven mainly by the credit-constraint mechanism, our model predicts that repayment flexibility should be particularly valuable to poorer and higher-ability individuals. To study this hypothesis, we examine the heterogeneity of the treatment effects with respect to the baseline economic status and schooling level. We use two different indicators of baseline economic status: land ownership and household income. For the *Dabi* sample, both measures show consistently that the treatment effects are not significantly different for respondents who had a lower economic status at baseline (see [Supplementary Table A.18](#)). If anything, the point estimates imply that better-off borrowers (who owned land or had higher household income) benefitted more, not less, from the flexible loan in terms of business profits. Similarly, we find no consistent and significant impact of ability (as proxied by schooling)—see [Supplementary Table A.19](#). When we estimate the same set of

53. The difference is highly significant, with $t = 8.28$ in a t-test for the equality of means. Annual recurrent costs were balanced at baseline by treatment status.

specifications for the *Progoti* clients, there is no significant heterogeneity with respect to baseline economic status (see [Supplementary Table A.20](#)), but we do find that the average treatment effects hide important heterogeneity across the borrowers' skill level. [Supplementary Table A.21](#) shows that the treatment effects on revenues and profits are significantly higher among *Progoti* clients with high (above-median) schooling at baseline, suggesting that skilled *Progoti* borrowers benefitted more from the flexibility. The lower panels of [Supplementary Table A.21](#) show that this heterogeneity is not simply driven by highly-educated clients being wealthier (as proxied by the size of land owned at baseline) or by them being less liquidity constrained (as proxied by a higher household income at baseline)—if anything, once we control for these indicators, the treatment heterogeneity with respect to schooling is more precisely estimated.

In summary, the lack of differential treatment effects among *Dabi* clients, despite their larger overall impact, indicates that the effects of the flexible contract on traditional microfinance borrowers are not primarily driven by the credit mechanism.⁵⁴ Conversely, for larger firms, the credit-constraint channel could be more relevant as the benefits of repayment flexibility are greater for more able *Progoti* borrowers.

5.5. Selection effects

We now turn to the question of how repayment flexibility affected the selection of individuals into borrowing at the market level. According to our theory, to the extent the flexible contract provides insurance, it may attract more or less risk-averse borrowers. We investigate this prediction by comparing the characteristics of the firm owners that choose to borrow from BRAC in the treatment and control branches after the introduction of the flexible contract.

To test whether the introduction of the flexible loan attracted different types of borrowers in treated branches relative to control, we rely on the representative sample of SMEs. Specifically, we examine if the launch of the flexible contract in the treated branches affected the pool of microentrepreneurs that were borrowing from BRAC by mid- or endline relative to the control group. We estimate the following model:

$$y_{it} = \beta \cdot T_i + \theta \cdot x_{i0} + \sigma \cdot T_i \cdot x_{i0} + \lambda \cdot y_{i0} + E_t + \sum_{s=1}^{15} \gamma_s + \epsilon_{it}, \quad (6)$$

where y_{it} is an indicator for having taken a loan from BRAC for business purposes by mid- or endline, x_{i0} is some characteristic of respondent i as measured at baseline, and the other parameters are defined as in specification (4) above. In equation (6), σ identifies the heterogeneity of the treatment effect with respect to x_{i0} . It tests the null hypothesis that treatment induced differential selection of microentrepreneurs along the dimension captured by x_{i0} . In particular, we evaluate if SME owners who borrow from BRAC for their businesses are different in terms of risk aversion and entrepreneurial skills. To proxy for the latter, we use the baseline willingness to start a new business, the willingness to expand the existing business (by hiring more workers), and the productivity of the entrepreneurs' business (profit per worker). Finally, we test for the importance of the respondent's wealth via the size of the landholdings.

54. These results should be interpreted with some caution due to the small sample size and noisy indicators, which affect the precision of the empirical tests. We view this as suggestive evidence that the credit-constraint channel is not the main mechanism determining the treatment effects on *Dabi* clients. It is possible that the ability to delay only 2 monthly payments is insufficient to alleviate the credit constraint, thereby limiting *Dabi* clients from making larger investments. If additional vouchers were available, the relevance of the credit-constraint channel might increase.

TABLE 9
Selection effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment	0.013 (0.011) [0.357]	0.031** (0.014) [0.083]	0.007 (0.012) [0.623]	0.009 (0.012) [0.502]	0.012 (0.011) [0.379]	0.012 (0.011) [0.368]	0.013 (0.011) [0.336]	0.020 (0.015) [0.274]	0.013 (0.011) [0.346]
Treatment × Risk averse		-0.035** (0.015) [0.029]						-0.031** (0.015) [0.055]	
Treatment × Wants to start new business			0.088*** (0.029) [0.017]					0.079*** (0.029) [0.031]	
Treatment × Wants to hire new worker				0.040 (0.033) [0.225]				0.032 (0.033) [0.369]	
Treatment × Profit per worker					0.003 (0.007) [0.596]			0.001 (0.007) [0.907]	
Treatment × Entrepreneurship Index						0.026*** (0.008) [0.003]			0.025*** (0.008) [0.005]
Treatment × Size of land owned							0.025*** (0.008) [0.004]	0.022** (0.008) [0.016]	0.022** (0.008) [0.011]
Observations	6,582	6,582	6,582	6,582	6,582	6,582	6,582	6,582	6,582
Mean in control	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108

Notes: The table shows the results of estimating specification (6) where the dependent variable is an indicator for having taken any BRAC loan in the last 12 months for the business. Standard errors are clustered at the BRAC branch office level ($\hat{\gamma} < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Randomization inference p -values of the null hypothesis of no effect are provided in square brackets. *Risk averse* is a dummy variable taking the value of one if the respondent's risk aversion score is greater than or equal to the sample median (see [Supplementary Appendix B](#) for further details on the risk aversion score). *Wants to Start a New Business* is a dummy variable = 1 if at baseline the respondent reported that s/he or someone in the household wants to start a new business in the following 12 months. *Wants to hire new workers* is a dummy variable = 1 if at baseline the respondent reported that s/he or someone in the household wants to hire new workers for a household business in the following 12 months. *Profit per worker* is the baseline level of the profit of the business over the last 12 months divided by the number of workers, including the business owner, at baseline. The variable is then standardized by subtracting the sample mean and dividing by the sample standard deviation. *Entrepreneurship Index* is the first principal component of the variables *Risk averse*, *Wants to start a new business*, *Wants to hire new workers*, and *Profit per Worker*. *Size of land owned* is the amount of land owned by the household (excluding the homestead) at baseline, standardized by subtracting the sample mean and dividing by the sample standard deviation.

In Table 9, columns (2)–(9) show the main results on selection, whereas column (1) examines average take up. Although take up increases, the estimate is noisy suggesting that the introduction of the flexible contract and the information campaign about the new loan made it no more likely that SME owners in treated branches joined BRAC relative to the control group. However, most of the remaining columns indicate substantial evidence of selection among those drawn in. Column (2) shows that risk-averse business owners were less likely to become BRAC clients in the treatment branches. In particular, take up of BRAC loans increased 3.5 *ppt* more for SME owners with low (below-median) risk aversion (RI *p*-value = 0.029). In column (3), we find that respondents who expressed an interest in opening up a new business were 8.8 *ppt* more likely to have become BRAC clients in the treatment branches (RI *p*-value = 0.017). The next column suggests that business owners who were interested in hiring new workers are 4 *ppt* more likely to become BRAC clients in the treatment branches, but this effect is imprecisely estimated at conventional levels. While column (5) shows that profits per worker measured at baseline was unimportant, we do see a significant differential impact on take up using the aggregated entrepreneurship index [in column (6)], which combines the indicators in columns (2)–(5) (RI *p*-value < 0.01). Finally, column (7) implies that wealthier SME owners with higher land ownership were more likely to borrow from BRAC in the treatment branches. If the effects were induced by vouchers alleviating the credit constraint, we would expect the share of less wealthy borrowers in the client pool to increase with the introduction of repayment flexibility. Importantly, the last two columns show that the effects on risk aversion and the entrepreneurship index are insensitive to the inclusion of land size as a proxy for wealth. Together, these estimates are in line with the predictions of our theory. In the model, the degree of risk aversion in the resulting borrower pool declines if individuals selecting in under repayment flexibility predominately belongs to the group of less risk-averse firm owners who wants to expand their operations.⁵⁵

In Section A of the [Supplementary Appendix](#), we assess the robustness of these findings. We show that the observable characteristics x_{i0} in specification (6) do not predict differential demand for BRAC loans across treatment and control branches at baseline ([Supplementary Table A.22](#)); that the results are insensitive to the inclusion of respondent characteristics such as age and education ([Supplementary Table A.23](#)); and that the findings are similar for SME owners who had taken a loan from BRAC in the past, ruling out concerns that the information campaign had the additional effect of informing about the existence of BRAC as opposed to the new product alone or that the extra contact by the enumerators signalled that they were particularly desirable candidates for BRAC loans ([Supplementary Table A.24](#)).

Overall, the results in Table 9 suggest that the flexible repayment contract is particularly attractive for less risk-averse borrowers who are willing to take risks in order to grow their businesses.

6. DISCUSSION

In this section, we discuss the interpretation of the empirical results in light of our theoretical framework and consider alternative explanations. We then test for possible spillover effects that the flexible loan offer may have had on borrowers not eligible to receive the contract. Finally, we assess the potential policy implications of our findings.

55. In addition to the market-wide selection of BRAC clients, we could also have differential take up among the eligible borrowers. In [Supplementary Section A.2.1](#), we discuss selection along this margin.

6.1. *Interpreting the results*

The empirical analysis shows that traditional microfinance clients taking the flexible *Dabi* loan experienced meaningful improvements in their business outcomes and socio-economic status. Investigating specific channels, we see an increase in risk taking but no evidence that repayment flexibility helped poorer or more able borrowers. These findings are consistent with the effects of the flexible contract being primarily driven by the insurance mechanism (see Section 3 and Table 1 for a summary of our theory's main predictions). Putting the larger *Progoti* businesses to the same test, we find a small and insignificant impact overall, with no indication of increased risk taking but some support for higher returns among the skilled clients. One explanation for these results is that larger firms have other external obligations, in addition to the loan payment, implying that too much risk remains even with repayment flexibility at hand.⁵⁶ In this case, our model illustrates that the flexible contract leads to smaller gains that could be particularly valuable to higher-ability clients, suggesting the presence of credit constraints for the larger businesses. Finally, we show that the flexible contract decreased the degree of risk aversion in the representative pool of microentrepreneurs that were borrowing from BRAC. This is what our theory predicts, if the entrepreneurs entering under repayment flexibility primarily consist of less risk-averse individuals with a desire to expand their firms. The selection results add further support to the view that an important mechanism driving our findings, at least for smaller businesses, is the need to alleviate binding insurance constraints.

There are alternative mechanisms through which the new, flexible loan product may have affected the borrowers' outcomes. First, by delaying the loan repayment without having to pay additional interest, the eligible clients are effectively charged a lower interest rate. While this price or income effect could potentially drive our results, it is unlikely to be the main mechanism explaining the findings for the *Dabi* clients where we observe the larger treatment effects. To see this, note that the average loan size among eligible *Dabi* clients in the treatment branches is 1,484 USD PPP, yielding a monthly loan payment (principal and interest) of 150.9 USD PPP. Among the treated eligible borrowers, 17% spent one voucher and 21% used both, implying a maximum saving of 89 USD in loan payments for the average client, $[(0.17 \times 150.9) + (0.21 \times 150.9 \times 2) = 89]$. In order for this to explain the entire effect on monthly business profits (97 USD), the annual rate of return has to be more than 10-fold (1,090%). This is much higher than what is found in experimental studies on comparable samples (*e.g.* de Mel *et al.*, 2008 find returns to capital of 55%–63% per year among microenterprises in Sri Lanka). Therefore, the income effect is unlikely to be the main channel driving our findings. Moreover, the income effect ought to be especially valuable for poor clients, but (as previously shown) we do not find any evidence of this. In addition, to benefit as much as possible from the income effect, both vouchers should be exhausted and spent upfront in the first 2 months. However, about 40% of the borrowers who took the flexible loan did not employ any voucher and vouchers were rarely used consecutively in months 1 and 2, but instead employed throughout the loan cycle or not at all. The fact that a large share of the flexible loan clients did not use their vouchers is in line with the theoretical prediction of Corollary 1. It suggests that some borrowers held on to their vouchers as an option value but that the need to use them did not arise.⁵⁷

56. Note that this is one potential explanation. Given that the two samples (*Dabi* and *Progoti*) and associated loan products are different along a number of key dimensions (*e.g.* collateral requirements, group meetings, loan size etc.), other alternative explanations are possible.

57. A complementary explanation for borrowers not using the vouchers could be that they wanted to appear risk free to obtain a better standing with BRAC. Section A.2.4 in the Supplementary Appendix provides further information on the timing and pattern of voucher use among *Dabi* and *Progoti* clients.

Second, another channel could be that the flexible contract offer was perceived as an encouragement to borrow from BRAC and that the encouragement itself explains part of the treatment. To assess whether this potential effect is important, we exploit variation in the number of prior BRAC loans taken by the eligible borrowers. If an encouragement effect is present, it should be stronger among less regular clients. On average, eligible *Dabi* (*Progoti*) borrowers had taken 6.8 (5.7) loans from BRAC by the 2015 baseline. There is substantial variation—the standard deviation of the number of previous BRAC loans is 3.3, both among eligible *Dabi* and *Progoti* clients. In [Supplementary Table A.25](#), we check the heterogeneity of the treatment effects with respect to the number of past BRAC loans. We note the following. First, a higher number of previous BRAC loans is positively correlated with the likelihood to re-borrow from BRAC within the control group.⁵⁸ This is in line with more “regular” clients being more likely to keep their relationship with BRAC. Therefore, we expect any encouragement effect (to re-borrow) that the flexible offer may have had to be weaker for them. Second, the treatment effect on the extensive margin of BRAC borrowing is, if anything, stronger for more regular BRAC clients.⁵⁹ This implies that the encouragement effect is unlikely to be driving the treatment impact we observe on borrowing from BRAC.⁶⁰ Finally, we do not see any significant heterogeneity in the treatment effects across the business outcomes. While the interaction terms in Panel A (for *Dabi* clients) are positive, they are imprecisely estimated at conventional levels. Overall, this suggests that the results are not driven by less regular borrowers, making it unlikely that an encouragement effect could explain our findings.

Third, our current theoretical framework assumes a fixed investment, implying that the loan value only increases for the voucher clients that were rationed under the standard contract. In a more general model with a variable investment size and decreasing returns-to-scale technology, repayment flexibility will boost the investment size and borrowing for all clients (as the illiquid project generates a higher return). This provides an explanation for the increase in the BRAC loan value that we observe among the eligible *Dabi* borrowers in the treatment branches.

Finally, there are other complementary reasons for the *Progoti* findings. While it is possible that the larger firms were unconstrained to begin with, this does not explain why they took up the flexible loan offer at almost the same rate as the *Dabi* clients. Another explanation has to do with the onerous collateral requirement, equal in value to the loan (unlike the collateral-free *Dabi* loan). Although the vouchers should be particularly valuable to borrowers who stand to lose their collateral, all of the eligible *Progoti* clients selected into BRAC under the standard contract. As it is costlier to take on risk under this contract (especially with collateral at stake), it may have attracted firms less prone to risk taking even when offered repayment flexibility.

6.2. Spillover effects on other clients' repayment behaviour

Since the flexible contract was offered to borrowers with good credit histories, this could affect the incentives of other clients: for existing ineligible borrowers as well as for borrowers arriving after the experiment was initiated. In particular, if ineligible clients also value access to flexible

58. Column (1) of [Supplementary Table A.25](#) shows that a one standard deviation increase in number of previous BRAC loans is associated with a 5 ppt increase in likelihood to re-borrow from BRAC within the control group.

59. In particular, a one standard deviation increase in the number of previous loans taken from BRAC is associated with a 5 ppt increase in the treatment effect on likelihood to re-borrow from BRAC. While the magnitude of the point estimate is identical in both the *Dabi* and the *Progoti* samples, it is borderline insignificant in the *Dabi* sample according to the RI *p*-value.

60. The fact that treatment had a stronger effect (on borrowing from BRAC) among more regular BRAC clients could be due to them being more experienced with the standard BRAC loan contract and therefore being better able to understand and appreciate the value of the new, flexible loan product they were offered.

loans, they may improve their efforts to meet their repayment obligations. Alternatively, they may resent not having been selected and quit BRAC or default on their loans.

To test for spillover effects on ineligible borrowers' repayment behaviour, we acquired the identifiers for all clients who were borrowing at baseline, but deemed ineligible to receive the flexible loan offer.⁶¹ When we examine the impact on their repayment behaviour, we do not find any significant effects. Panel A of [Supplementary Table A.26](#) shows that the ineligible *Dabi* clients in the treated branches were 4 *ppt* less likely to leave BRAC, but this effect is imprecisely estimated. As for default rates, all effects are close to zero. We also have administrative information for borrowers who became BRAC clients after the launch of the experiment. Panel B of [Supplementary Table A.26](#) shows that the introduction of the flexible contract in the treatment branches did not have any impact on the repayment behaviour of these borrowers. Similarly, we do not find any significant differences for newly arrived *Progoti* clients (reported in [Supplementary Table A.27](#)). Together, the findings imply that the flexible loan pilot did not have significant spillover effects on the repayment behaviour of other clients.

6.3. Policy implications

Given the sizable and positive impact of the flexible contract on traditional microfinance clients, it is important to consider whether the new loan product is viable more generally. To do so, we compare the magnitude of the benefits for the *Dabi* borrowers relative to the costs of the pilot and estimate its internal rate of return. The results are presented in [Supplementary Table A.30](#). We initially set the social discount rate at 5%, in line with World Bank guidelines [column (1)], and then report two alternative rates: 10% [column (2)] and 22% [column (3)], with the last one corresponding to the interest rate charged by BRAC. The average cost of the pilot per eligible *Dabi* client in the treatment branches was 58.61 USD PPP.⁶² This is the result of an initial cost (at year 0) corresponding to 51.10 USD PPP per beneficiary and the cost of foregone interest payments per client during each year of 1.11 USD PPP. As a measure of benefits, we use changes in household income at mid-line (year 1) and endline (year 2). The “total benefits” sum up the changes in household income to compute the net present value of benefits, corresponding to 2,606 USD PPP.⁶³ This is divided by the programme cost to obtain the benefit-cost ratio. The estimates show that the average benefit of the pilot was 45, 39, or 30 times larger than the cost, depending on the social discount rate we apply. The average internal rate of return in our baseline specification is 26, positive, and clearly above the discount rate. Since we find few significant treatment effects on the outcomes of the *Progoti* clients, introducing a flexible loan product for such clients does not seem to be viable from a cost-benefit perspective.

61. We were able to identify 88% of the borrowers ineligible at baseline (69,801 *Dabi* clients) using BRAC's administrative records as of August 2017.

62. This cost is calculated as if there were no *Progoti* clients in the experiment. That is, we assume that the fixed cost of setting up the experiment would have been the same if we had done it only with the *Dabi* borrowers. As such, it is likely an upper bound of the true cost per *Dabi* client.

63. The underlying assumption is that the effect of increased business assets is fully incorporated in the household income changes. If capital accumulation as of year 2 leads to even greater increases in household income in the future, we will underestimate the benefits of the programme. The “change in household income in year 1” and “year 2” report, respectively, the ITT estimates of the programme on household income, for the mid- and endline surveys. As the impact on household income is insignificant in year 1 and significant at the 10% level in year 2, an alternative would be to assume that the effect in year 1 is zero. In this case, the cost-benefit ratio is 15 and the internal rate of return is equal to 4 for the case of a social discount rate of 22%.

If the costs of introducing a flexible loan product for traditional microfinance clients are so small compared to the benefits, why do most microfinance institutions still prefer to offer traditional loans with a strict repayment structure? One reason could be related to the selection effects discussed in Section 5.5. We observe that even the pilot of a loan product with repayment flexibility attracted less risk-averse borrowers, with a greater desire to invest in riskier projects. This is in line with concerns reported by many practitioners and credit officers in the microfinance industry that moving away from the traditional microfinance model may cause default rates to increase in the long run. However, since our findings show that the repayment behaviour remained the same (or even improved) for clients that were offered the flexible contract, the industry's view may be overly pessimistic. In fact, an underlying rationale for repayment flexibility is precisely to provide state-contingent insurance to avoid difficulties in meeting payments on time. This is an important distinction compared to earlier work assessing features of the typical credit contract. For example, [Field *et al.* \(2013\)](#) find that the provision of a grace period increased default rates. Unlike a grace period, repayment flexibility caters to unexpected shocks throughout the loan cycle (allowing for greater risk taking without jeopardizing the repayment obligation).⁶⁴ At the same time, our results are based on the short-term effects of a pilot where the terms of the traditional microfinance product were altered. It is important to be careful when extrapolating beyond our population of borrowers who had built good credit histories under the standard credit contract. If BRAC, or other lenders, were to offer loans with flexible repayment plans to first-time borrowers, the effects may be different.⁶⁵ More work on the long-run impact of flexible loan products on lenders' portfolio is necessary to shed further light on this question.

7. CONCLUSION

Based on the extensive evidence of credit rationing and risk holding back small firm growth, our conjecture was that a financial instrument that could address imperfections in the credit and insurance market would improve the outcomes of poor microentrepreneurs. Together with the NGO BRAC, we designed an intervention aimed at relaxing both of these constraints via the provision of repayment flexibility. We followed existing and potential microfinance clients across 50 branch offices and local markets in Bangladesh over a 2-year period to examine the relative benefit of flexible versus standard credit contracts, the importance of credit and insurance constraints, and the selection into borrowing.

We document substantial improvements in the business outcomes and socio-economic status of the traditional microfinance clients offered the flexible as opposed to the standard credit contract and find that uninsured risk helps explain these results. The effects are heterogeneous, driven by clients who faced greater demand uncertainty at baseline and clients who did not experience negative demand shocks during the experiment. The impact of repayment flexibility is less transformative for borrowers with larger businesses and larger loans. To the extent that other contractual obligations hold back these clients, there is some evidence that larger firms are credit rationed, with the returns to the flexible contract being higher for more able entrepreneurs. Repayment behaviour for both traditional microcredit and larger loans weakly improve, suggesting that the intervention is fairly cost-effective, at least for the traditional microfinance clients.

64. Also, in contrast to [Field *et al.* \(2013\)](#), the flexible contract was optional whereas the grace period was mandatory for all treated borrowers. It is possible that default rates would have been higher (or lower) in our setting if repayment flexibility had been made a compulsory feature of the contract.

65. In line with this, [Brune *et al.* \(2022\)](#) find that offering first-time borrowers in Colombia a flexible microcredit product similar to the one we evaluate increased defaults, with no effect on clients' profits.

We also show that repayment flexibility attracts less risk-averse borrowers interested in expanding their business activities. This last finding, together with the increased risk taking that we observe among borrowers offered the contract, indicates that repayment flexibility provides a simple but novel way to spur risk taking and entrepreneurship among the poor. From a policy perspective, the contract is a cost-effective financial product that promotes business outcomes by insuring against entrepreneurial risks. However, the flexible contract is not a cure-all. The less than universal take-up rates suggest that the product may not appeal to all potential borrowers.

There are several interesting avenues for future research. While the evidence in this paper indicates that the flexible loan promotes business activities, it could also allow for increased consumption smoothing. To fully capture consumption behaviour, one would need diaries that track households regularly over longer periods. Richer, high-frequency data on borrowers' social networks and their transfers would further enable an analysis of how the insurance provided by the vouchers extend through the network. The repayment flexibility could also be expanded to include additional vouchers up to paying everything at the end of the loan cycle. Such a contract would probably have to balance the optimal amount of insurance or credit provision or both against potential concerns of opportunistic behaviour. Future research should also address how recurrent contractual obligations, in addition to the loan payments, affect borrowing, risk taking, and subsequent growth of larger firms.

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Supplementary Data

Supplementary data are available at *Review of Economic Studies* online.

Data Availability Statement

The data and code underlying this research is available on Zenodo at <https://doi.org/10.5281/zenodo.8319584>

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