



Regular Article

Credit lines in microcredit: Short-term evidence from a randomized controlled trial in India[☆]Fernando M. Aragón^{a,*}, Alexander Karaivanov^{a,**}, Karuna Krishnaswamy^b^a Simon Fraser University, Department of Economics, Canada^b World Bank, India

ARTICLE INFO

Keywords:

Microfinance

Flexibility

Randomized control trial

Credit lines

ABSTRACT

We study the short-term effect of flexible microcredit loans on small businesses. We use data from a randomized controlled trial that offered a credit line product to street vendors in India. The credit line retains standard features of microcredit such as joint liability, female borrowers and weekly meetings, but allows flexible borrowing and repayment, like a credit card. We find a positive effect on the vendors' gross profits: on average, a credit line increases profits by 7 percent compared to a standard microcredit term loan. The profit differential increases with time since loan disbursement, to about 15 percent after 18 weeks. The observed increase in profits appears to be mainly driven by the credit line allowing more flexible borrowing and repayments, and allowing vendors to invest in more profitable goods. Our findings highlight providing flexible loans as a viable strategy for raising the impact of microcredit.

1. Introduction

Ever since its origins in the Grameen Bank of Bangladesh, microcredit has followed a well-established and relatively standardized model of providing credit to poor people without collateral: small, often joint-liability, loans with frequent meetings and repayments (Banerjee, 2013; Ghatak and Guinnane, 1999; Morduch, 1999). A key feature of microcredit is the use of term loans: the borrowers receive a fixed amount to be repaid in regular equal payments over a set period of time.

An important concern with this form of credit, however, is that it may not be optimal in many situations, especially when a business faces unpredictable cash flow or recurring needs for working capital, as it is often the case for many microcredit clients. In those situations, a term loan with immediate and frequent repayments may be too rigid and fail to match the clients' borrowing needs in both quantity and timing (Karlan and Mullainathan, 2007). Indeed, most businesses in the developed world do not rely on bank loans to finance daily operations and instead use more flexible sources of finance such as credit lines and trade credit.

Surprisingly, there has not been much use of credit lines in microcredit and there is not much empirical evidence on the effect of credit lines on microcredit borrowers. Is a flexible loan product more effective in improving business performance than the standard microcredit term loan? This is a relevant question in light of the emphasis given to microcredit as a driver of entrepreneurship and the growing evidence that standard lending practices may be unnecessarily rigid and restraining entrepreneurial initiative and business outcomes (Barboni, 2017; Czura, 2015; Field and Pande, 2008; Field et al., 2012, 2013; Fischer, 2013; Giné and Karlan, 2014).

We examine empirically the short-term effect of a credit line on the business performance of microcredit clients in India. The borrowers are female market vendors, many of whom sell perishable goods. Our main contribution is showing that the flexibility of borrowing and repayment offered by a credit line has a positive effect on the vendors' profits, compared to a term loan. The observed profit differential is growing over time since loan disbursement and is driven by the flexibility of repayments and borrowing and by clients investing in different goods for sale.

[☆] We thank Xavier Giné, the Editor Dean Karlan, participants at the 2019 CEA meeting and two anonymous referees for their excellent comments and suggestions. Karaivanov acknowledges financial support by the Social Sciences and Humanities Research Council of Canada, grant 435-2013-0698.

* Corresponding author.

** Corresponding author.

E-mail addresses: faragons@sfu.ca (F.M. Aragón), akaraiva@sfu.ca (A. Karaivanov), karuna.krishnaswamy@gmail.com (K. Krishnaswamy).

<https://doi.org/10.1016/j.jdevec.2020.102497>

Received 20 March 2019; Received in revised form 15 April 2020; Accepted 19 April 2020

Available online 30 April 2020

0304-3878/© 2020 Elsevier B.V. All rights reserved.

We use data from a randomized controlled trial (RCT) implemented by Mann Deshi Bank, a large microlender in Maharashtra, India. The Bank introduced a new product: a credit line that allows clients to withdraw or repay at any time a flexible amount, up to a pre-approved limit. The only required minimum repayment is the interest accrued on outstanding debt. The new product retains key features of standard microcredit loans, such as joint-liability, weekly meetings, and lending to female borrowers.

We focus on the effect of a credit line on the clients' gross profits. Our experimental design compares clients who were offered a credit line, the treatment group, to clients who were offered a standard term loan, the control group. That is, we estimate and evaluate the differential effect of a credit line relative to a term loan, not the effect of access to microcredit of either type in itself.

We find a positive effect on borrowers' profits from receiving a credit line. During the intervention period, the clients who were randomly offered a credit line obtained, on average, gross profits larger by Rs. 60 per day (s.e. = 34, p-value = 0.085) compared to the clients who were randomly offered a term loan. This estimate represents a profit differential of almost 7 percent in favor of the credit line relative to a term loan.

Second, we find that the effect of a credit line on vendors' profits increases with the time elapsed since loan disbursal. In the first 12 weeks after disbursal, the relative impact of receiving a credit line vs. term loan is small and not statistically significantly different from zero. However, the effect of a credit line on profits, relative to a term loan, increases to Rs. 79 (s.e. = 39.7, p-value = 0.049) for weeks 13–17 after loan disbursal, and to Rs. 125 (s.e. = 44.9, p-value = 0.006) for weeks 18 and later. A possible explanation could be costly learning about how to use the new credit product. We cannot, however, rule out other complementary or alternative explanations, for example, rigidities in business practices or a delayed effect on profits from changes in financial management.

We examine empirically three economic mechanisms that may explain why profits increase by more when using a credit line, compared to when using a term loan. We rule out that the effect on profits is simply driven by the credit line clients being able to borrow larger amounts. Instead, the data suggest that the effect of the credit line on profits is mainly driven by the additional flexibility in repayments and borrowing. This flexibility allows the traders to react to variable market conditions. In addition, we find suggestive evidence that the credit line flexibility allows some traders to adopt more profitable business practices, e.g., changing the type of goods sold.

Related literature This paper contributes to a growing literature that studies which features of the canonical microcredit model are effective in practice, and which features are not. An important finding in this literature is that relaxing the terms of the standard lending contract can have a positive effect on business performance. The impact of such relaxations on default and repayment rates is, however, mixed.

For example, Field et al. (2013) find that allowing a two-month grace period instead of immediate repayment has a positive effect on business profits, but also increases default rates by around 6–9 percentage points. The effect on profits appears driven by the borrowers' ability to make more profitable but less liquid investments.¹

Field and Pande (2008) and Field et al. (2012) study the effect of reducing the frequency of loan repayments from weekly to monthly. They report a positive effect on business income and investment, with no significant impact on the clients' delinquency or default rates. The monthly-repayment clients also reported a significantly lower rate of financial stress or anxiety. Similarly, Battaglia et al. (2018) use data

from an RCT in Bangladesh in which some borrowers were randomly given the option to delay up to two monthly repayments per year. The authors find sizeable (0.2 standard deviations) improvement in business outcomes and lower default rates.²

The above papers examine specific aspects of repayment flexibility, such as reduced frequency, grace periods, or skippable payments. An important advantage of our approach and data is that we study and identify the (short-term) effects of a loan product that offers full flexibility and spontaneous repayment and borrowing discretion. Unfortunately, due to data limitations, we cannot examine the impacts on default, delinquency rates, or other long-term outcomes.

2. Background

We study a randomized credit line intervention implemented by Mann Deshi Mahila Bank in Maharashtra, India. Mann Deshi is a regulated urban cooperative bank run by and for women. It offers loans and microcredit services to female entrepreneurs. The bank was founded in 1997 and is currently serving around 200,000 clients through seven branches.

In 2013 Mann Deshi did a preliminary study aimed at better understanding the needs of their clients, most of whom are street vendors.³ The study showed that, because of volatile sales and cash flows and the risks associated with trading perishable goods, the vendors had highly variable working capital needs. These needs were not well met by the standard microcredit product offered by the Bank: a fixed-term group loan with joint liability and weekly repayments. Besides, many street vendors reported relying on their savings or expensive credit from wholesalers to fund their working capital needs.

2.1. The credit line product

Based on the findings from the 2013 preliminary study, Mann Deshi launched a new product called "Cash Credit Loan", alongside its standard term loan product, via a randomized controlled trial described in detail below. The new product works like a credit line: at any time, clients can borrow or repay a flexible amount, up to a pre-approved maximum (the drawing limit). The only required repayment is interest on the outstanding debt balance.⁴ Similar to traditional microcredit loans, the new product was made available to groups of three unrelated women who were jointly liable in case of default.⁵ Table B.1 in the Appendix provides a detailed description and comparison of the credit line and term loan products.

For the randomized controlled trial evaluation, the credit line product was made as similar as possible to the standard term loan offered by the bank. Loan officers set the initial drawing limit (the initial loan size for term loan clients) to either Rs. 10,000 or Rs. 20,000, based on the characteristics of the borrowers and their businesses (cash flow analysis, age of the business, reference checks, home visit).⁶ Both loan products charged the same annual interest rate of 24% and the Bank

² Several non-experimental studies also report mixed results on default. For example, Armendáriz and Morduch (2010) show more flexible repayments associated with higher default in Bangladesh, while (McIntosh, 2008) finds less delinquency among Ugandan MFI clients who choose more flexible repayment schedules.

³ The vendors sold perishables, e.g., fruits or vegetables, as well as sweets, food, spices, clothing, etc.

⁴ In practice, repayment of interest plus some of the principal was recommended, see more on this below.

⁵ The group members were jointly liable for the minimum required interest payments and ultimately the loan principal. There is no evidence that joint liability was harder to enforce among credit line borrowers.

⁶ There is a small number of exceptions: 6 borrowers received Rs. 15,000 and 2 borrowers received Rs. 30,000 according to the administrative loan data.

¹ In other related work, Carpena et al. (2012) and Giné and Karlan (2014) find that relaxing the standard requirement of joint liability does not affect repayment performance, although it may affect how the loans are used and the impact of microcredit on entrepreneurship and poverty (Attanasio et al., 2015).

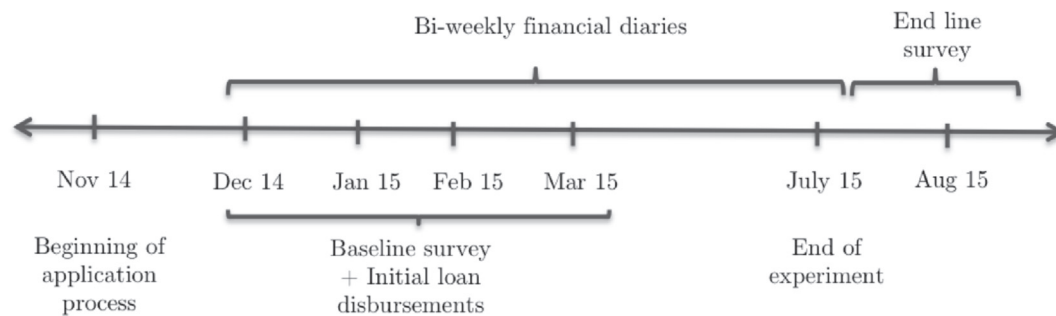


Fig. 1. Timeline of intervention.

recommended similar weekly repayments.⁷ Payments were made to a bank employee who collected them from a designated group member in the village or locality on a fixed collection day. The loan period was set to 3 years for credit line clients and 1, 1.5 or 2 years for term loan clients.⁸

The main difference between a credit line and a term loan is the additional flexibility allowed by the credit line. Credit line clients can choose when and how much to borrow, up to the credit limit. They can also choose when and how much to repay, subject to the minimum required interest payment. In contrast, term loan clients must withdraw the entire loan amount at the beginning of the loan period and then repay it following a rigid installment schedule. We formally model these differences in [Appendix A](#).

2.2. Implementation

The credit line product was introduced in 15 street markets located in three districts of rural Maharashtra: Satara, Pune, and Solapur. The randomized controlled trial took place between November 2014 and July 2015 (see [Fig. 1](#) for the timeline of the intervention). In total, 360 female street vendors participated in the trial.

All individuals in the sample were new clients of Mann Deshi Bank. They are small to mid-size vendors with daily sales of around Rs. 3000 (approximately USD 50), and average daily gross profits of Rs. 600 (see [Table 1](#) for summary statistics). The borrowers had established businesses, with an average age of about ten years. Around 1/3 of borrowers sold perishables, mostly fruits, and vegetables, and they had limited access to working capital credit: around 70% of their working capital was financed from savings or business profits.

In each market, bank officers solicited loan applications. The borrowers were aware of the two loan products at the time of applying and were told that, based on the loan appraisal process, a suitable product would be offered to them. The borrowers formed groups of three and applied for loans. All applications were evaluated using standard bank rules and information collected by the loan officers in site visits.

Loan applications were made on an ongoing basis, from mid-November 2014 until early March 2015. Once there were at least two joint-liability groups with approved loans in a market, a member of the research team randomly selected half of the groups to be offered

the credit line product while the other half were offered a term loan.⁹ [Table B.2](#) in the Appendix lists the month-by-month fractions of clients who were offered term loan or credit line. This stratified randomization procedure increases the comparability between the treated and the control group in two dimensions: (i) location of business and (ii) time of the loan application. Note also that the unit of randomization is not an individual client, but the joint-liability group.

All clients participated in two 1-hour training sessions conducted by Mann Deshi staff before and after the loan approval.¹⁰ The training program provided basic financial education and guidance on loan use and on preventing over-indebtedness. It also explained the main features and requirements of the loan products. Then, the initial loan was disbursed.¹¹ Because of the ongoing application process, the initial loan disbursements in the data occur between December 2014 and March 2015. [Table B.2](#) in the Appendix shows that around one-quarter of all clients received their loans in each of these four months.

The credit line product proved very popular among the borrowers, and in late July 2015 all term loan clients were switched to a credit line. In fact, it was the lender's original intention to introduce the credit line and the term-loan control group was intended for evaluation purposes. However, the timing of the switch to credit line was not planned by the research team; it occurred in response to pressure from the clients and the local bank officers to extend the coverage of the new product.¹² The switch of all borrowers to credit line ended the controlled trial, which concluded by asking all clients to complete an endline survey.

The switch to a credit line creates two important limitations in our analysis. First, we only observe the borrowers in our sample for a maximum of 6 months after the loan disbursement, although the financial services continue for 0.5 to 2.5 additional years.¹³ We do not observe any borrower outcomes after the term loan borrowers were switched to a credit line. Second, because of the relatively early end to the experi-

⁹ All applicants who were offered a loan of either type accepted it and participated in the study.

¹⁰ We are told that at present (not part of our data) the training has been expanded to 3 2-h sessions, as the bank staff realized that it takes more time for many borrowers to fully understand the credit line product. This is consistent with our learning interpretation below.

¹¹ For both products, the authorized amount was deposited in the borrower's bank account. Term loan clients were required to withdraw the entire amount immediately while credit line clients could decide freely when and how much to withdraw.

¹² The Bank is still offering the new product (called *weekly market*) and term loans. Based on internal profitability reports for 2017–2018, we corroborate that the weekly market product remains popular (it represents around 16% of all outstanding loans), has good profitability (approximately 4.8% net return on assets), and a low default rate (measured by the share of non-performing assets). Note that these reports do not use our RCT sample, but instead current Bank clients.

¹³ The number of weeks for which we observe the borrowers after the loan disbursement ranges from 16 to 30 weeks, with a median of 21 weeks. See [Fig. C.1](#) in the Appendix.

⁷ The recommended payments were about 2.5–3% of the loan amount (Rs. 300 for a Rs. 10,000 loan and Rs. 500 for a Rs. 20,000 loan).

⁸ This difference, which we do not observe directly, could matter for interpreting our results. In [Section 4.3](#) we compare the borrowing and repayment patterns of credit line vs. term loan clients using administrative loan data. While the loan period was set longer for credit line clients, they were recommended to repay 10% of the outstanding balance each month; as a result their repayments are similar in size to those of the term loan clients. We cannot compare any long-term outcomes since all borrower groups were switched to a credit line within six months into the program.

Table 1
Summary statistics.

Variable	Initial assignment				p-value(1)=(3)
	Term loan (control)		Credit line (treated)		
	mean (1)	s.d. (2)	mean (3)	s.d. (4)	
<i>A. Profitability and sales</i>					
Gross profits	644	397	670	401	0.553
Sales	3056	2226	3068	1973	0.957
Cost of sales	2401	1959	2349	1656	0.788
<i>B. Stock and other expenses</i>					
Initial stock	11,483	16,147	12,417	18,944	0.624
Final stock	8938	15,303	9833	18,036	0.621
Other expenses	218	148	206	136	0.465
<i>C. Business characteristics</i>					
Monthly business income	10,141	4734	9913	6371	0.700
Sells perishables	0.333	0.473	0.383	0.487	0.332
Years in business	10.0	7.8	9.4	7.4	0.436
Balance in savings account	8408	9472	7899	9361	0.608
<i>D. Sources of working capital</i>					
Bank or microfinance	0.113	0.317	0.077	0.267	0.238
Savings or business profits	0.689	0.464	0.760	0.429	0.136
Wholesaler	0.136	0.343	0.077	0.267	0.069
<i>E. Demographics</i>					
Household size	4.8	2.0	4.7	1.6	0.394
Can read and write	0.814	0.391	0.809	0.394	0.907
Is married	0.898	0.303	0.891	0.313	0.815
No. Joint liability groups	59		61		
No. Individuals	177		183		

Notes: All monetary outcomes are measured in Indian Rupees (INR). Profits, sales, costs of sales, stock and expenses refer to daily values. The data are collected from the baseline survey or pre-treatment financial diaries. Loan type is based on intention to treat. The variables in Panels A and B are trimmed of top and bottom 1% values. Column 5 displays the p-values of a means comparison test.

ment, we are unable to measure long-term outcomes, such as default rates or business growth.¹⁴ Therefore, we only examine the short-term effects of the credit line intervention.

2.3. Data

Our data come from three survey instruments: a baseline survey (completed 1–2 weeks before the initial loan disbursement), an endline survey (collected in late July and August), and financial diaries.¹⁵ We complement the survey data with data from the Bank's administrative records of the clients' borrowing and repayments.

The financial diaries are the main data source used in the empirical analysis. These diaries are bi-weekly short surveys about the outcomes of a client's business during the interview day. The diary interviews were conducted on a randomly chosen day of the week, shortly before the client closed shop. The collection of financial diaries started immediately after the baseline survey, before the initial loan disbursement, and continued until the end of the RCT in the third week of July 2015.

The main variables collected in the financial diaries are daily sales, the value of the initial stock for the day, and the value of the final stock for the day. We use this data to construct a measure of the traders' daily gross profits. We define gross profits as sales revenue minus the

cost of sales, where the cost of sales is the difference between initial and final stock. We also consider alternative definitions of profits in the robustness analysis in Section 4.2.

3. Empirical methods

As explained in Section 2.2, the randomization was stratified at the joint-liability group level over time - once there were at least two groups with approved loans in a market, half of the groups were randomly offered the credit line and half were randomly offered the term loan. In total, there are 120 joint-liability groups (360 borrowers) and 49 strata in our data. Most of the strata (75%) consist of two groups. There are, however, several larger strata in which there were more than two groups with approved loans at the same time (see Table B.3 in the Appendix for a list of all strata).¹⁶

3.1. Baseline specification

Given the available data, we focus on the effect of a credit line, relative to a term loan, on the vendors' gross profits. We define gross profits as *sales - cost of sales*, where *cost of sales* = *initial stock - final stock*. All variables are constructed using data from the vendors' financial diaries

¹⁴ Recent unofficial communication with bank staff indicates that all borrowers in our study have repaid their loans and many have started a second loan cycle.

¹⁵ All questionnaires are available upon request.

¹⁶ There are also three cases in which there was only one joint-liability group with an approved loan. To avoid delays in loan disbursement while waiting for a second group to be approved, those groups were randomly offered a credit line or term loan and put in a stratum of size one.

and refer to outcomes observed on the day of the diary interview.

To evaluate the effect of the credit line product on gross profits, we pool all bi-weekly observations from the financial diaries and estimate the following baseline specification:

$$\text{grossprofits}_{ist} = \beta(\text{Creditline}_i) + \eta_s + \delta X_{it} + \epsilon_{ist}, \quad (1)$$

where the unit of observation is client i in stratum s in week t . The main right hand side variable is Creditline_i , which is an indicator for the type of the assigned loan (1 if client i is offered a credit line, 0 if offered a term loan). All clients in a borrowing group are offered the same loan type.

Our baseline specification includes strata fixed effects, η_s , and we cluster the error terms ϵ_{ist} by joint-liability group to account for the randomization design. The inclusion of strata fixed effects implies that we compare clients who applied for a loan at approximately the same time and who trade in the same market, and thus are subject to the same local shocks and length of exposure to the program.

We also include a vector X_{it} of day-of-the-week (i.e., Monday, Tuesday, etc.) and district-by-month fixed effects, where week and month refer to the time at which the interview took place. These covariates control for potential seasonality or periodicity in daily profits. To reduce the influence of outliers, we trim the top and bottom 1% of all observations based on the value of the outcome variable.¹⁷

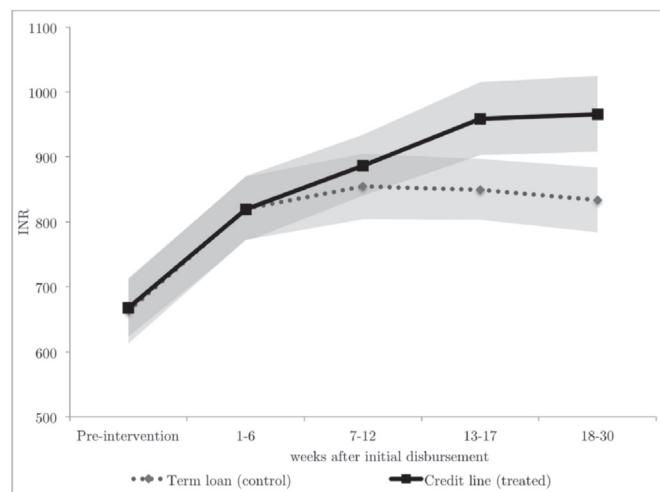
Our empirical results compare clients who were offered a credit line to clients who were offered a term loan. Since both the treated and the control group received a loan, this comparison does not provide experimental evidence on the effect of receiving microcredit. Instead, it is an evaluation of the differential effect of being able to use a credit line compared to a standard term loan.

3.2. Integrity of the experimental design

We verify the integrity of the experimental design with a balance test, by comparing the means of all variables of interest between the vendors assigned to the control vs. the treated group - see Table 1. The balance check shows that the two groups were similar before the treatment - there are no statistically significant differences in any of the observed variables, including business outcomes, business characteristics, and client demographics. These findings suggest a well-randomized experiment.

However, there are two *ex-post* sources of non-random variation that we address. First, six joint liability groups initially assigned to a term loan were instead given a credit line. This non-compliance issue does not appear to be empirically important - the balance test and regression estimates using actual treatment instead of the initial assignment produce very similar results. Nevertheless, because of the non-compliance, our baseline results using the initial assignment should be interpreted as “intention to treat” (ITT) estimates. In Column 3 of Table 3, we present estimates of local average treatment effects (LATE) using the initial assignment as an instrument.

Second, approximately two months into the program, the loan size or limit was raised from Rs. 10,000 to Rs. 20,000 for some borrowers. These loan “upgrades” were done at the request of the borrowers, based on their repayment and business performance, and based on an assessment by the loan officer that a borrower needs and can appropriately absorb the extra credit. Such credit increases were granted to 33% of the clients assigned a credit line and to 20% of the clients assigned a term loan in our sample. A relevant concern is that the loan upgrades may confound the estimated effect of the credit line product. We address this issue by including, as an additional control variable, the predicted probability of receiving a loan upgrade and its interaction with the treatment variable (see Table 4).



Notes: The Figure shows average daily gross profits for the credit line (treated) and term loan (control) clients, before treatment and at different times after receiving the loan. The markers represent average profits, and the shaded areas represent 95% confidence intervals.

Fig. 2. Daily gross profits, Rs.

4. Results

4.1. Main findings

We first show the main patterns in the data in Fig. 2. This figure displays the average daily profits of term loan and credit line borrowers after receiving the loans. The shaded areas correspond to 95-percent confidence bounds. Before obtaining a loan, both borrower types had similar daily profits of around Rs. 650 (denoted “pre-intervention” on the Figure).¹⁸ Profits for the term loan and credit line clients remain similar during the first weeks of the intervention. The difference in average profits for credit line vs. term loan clients, however, increases over time and becomes statistically significant at the 95% confidence level after week 13.

We formally examine the relationship between receiving a credit line vs. term loan and gross profits in Table 2. Column 1 reports the results from our baseline specification, pooling all observations from the financial diaries after receiving the loan. The estimates suggest a positive effect of the credit line relative to a term loan: clients who were offered a credit line obtained, on average, gross profits Rs. 59.5 greater than term loan clients (s.e. = 34.3, p-value = 0.085). The estimated effect is economically significant: it represents an increase in gross profits of almost 7 percent relative to the control group (term loan).

Columns 2 to 5 in Table 2 stratify the data into four sub-samples based on the elapsed time from the initial loan disbursement: weeks 1–6, weeks 7–12, weeks 13–17, and weeks 18 and later. Each sub-period refers to an individual’s loan timeline so they do not coincide in calendar time.

Similar to Fig. 2, we find that the effect of a credit line increases with time since loan disbursement. In the first weeks after loan disbursement

¹⁷ The estimates obtained without trimming the sample are similar (see Column 4 in Table 3).

¹⁸ After receiving a loan, gross profits go up from Rs. 650 to around Rs. 800 for both types of borrowers. This difference represents an increase of almost 20 percent. This observation is consistent with other experimental studies that find statistically and economically significant effects of microcredit on business size and profits (Banerjee et al., 2015a,b, Crépon et al., 2015). However, due to the lack of experimental variation in access to credit, we cannot interpret this as a causal effect.

Table 2
Effect of credit line on gross profits.

	Dep. variable = Gross profits (sales - cost of sales)				
	(1)	(2)	(3)	(4)	(5)
Credit line	59.5* (34.3)	10.9 (54.9)	26.4 (44.2)	78.9** (39.7)	125.0*** (44.9)
Weeks after initial loan disbursement	All weeks	Weeks 1 to 6	Weeks 7 to 12	Weeks 13 to 17	Weeks 18 up to 30
Mean of outcome var. (control group)	839.8	820.3	854.1	849.6	833.5
No. obs.	4087	934	1064	1010	1079
No. clients	360	340	359	358	325
R-squared	0.244	0.213	0.206	0.383	0.371

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions use weekly data from financial diaries and include strata, district-by-month-of-interview, and day-of-week fixed effects. Column 1 uses data from financial diaries collected during all the intervention. Columns 2 to 5 use sub-samples of observations based on number of weeks after initial loan disbursement.

Table 3
Robustness.

	Gross profits						Gross profits minus interest	Self-reported large increase in profits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>A. Sample = all weeks</i>								
Credit line	60.8* (34.2)	48.9 (35.0)	66.3* (38.9)	81.6* (43.5)	42.7 (56.1)	89.2** (41.6)	52.1 (34.7)	0.299*** (0.040)
No. obs.	4087	4087	4087	4137	2139	1948	3876	360
No. clients	360	360	360	360	186	174	360	360
<i>B. Sample: weeks 13 to 30</i>								
Credit line	96.1*** (35.6)	90.9** (36.2)	109.9*** (40.6)	69.5 (44.0)	106.0* (54.2)	110.8** (44.6)	86.8** (35.0)	n.a.
No. obs.	2089	2089	2089	2113	1171	918	1912	
No. clients	360	360	360	360	186	174	360	
Specification	Adding client charact.	Only strata FE	2SLS	Without trimming	Early applicants	Late applicants	Baseline	Only strata FE

Notes: Robust standard errors in the parentheses. The standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. Unless specified, all regressions use weekly data from the financial diaries and include strata, district-by-month-of-interview and day-of-week fixed effects as in the baseline specification in Table 2. Column 1 adds trader characteristics (age, marital status, literacy, household size and an indicator of selling perishable goods); column 2 estimates a simplified specification that excludes all controls except strata fixed effects. Column 3 estimates the baseline specification using 2SLS, with the original loan type assignment used as instrument for the actual assignment. First stage F-test = 449.9. Column 4 uses all observations, without trimming. Column 5 and 6 split the sample between early and late applicants. Early applicants = loan disbursement between Dec. 2014 and Jan. 2015. Late applicants = loan disbursement between Feb. and Mar. 2015. Column 7 uses as outcome variable gross profits minus interest charges. Column 8 uses as outcome variable an indicator for reporting “large increase” in profits (omitted categories are: small increase and decrease); these data are from the endline survey. Column 8 includes only strata fixed effects.

(columns 2 and 3), the effect of being offered a credit line on gross profits, relative to being offered a term loan, is small and not statistically significantly different from zero. In contrast, in later weeks (columns 4 and 5), the estimated effect is much larger: Rs. 78.9 Rs. (s.e. = 39.7, p-value = 0.049) in weeks 13–17 and Rs. 125 (s.e. = 44.9, p-value = 0.006) after week 18. The estimated profit increase of Rs. 125 in column 5 is more than twice the average estimated effect and represents a profit increase of almost 15% relative to the control group.

The delayed effect on profits could be due to costly learning on how to use the new credit line product, or to rigidities in adjusting business practices to benefit from the product’s greater flexibility in borrowing and repayments. These factors may also potentially explain why the estimated average effect is relatively small over the relatively short duration of the whole RCT.

4.2. Robustness analysis

In Table 3 we examine the robustness of our main results to alternative specifications. To account for the delayed effects documented above, we present two sets of results: panel A, using all financial diary observations after loan disbursal and panel B, restricting the sample to only observations from weeks 13–30 after the loan disbursal.

Column 1 in Table 3 adds a richer set of client characteristics (age, marital status, literacy, etc.) to our baseline specification. Column 2 estimates a simpler model with only strata fixed effects. Column 3 addresses the issue of partial non-compliance by estimating a 2SLS model using the original loan type assignment as an instrument for the actual loan type received. Column 4 uses all available data without trimming the top and bottom 1% and thus includes several outliers. In all specifications, we observe a positive and marginally statistically significant average effect of the credit line on gross profits, ranging from

Table 4
Controlling for loan upgrades.

	Dep. variable = Gross profits			
	(1)	(2)	(3)	(4)
Credit line	61.4* (33.5)	169.7*** (53.6)	98.1*** (35.2)	232.5*** (69.7)
Predicted prob. loan upgrade	−284.1* (168.4)	−192.0 (161.2)	−105.3 (159.9)	0.3 (159.4)
Credit line × predic. prob. loan upgrade		−188.4** (85.1)		−228.2** (104.0)
Weeks after initial loan disbursement	All weeks		Weeks 13–30	
No. obs.	4087	4087	2089	2089
R-squared	0.246	0.248	0.340	0.344

Notes: Robust standard errors clustered by joint liability group in the parentheses. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions use weekly data from the financial diaries and include strata, district-by-month-of-interview, and day-of-week fixed effects. Columns 1 and 3 add as control the predicted probability of receiving a loan upgrade estimated using the control group (column 1 in Table B.4). Columns 2 and 4 add the interaction of the predicted probability with the treatment indicator. Columns 1 and 2 use all observations, columns 3 and 4 use only observations from weeks 13–30 after the loan disbursement.

49 to 82 INR. The estimated effects in weeks 13–30 (panel B in Table 3) are larger, up to 110 INR, and with larger statistical significance (column 4 is the only exception).

Early vs. late applicants The implementation of the RCT was sequential: clients applied for a loan and then, once enough groups were formed in a market, the credit line was randomized, and loans disbursed. This feature of the data means that there are several cohorts of applicants: some received their loans in December 2014 while others received their loans as late as in March 2015. These different cohorts are not directly comparable (See Table B.6 in Appendix B). Specifically, the late applicants (the clients who received a loan in February–March 2015) tend to have lower sales and report lower business income than the early applicants. Late applicants were also less likely to have credit from a wholesaler. We control for these observable characteristics in our robustness checks, but there may be other unobservable differences such as the level of information, entrepreneurship, or exposure to different market shocks.¹⁹

The observed differences across borrower cohorts are unlikely to affect the causal interpretation of our results because of the inclusion of strata fixed effects. This feature means that the effect of the credit line is estimated by comparing clients who applied around the same time and did business in the same local market.²⁰ A more relevant concern is that the delayed effects on profits documented above may not reflect costly learning or business practice rigidities, but instead heterogeneity between early and late applicants.

We address this concern in columns 5 and 6 of Table 3 by splitting the sample into early and late applicants. Early applicants are defined as the clients who received their loans in December 2014 or January 2015, while late applicants received their loans in February or March 2015. In both cases, we find similar results: a positive and increasing

over time (compare panel A with panel B) effect on profits from the credit line.²¹

Alternative profit measures Our baseline measure of gross profits does not account for interest payments or possible intra-day changes in inventory. These issues may lead to over-estimation of the profits of the treated group. We examine this concern by checking the robustness of our results to using alternative measures of profitability. First, we calculate profits as gross profits minus interest charges.²²

Second, we use self-reported changes in profits from the endline survey. We construct an indicator variable for reporting a “large increase in profits”.²³ This indicator also has limitations (e.g., possible reporting bias) but provides an alternative way to assess the effect of the credit line on profitability, without relying on data from the financial diaries. The results, shown in columns 7 and 8 in Table 3, suggest a positive effect of being offered a credit line on the likelihood of reporting a large increase in profits, in line with our baseline findings.

Endogenous loan size upgrades As mentioned in Section 3.2, approximately two months into the RCT, some borrowers received a loan upgrade, that is, an increase in their loan amount or maximum borrowing limit. These loan upgrades were done at the request of borrowers and approved by the loan officers. In practice, a larger fraction of credit line clients (33%, vs. 20% for term loan clients) received loan upgrades. This issue creates a potential confounding factor: our estimates might be picking up an effect on profits from receiving a larger

¹⁹ We also examine differences between the early and late applicants in loan size, borrowing and repayment in Table B.7 in Appendix B. We find no significant differences in the probability of being offered a credit line or receiving a loan upgrade. Consistent with having smaller business size, we observe that late applicants receive smaller initial loans, have lower total payments during the RCT, and have a slightly larger number of missed payments.

²⁰ This approach to address selection, by comparing only clients who applied at the same time, has a similar flavor to the approach used by Karlan and Zinman (2009) when addressing hidden type by controlling for the interest rate offered to potential borrowers.

²¹ The maximum number of weeks for which we observe clients after loan disbursement ranges from 16 to 30, with a median of 21 weeks. This period is larger for the early applicants (18–30 weeks with median 23) and shorter for the late applicants (16–22 weeks with median 19). See Figs. C.1 and C.2 in the Appendix.

²² Clients do not report interest charges in the financial diaries. Instead, we calculate these charges using the implied daily interest rate (24% per year, 0.07% per day) and administrative records with information on the outstanding loan balance ± 7 days around the date of the interview of the financial diary. On average, the imputed daily interest charges are around Rs. 9.2.

²³ The survey question asks: “By how much have your profits change in the last six months after receiving the Mann Deshi loan?” The answer categories are: decrease by a large amount, decrease by a small amount, remained the same, increase by a small amount, and increase by a large amount. We focus on large increases because the vast majority of clients, 94%, report that their profits increased by a large or small amount, while the proportion of term loan and credit line clients reporting a large increase is 1.6% vs. 31%, respectively.

loan amount on average, not only the effect of the credit line itself.

We address this concern by including, as additional controls, the predicted probability of receiving a loan upgrade and its interaction with the treatment variable in Table 4.²⁴ Specifically, we estimate the probability of receiving a loan upgrade by a probit model restricting the sample only to the control group (term loan clients). Table B.4 in the Appendix displays these estimates. The main finding is that the probability of receiving a loan upgrade is mostly determined by market fixed effects and not by client characteristics.²⁵ This finding is consistent with loan upgrades being driven mainly by the discretion of the loan officers, who usually are assigned a specific market.

Table 4 reports the results when controlling for loan upgrades. Columns 1 and 2 use observations from all weeks, while columns 3 and 4 restrict the sample to observations from weeks 13–30 after loan disbursement (as in panel B of Table 3). The estimated effect of the credit line is positive, statistically significantly different from zero, and similar in magnitude to the baseline results.

4.3. Economic mechanisms

Why did vendors assigned a credit line obtain higher profits? We hypothesize several possible economic mechanisms which we then explore empirically²⁶:

1. Larger credit amount used: credit line clients can carry larger outstanding debt balance for a longer time.
2. More flexible loan use: a credit line gives flexibility to the traders to adjust their debt and stock levels to market conditions. They can borrow and buy more stock when conditions are favorable and carry lower inventory and debt levels (repay outstanding balances) when conditions are not favorable. That is, they can better match their borrowing to their idiosyncratic and time-varying needs. This mechanism implies higher “intensity” in using the loan by credit line borrowers, that is, more frequent borrowing and repayments and/or repayments different in size from the prescribed term loan fixed installments. The mechanism also implies a larger variation in debt or stock balances under a credit line compared to a term loan.
3. Changes in business practices: access to a credit line can allow traders to adopt new, more profitable business practices, such as selling different goods or investing in new inputs. These new practices may have (or be perceived as having) less predictable or different cash flows. This could happen, for instance, if the goods for sale are riskier or more illiquid (e.g., take longer to sell). In such a case, term loan traders may be reluctant to adopt these practices since this could affect their ability to meet the required fixed repayments. On the other hand, the flexibility of the credit line provides protection (and more time to recover) from low liquidity or other cashflow risks and enables traders to benefit from higher expected return. See Appendix A for a simple formal model of this mechanism.

As a first step in exploring why the credit line is associated with increased gross profits relative to the term loan, we examine how the borrowers use their loans, which is related to mechanisms 1 and 2 listed above. We use administrative records on the borrowers’ repayments,

borrowing, and outstanding loan balance over time. In Table 5, we estimate two models: a model with only strata fixed effects and a model including the predicted probability of receiving a loan upgrade.

Table 5 reveals significant differences in the amount borrowed: credit line clients have a larger outstanding principal balance, both during the RCT period and at its end (rows 2, 4, and 5). Since both groups start with similar initial loan balance on average (row 1), this observation appears to be driven by the credit line clients having larger net borrowing during the loan period. This finding is consistent with the flexibility of the credit line (also note that credit line borrowers have larger total repayments, row 3). It is, however, also consistent with the explanation that profits increase because credit line clients can carry on more credit for a longer time (mechanism # 1).

We examine this possible mechanism by adding to our baseline specification the average outstanding debt balance (principal and interest) ± 7 days around the interview date of the financial diary.²⁷ Table 6 presents results using all the data from the financial diaries (columns 1 and 2) and restricting the sample to weeks 13–30 after the initial disbursement, corresponding to the largest observed profit increase (columns 3 and 4). Columns 1 and 3 use profits and outstanding balance in levels, while columns 2 and 4 use a log-linear specification.

In all cases, the coefficient estimate of the outstanding debt balance is not statistically significant. Reassuringly, the estimates of the effect of the credit line remain similar to those in the baseline Table 2, albeit less precise. These results mitigate possible concerns that the observed profit increase for credit line clients may be mechanically due to them having access to larger credit amount on average.

We next turn to explore the role of loan flexibility (mechanism #2) in Panel A of Table 7. This table uses data from the administrative loan records and the endline survey. Column 2 reports estimates using our baseline specification with strata fixed effects, while column 3 also controls for the predicted probability of receiving a loan upgrade.

We assess whether the credit line facilitated a more flexible stock and debt management as hypothesized. We construct measures for the variability of the stock of goods and loan use for each client: the coefficient of variation (CV) of the daily initial stock and measures of intensity of loan use. The loan use intensity measures use data from each client’s borrowing and repayment record. These measures are calculated as the sum of squared deviations of each client’s actual borrowing and repayment from the hypothetical schedule of a term loan (that is, single instance of borrowing at the beginning of the loan period and repaying a fixed installment every week).

Specifically, the *repayment intensity* measure is defined as $\frac{1}{T} \sum_{t=1}^T \left(\frac{R_{it} - R^*}{R^*} \right)^2$, where R_{it} is the actual repayment of client i in week $t = 1 \dots T$, and R^* is the hypothetical fixed installment of a term loan (Rs. 300 for a Rs. 10,000 loan, or Rs. 500 for a Rs. 20,000 loan).²⁸ An intensity measure of zero, the minimum possible value, means following exactly the standard term loan schedule, while larger intensity values correspond to clients deviating by either larger amounts or more often from this schedule.

To visually illustrate the loan use intensity measures, in Fig. C.4 in the Appendix, we plot the outstanding debt balance over time since loan disbursement for four sample borrowers. Borrowers 10 and 8 follow

²⁴ Estimates (available on request) using an indicator for receiving a loan upgrade instead of the predicted probability produce similar results.

²⁵ Our preferred specification includes only market fixed effects. Other covariates are not jointly or individually significant. Moreover, the pseudo R-squared of the model with market fixed effects is 0.445 but drops to 0.072 when they are removed (see columns 2 and 3 and the last row of Table B.4).

²⁶ We present a stylized model illustrating these mechanisms in Appendix A. Note that a credit line is always (weakly) welfare-improving for the borrower compared to a term loan of the same size, since a credit line borrower can always choose to replicate the term loan repayment schedule but is not bound by it.

²⁷ Data on the outstanding balance come from administrative records. These records have a weekly frequency which, in most cases, does not coincide with the financial diary interview date.

²⁸ Similarly, we define a *borrowing intensity* measure as $\frac{1}{T} \sum_{t=1}^T \left(\frac{B_{it} - B^*}{L} \right)^2$, where B_{it} is the actual amount borrowed in week $t = 1 \dots T$, B^* is the borrowing schedule of a term loan client (i.e., full loan amount in first week, and zero afterwards) and L is the loan size (or credit limit). *Total loan use intensity* is defined as the sum of the repayment and borrowing intensities. In computing these measures, we do not consider loan upgrades (raising the loan size or limit) as deviations from the term loan schedule.

Table 5
Effect of credit line on loan size and repayment.

Dependent variable	Mean value control group (term loan)	Effect of Credit Line	
		Baseline specification (2)	+ predicted prob. of loan upgrade (3)
1. Initial loan balance	15,680	−204.0 (446.6)	−200.4 (449.6)
2. Additional borrowing	2994	3327*** (600.9)	3280*** (582.9)
3. Total payments (principal and interest)	7939	720.3** (353.8)	733.2** (354.1)
4. Outstanding principal (end of period)	10,735	2402*** (486.7)	2346*** (454.8)
5. Outstanding principal (7-day window)	13,196	1106*** (334.3)	1045*** (316.5)
6. Number of missed payments	0.904	0.211 (0.189)	0.210 (0.195)

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. Data obtained from administrative records and the endline survey. All regressions include strata fixed effects. Column 3 also adds as control variable the predicted probability of getting a loan upgrade (estimated in Column 1 of Table B.4). Number of observations = 360.

Table 6
Controlling for outstanding debt balance.

Dependent variable	Gross profits (1)	ln(gross profits) (2)	Gross profits (3)	ln(gross profits) (4)
Credit line	50.6 (34.5)	0.050 (0.038)	87.1** (35.8)	0.083** (0.042)
Outstanding balance (7-day window)	0.003 (0.004)		0.003 (0.005)	
ln(outstanding balance) (7-day window)		0.025 (0.057)		0.013 (0.066)
Weeks after initial loan disbursement	All weeks		Weeks 13–30	
No. obs.	3904	3830	1919	1894
R-squared	0.220	0.236	0.310	0.308

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions use weekly data from the financial diaries and include strata, district-by-month-of-interview and day-of-week fixed effects. The *outstanding balance* is obtained from administrative records. It is the average of outstanding principal balance ± 7 days around the financial diary date. Columns 1 and 2 use data from all weeks, while columns 3 and 4 restrict the sample to observations from weeks 13–30 after initial loan disbursement.

exactly the standard prescribed term loan schedule, even though borrower 8 received a credit line. Both have intensity measures equal to zero. In contrast, borrowers 239 and 335 received a credit line and deviated from the term loan schedule: they drew on their credit lines on several occasions and made repayments different from the standard installments. Their total loan use intensity measures are positive, 0.13 and 0.50, respectively.²⁹

Table 7, panel A, shows no significant effect of the credit line on the coefficient of variation of initial stock. There is, however, a significant effect on the measures of borrowing and repayment loan use intensity.

These results suggest that credit line clients on average used their loan in a different, more flexible way and are consistent with our previous results in Table 5 showing that the credit line clients had larger borrowed and repaid amounts.³⁰ We interpret these results as supportive evidence for economic mechanism #2, more flexible loan use.

In Panel B of Table 7, we explore whether the observed increase in profits could be due to changes in business practices (mechanism # 3) using several indicators of business practices obtained from the endline survey. We find statistically significant differences in the likelihood of reporting buying more profitable goods (with a larger profit margin),

²⁹ As a further illustration on these measures, we plot the outstanding balances of the credit line clients with the highest and the lowest total loan intensity on Figs. C.5 and C.6 in the Appendix.

³⁰ In addition, Table B.5 in Appendix B shows that the coefficient of variation for repayments and debt balance are statistically significantly larger for credit line compared to term loan borrowers.

Table 7
Effect of credit line on stock management and business practices.

Outcome	Mean value	Effect of Credit Line	
	control group	Baseline	+ predicted prob.
	(1)	specification	loan upgrade
	(1)	(2)	(3)
<i>A. Stock and debt management</i>			
Borrowing intensity	0.007	0.0228*** (0.006)	0.0227*** (0.006)
Repayment intensity	0.005	0.0216** (0.009)	0.0220** (0.009)
Total loan use intensity	0.012	0.048*** (0.012)	0.048*** (0.012)
CV initial stock	0.439	0.016 (0.020)	0.016 (0.020)
<i>B. Business practices</i>			
Buy more profitable goods	0.475	0.081** (0.037)	0.079** (0.037)
Buys better quality goods	0.644	0.036 (0.044)	0.034 (0.044)
Buy more quantity	0.661	0.0265 (0.044)	0.0240 (0.043)
Hired employee	0.006	0.023* (0.012)	0.023* (0.012)
Added stall	0.011	0.023* (0.013)	0.023* (0.014)
Index of business practices		0.138*** (0.047)	0.136*** (0.047)

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. Data obtained from financial diaries, administrative records and endline survey. All regressions include strata fixed effects. Column 3 also adds as control variable the predicted probability of getting a loan upgrade (estimated in Column 1 of Table B.4). See text for definition of intensity measures. Index of business practices = simple average of normalized values of all variables in panel B. Normalized values are obtained by subtracting and dividing by mean and standard deviation of the control group. Number of observations = 360.

hiring an employee, or adding a stall.³¹

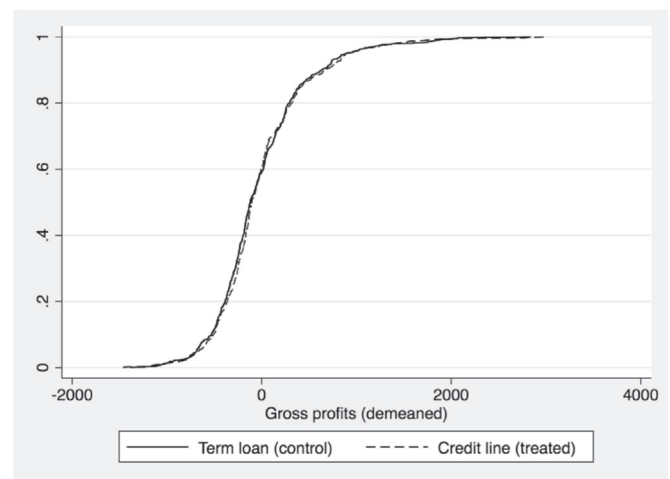
To further explore this mechanism, we also construct an index of business practices, defined as the simple average of the normalized values of variables in Panel B.³² Using this index allows us to aggregate the information on business practices and improve the precision of the estimates. The results, reported in the last row of Table 7 confirm that the credit line had a positive and significant effect on business practices.

Related to the changes in business practices is the question whether credit line clients achieve larger profits because of investing in riskier but more profitable goods for sale. While we cannot observe the riskiness of the clients' investments, we indirectly assess it by examining the distribution of the traders' daily profits. The idea is that changes in business profitability or risk would affect the mean and dispersion of the distribution of daily profits. Fig. 3 plots the cumulative distribution of daily profits for the treated and control groups. We split the data into two periods based on the elapsed time from the loan disbursement: weeks 1–12, and weeks 13–30. We also demean profits by regressing them on strata, day of the week, and district-by-month of interview fixed effects.³³

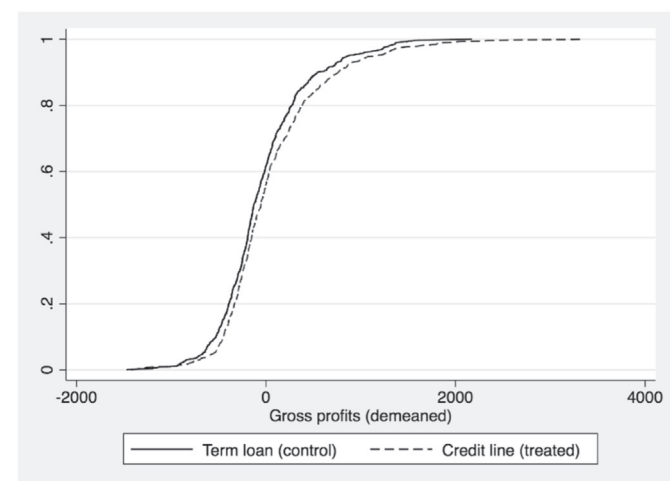
³¹ The latter two effects appear large, however, the actual increment is small. For instance, the number of term loan clients who hired an employee or added a stall are 1 and 2, respectively. The corresponding numbers for credit line clients are 2 and 6.

³² We use the mean and standard deviation of the control group. Thus, the mean of the control group is, by construction, always zero.

³³ These are the same covariates used in our baseline specification.



(a) Weeks 1-12



(b) Weeks 13-30

Fig. 3. Cumulative distribution of daily gross profits.

We observe that in the first weeks into treatment, the distribution of daily profits of the treated and control groups are very similar. However, after week 13, the distribution of profits of the credit line clients shifts to the right.³⁴ These results are consistent with the increase in average profits in the later weeks of the intervention documented earlier. Furthermore, the profit distribution of the treated group (credit line) appears to first-order stochastically dominate the distribution of profits of the control group.

To summarize, we interpret the findings in Tables 5–7 and Fig. 3 as suggestive evidence that the flexibility of the credit line allowed clients to achieve larger profits by using their loans more intensively, e.g., better matching cash flow to borrowing and repayments. Larger loan balances carried by the credit line borrowers cannot, on its own, explain the observed increase in profits. The credit line flexibility is also associated with changes in business practices, e.g., experimenting with new, more profitable, goods for sale. While we cannot pin down why these goods are, on average, more profitable, they do not seem associated with increased business risk, in the sense of more frequent low-profit

³⁴ The differences between the treatment and control group distributions in weeks 13–30 are statistically significant. The p-value of the Kolmogorov-Smirnov test of equality of distributions for weeks 1–12 is 0.296, while for weeks 13–30 it is 0.006.

realizations.³⁵ Our results are broadly consistent with previous findings by Field et al. (2013). Using data from an RCT in Kolkata, the authors find that a delayed initial repayment (two-month grace period instead of immediate repayment) had a positive effect on business profits. They argue that the delayed repayment encouraged more profitable, but also riskier and more illiquid, investments and allowed borrowers to experiment with new services or products.

Is the delayed effect caused by different repayment requirements? We hypothesize that the delayed effect of the credit line on traders' profits is driven by costly learning or rigidities in adjusting business or managerial practices. An alternative possibility is that the delayed effect may mechanically reflect growing differences in repayment requirements. Recall that term loan clients must repay a fixed amount each week. In contrast, credit line clients were advised to repay a similar amount but were only required to pay the accrued weekly interest. Hence, both groups may use their loans in the same way in the first few weeks but there could be growing differences later on: after several weeks, term loan clients would be required to have repaid a relatively larger total amount and thus may have less funds available.

To explore this possibility, we examine the loan use of credit line and term loan borrowers over two time periods: weeks 1–12 and weeks 13–30 after receiving the initial loan. The analysis follows roughly Tables 5 and 7, however, here we only use variables observed over time (e.g., withdrawals, repayment, initial stock). The results, displayed in Table 8, suggest that, on average, differences in loan use between the term loan and the credit line traders appear early on, without much delay. In both weeks 1–12 and weeks 13–30 we observe statistically significant differences in additional borrowing, total payments, and intensity of loan use. These results do not support the hypothesis that the observed delayed impact on profits reflects delayed or growing differences in repayment requirements. That said, while the Table 8 results are consistent with the costly learning or rigidities hypothesis, the experiment does not provide sufficient data to pinpoint the precise reason for the delay in the credit line effect.

Repayment and default concerns Table 5 shows no significant difference between credit line and term loan clients in the number of missed payments (row 6). This finding suggests that, at least during the period of our analysis, the new product did not have a discernible effect on default incentives.³⁶ Table B.5 in the Appendix provides additional evidence that credit line clients are repaying regularly. The Table shows that, on average, credit line borrowers repay more per week than term loan borrowers (some of these are bulk repayments before re-borrowing) and that the last observed debt balance of credit line clients is well below their highest debt level reached.³⁷

While we can only directly examine short-term effects on repayment and default, there is additional evidence suggesting that the credit line product did not have a negative impact on default rates also in the long run. First, Mann Deshi officers have informed us that all clients that

Table 8

Effect of credit line on loan use, by week after initial disbursement.

Dependent variable	Effect of credit line	
	Weeks 1–12 (1)	Weeks 13–30 (2)
Additional borrowing	1222.1*** (420.6)	2004.7*** (531.5)
Total payments (principal and interest)	383.9* (207.5)	390.1* (226.8)
Borrowing intensity	0.014** (0.007)	0.017*** (0.005)
Repayment intensity	0.088** (0.044)	0.012 (0.012)
Total intensity	0.102** (0.046)	0.029** (0.014)
CV initial stock	0.013 (0.021)	0.013 (0.016)

Notes: Robust standard errors in parentheses. The standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. The table uses data obtained from the financial diaries and administrative records. All regressions include strata fixed effects. The column (1) estimates use dependent variables data from weeks 1–12 after initial disbursement, while the column (2) estimates use data from weeks 13 and later.

participated in the RCT have repaid their loans in full by the end of the lending cycle. Second, the credit line remains a successful financial product offered by the bank.³⁸ Profitability analysis done by the bank (available upon request) shows that the default rate of credit line clients is lower than that of term loan clients. Specifically, in the fiscal year 2016–17, the share of non-performing assets (NPA), defined as the share of loans with principal or interest payment overdue by 90 or more days, was 0.2% for the credit line vs. 0.9% for the term loan.³⁹

4.4. Heterogeneous effects

In addition to the previously reported comparison of early vs. late loan applicants, we perform two not pre-specified analyses of heterogeneous effects from the credit line. First, we estimate quantile regressions of traders' profits on the treatment variable, being offered a credit line.⁴⁰ This allows us to quantify the credit line effect at different points of the distribution for the period in which the effect is most pronounced. Fig. 4 plots the estimated coefficients and confidence intervals at different percentiles. The horizontal dashed line depicts the average effect estimated using an OLS regression. For clarity of exposition, we use as outcome variable the log of average profits. Thus, the estimates can be interpreted as the percentage difference in profits between credit line and term loan clients.⁴¹ The main takeaway from Fig. 4 is that the observed profit increase is concentrated among traders with medium-high profits (around the 75th percentile). In contrast, the profit differential for low to medium levels of profits is positive, but below the

³⁵ A relevant open question is why term loan traders do not choose to sell these more profitable goods. It could be that these goods are more illiquid or have more unpredictable cash flows. Or, it could be that vendors have limited information on the cash flow of these new products, so term loan clients are unwilling to stock them given the rigid payment schedule they face. Unfortunately, due to data limitations, we cannot explore these hypotheses directly.

³⁶ We also examine the effect of the credit line on repayment stratified by early vs. late applicants, as defined in Table 3. As shown in Tables B.6 and B.7, late applicants have smaller business and missed more payments than early applicants. Using missed payments as the outcome variable we find, however, that the estimates for the treatment variable (credit line) are not statistically significantly different from zero for both groups of clients (see Table B.8 in the Appendix).

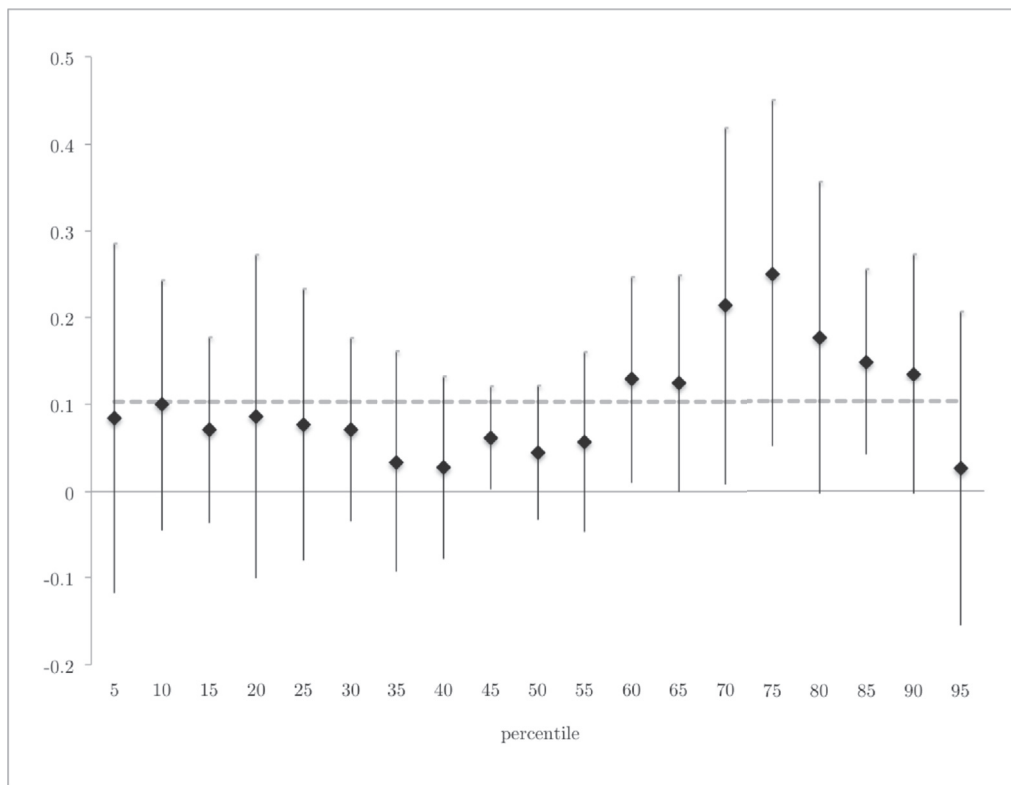
³⁷ In addition, Fig. C.7 in Appendix C displays the distribution of weekly repayments by all borrowers. With very few exceptions, all clients repay average weekly amounts equal or higher than the suggested Rs. 300 or Rs. 500 term loan installments.

³⁸ The product is now called “weekly market cash flow facility”. See list of financial products offered by the Bank at <http://manndeshibank.com/offering/loans/>.

³⁹ While suggestive of no negative effects, these differences in NPA should be interpreted with caution. In contrast to the RCT, these measures do not address relevant issues such as possible systematic difference between credit line and term loan clients, among other potential confounding factors.

⁴⁰ To implement the quantile regression, we adapt our baseline specification as follows: we collapse the data at the client level, use as outcome variable the log of average profits in weeks 13–30 after loan disbursal, and include only district fixed effects.

⁴¹ Fig. C.8 in Appendix C plots the estimated profit differences in levels.



Notes: The Figure depicts the estimates from bootstrapped quantile regressions (diamonds) and their 95% confidence intervals (vertical lines). The regressions include only district fixed effects. The outcome variable is log of average daily profits 13-30 weeks after loan disbursal. The horizontal dashed line depicts the average effect from an OLS regression. N = 360.

Fig. 4. Quantile regression estimates.

Table 9

Effects of credit line on gross profits by baseline characteristics

	Dep. Variable = Gross profits					
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Line (CL)	1.3 (47.5)	21.7 (38.3)	61.7 (48.2)	101.8** (42.7)	61.0 (39.7)	-6.6 (63.1)
CL × 1(pre-treatment income > median)	129.2* (66.7)					161.1* (65.4)
CL × 1(had formal loan)		137.6* (72.8)				122.3* (72.3)
CL × 1(education level > median)			-9.1 (68.6)			-20.8 (65.3)
CL × 1(pre-treatment gross profits > median)				-97.9 (64.5)		-117.9* (64.6)
CL × 1(sells perishables)					-10.4 (73.3)	48.0 (77.5)
No. obs.	4087	4063	4087	3989	4087	3965

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions use weekly data from the financial diaries and include strata fixed effects, district-by-month-of-interview and day-of-week fixed effects as in the baseline specification. The regressions include interaction term between the treatment indicator (CL) and an indicator of a client baseline characteristic.

average and not statistically significant.

Second, we extend our baseline regressions from Table 2 by adding interaction terms of the treatment variable (credit line) with other variables possibly correlated with business profitability, such as income,

pre-treatment profits, education, and type of goods sold.⁴² Table 9

⁴² Results on the determinants of business profits, not reported here, are available upon request.

presents the results. We find that the effect of the credit line is significantly (at the 90% confidence level) larger for traders who had pre-treatment income above the median (column 1) and those with prior access to formal loans (column 2). These results continue to hold when including all interaction terms jointly, in column (6). In contrast, the interaction terms for clients' education level, pre-treatment profits, or sale of perishables are not statistically significantly different from zero.

The results in Fig. 4 and Table 9 suggest that there exists heterogeneity among the clients in the benefits from a credit line. With the available data, however, it is hard to pin down the exact reasons. For instance, it could be that previous experience with formal loans allowed some traders to learn faster how to use the new financial product. Alternatively, it could be that there are unobservable characteristics (e.g., entrepreneurial ability) that are correlated with previous access to formal loans or larger pre-treatment income, and better ability to exploit the new profit opportunities facilitated by the credit line.

5. Conclusion

We use data from a randomized controlled trial, complemented with survey data and administrative loan data, to study the impact of introducing a credit line in a microcredit program. We show that receiving a credit line corresponds to a larger increase in business profits compared to receiving a term loan. The difference in profits grows more statistically and economically significant with time since loan disbursement. These findings are consistent with costly learning or lags in adjusting business practices. If so, our estimates here may be a lower bound of the potential longer term effects.

More generally, our results suggest that allowing more flexibility in the lending terms could increase the effectiveness of microcredit provided to small businesses in developing countries. The added flexibility may enable borrowers to manage their debt more actively and/or

pursue more profitable investments. These findings complement and contribute to the growing evidence that conventional microcredit loans may be unnecessarily rigid and constraining entrepreneurship.

An unfortunate but important limitation of our analysis is that the randomized intervention was concluded earlier than initially planned, because of requests to extend the credit line product to all borrowers. This hurts our ability to observe and quantify medium- and long-term impacts of the credit line, for example, on business growth, firm survival, or default rates. Default rates could be affected, in theory, if credit line clients systematically invested in riskier projects. Also, the additional loan use flexibility and ability to delay repayment may exacerbate potential self-control problems, as in Fischer and Ghatak (2016), for example.⁴³ These are potential drawbacks that must be traded off against the efficiency gains from using credit more flexibly.

Because of data availability, we have primarily focused on the borrowers' side of the market. Hence, we are unable to measure the impact of the credit line on many relevant supply-side (lender) outcomes, e.g., repayment rates, operational costs or costs of funding. Understanding and quantifying these outcomes is important for a complete assessment of the implications of credit lines for microcredit and business practices. Lacking consumption data, we have also abstracted from the role of risk aversion and assessing the obvious additional efficiency gains in consumption smoothing that credit line financing can achieve. Addressing these important issues warrants further research.

Author statement

F. Aragón: Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Writing - Review & Editing. **A. Karaivanov:** Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Writing - Review & Editing. **K. Krishnaswamy:** Conceptualization, Investigation, Writing - Original Draft.

Appendix.

A. Model

We develop a simple theoretical model to illustrate the main economic implications of borrowing via a credit line vs. a term loan. The model highlights two main mechanisms through which we hypothesize that a credit line can increase traders' gross profits, compared to a term loan: allowing more flexible stock and debt management and allowing traders to invest in riskier but more profitable goods for sale.

Consider loan-financed traders selling a perishable good over two periods. We model the traders as risk-neutral and interpret their net payoff (utility) as gross profits (business cash flow). The traders have no other assets or income. Each period $t = 1, 2$ a trader buys stock of goods for sale s_t at cost 1 per unit and sells it at price $p_t > 1$ per unit. This implies that it is never optimal for the trader to carry cash balances over time, i.e., all cash on hand from sales or loans is fully used to purchase stock.

Motivated by our empirical application, we consider two different financial products: a term loan and a credit line. Both products charge the same interest rate $r > 0$ and have the same loan size or drawing limit, L . For simplicity, we assume that default is not possible; the results easily generalize to allowing a finite cost of default.

The main difference between the two credit products is in the timing for receiving and repaying the loan. With a term loan, the trader receives the full amount L upfront, before any sales are realized. In addition, the trader is required to repay a fixed installment each period. In contrast, with a credit line, the trader can withdraw any amount up to L after observing p_t . This assumption captures the main distinction between the products: the term loan has a fixed debt and repayment schedule, while the credit line offers the flexibility of being able to vary the debt and repayment amounts in response to demand or other shocks.

For simplicity, assume that the first-period price p_1 is constant/known and $p_1 > 1 + r$.⁴⁴ Assume also that p_2 is a random variable with support $[1 + \underline{\varepsilon}, 1 + \bar{\varepsilon}]$ where $\bar{\varepsilon} \geq \underline{\varepsilon} > 0$. We interpret the randomness in p_2 as a stochastic demand shock. The shock could be caused either by a variation in the good's price or variation in the fraction of stock sold, or both.⁴⁵

We start with the observation that a trader can earn higher expected profits with a credit line than with a term loan of the same size (see Appendix A.3 for formal analysis). Intuitively, a credit line financed trader can always choose to replicate the actions of a trader using a term loan of the same size. However, as we show formally in Sections A.1 and A.2, a credit line trader has additional flexibility in debt and sales stock

⁴³ Fischer and Ghatak (2016) analyze high-frequency repayments in a theoretical model with present-biased borrowers and limited enforcement. They show that more frequent repayments reduce the borrowers' incentive to default strategically and allow larger loan size. However, the welfare implications are ambiguous, since more frequent repayments could lead to over-borrowing.

⁴⁴ This implies that borrowing the maximum amount is always optimal in the first period, as we observe for the vast majority of borrowers in our data. All results remain valid in the case $p_1 < 1 + r$.

⁴⁵ For example, if fraction $\varphi \in (0, 1]$ of the stock s_t is sold at price p_t and the rest perishes, this is isomorphic to the trader selling the entire stock at price φp_t .

management, as well as in the choice of goods for sale.

A.1. Stock and debt management

A term loan financed trader borrows L at the beginning of $t = 1$ and repays equal installments, F at the end of each period.⁴⁶ Since $p_1 > 1$, carrying money balances across periods is return-dominated by buying goods for sale and thus the trader uses the full loan balance, $b_1^{TL} = L$ to purchase stock $s_1^{TL} = L$. At the start of period 2, the term loan trader has debt $b_2^{TL} = (1 + r)L - F = \frac{(1+r)L}{2+r}$ and available cash $p_1 s_1^{TL} - F$ which, since $p_2 > 1$, he uses to purchase stock $s_2^{TL} = p_1 L - F$. Overall, this yields expected profits:

$$\Pi^{TL} = E(p_2)(p_1 L - F) - F \quad (2)$$

We also assume that, for any possible p_2 , the term loan trader always has enough funds to repay the loan installment, that is

$$p_2(p_1 L - F) \geq F, \text{ for all } p_2 \quad (3)$$

A credit line financed trader can choose any debt level $b_t \leq L$ at $t = 1, 2$, after observing p_t . At the end of each period, the credit line trader is only required to pay interest on her current debt balance, rb_t .⁴⁷ The trader can otherwise increase or decrease her debt level as she finds optimal. All outstanding debt must be repaid by the end of period 2.

Since we assume $p_1 > 1 + r$, the credit line trader initially borrows the maximum amount $b_1^{CL} = L$ and purchases stock $s_1^{CL} = L$.⁴⁸ At the end of the first period, she must repay rL and has cash on hand $(p_1 - r)L$. We focus on the second period.

Suppose the realized second-period price p_2 satisfies $p_2 \geq 1 + r$ ("high price") – sales profits per rupee exceed the cost of carrying debt. Then it is easy to show that the credit line trader optimally rolls over her debt, that is, $b_2^{CL} = L$ and buys the maximum possible amount of stock, $s_2^{CL} = (p_1 - r)L$.⁴⁹ Note that $b_2^{CL} > b_2^{TL}$ and $s_2^{CL} > s_2^{TL}$. That is, in good times (high p_2) the credit line allows the trader to borrow more and purchase more stock than a term loan trader.

Suppose now that the realized p_2 satisfies $p_2 \in (1, 1 + r)$ ("low price") – sales profits per rupee are lower than the cost of carrying debt. Now it is optimal for the credit line trader to bring her debt to zero, i.e., $b_2^{CL} = 0$ and purchase stock $s_2^{CL} = (p_1 - 1 - r)L$ (since $p_2 > 1$, purchasing stock dominates carrying cash). That is, in bad times (low p_2) the credit line allows the trader to borrow less (note that $b_2^{CL} < b_2^{TL}$) and purchase less stock (note that $s_2^{CL} < s_2^{TL}$) compared to a term loan trader.

To summarize, a term loan trader's debt schedule, $\{b_1^{TL}, b_2^{TL}\}$ and stock purchases, $\{s_1^{TL}, s_2^{TL}\}$ are rigid and do not depend on the realization of p_2 (the demand shocks).⁵⁰ In contrast, a credit line trader's debt and stock purchases are flexible and optimally vary with the realization of the sales shocks. As a result, the credit line trader always achieves larger profits.⁵¹

A.2. Safe and risky goods

We now describe a second mechanism that can enable credit line traders to achieve larger profits compared to term loan traders, by choosing different goods for sale. This mechanism can operate in addition to the more flexible debt management discussed in the previous section.

Hold everything else the same as before, but suppose that there are two possible goods for sale in period $t = 2$: a 'risky', high-return good and a 'safe', low-return good. The safe good yields p^s per unit of stock with certainty. The risky good has stochastic yield, p^r with larger expected value than that of the safe good, $E(p^r) > p^s$ and support $p^r \in [1 + \underline{\varepsilon}, 1 + \bar{\varepsilon}]$ where $\bar{\varepsilon} > \underline{\varepsilon} > 0$. Assume also $p^s > 1 + \underline{\varepsilon}$.

The timing after the completion of period $t = 1$ is as follows. First, the trader decides which good to stock (safe or risky). Second, if the risky good is chosen, the second-period price p^r is realized. Observing p^r , a credit line trader optimally chooses her $t = 2$ debt, b_2^{CL} and stock, s_2^{CL} . In contrast, term loan traders' $t = 2$ debt and stock levels are pre-determined by their $t = 1$ choices, as in Section A.1.

We show that the rigidity of the term loan can make term loan traders stock the safe good while, for the same model parameters, credit line traders invest in the higher-return risky good and obtain larger profits. The argument is not based on risk aversion but on the (in)ability of term loan traders to repay. Indeed, suppose that the repayment feasibility condition (3) is not satisfied at $p_2 = 1 + \underline{\varepsilon}$ but it is satisfied at $p_2 = p^s$. Then, term loan traders must invest in the safe good because, due to the rigid debt repayment schedule, stocking the risky good can put them in danger of not being able to repay the required installment F when sales are weak (low p_2). In contrast, credit line traders are able to optimally adjust their debt balance b_2^{CL} upon observing the realized p^r and avoid the risk of default.⁵²

Since $E(p^r) > p^s$, a credit line trader's expected profits from stocking the risky good are always larger than her profits from stocking the safe good,⁵³ which in turn are larger than a term loan trader's profits from stocking the safe good:

$$\Pi_{risky}^{CL} > \Pi_{safe}^{CL} > \Pi_{safe}^{TL}$$

The first inequality captures the increase in expected profits for a credit line trader from the choice of good for sale and the second inequality captures the increase in expected profits from more flexible debt and stock management.

⁴⁶ Using the compound interest formula, the installment size is $F = \frac{(1+r)^2}{2+r} L$.

⁴⁷ This assumption matches the credit line rules in our data.

⁴⁸ Note, however, that if we had $p_1 \in (1, 1 + r)$ then the credit line trader would not borrow in the first period, that is, $b_1^{CL} = s_1^{CL} = 0$ – unlike the term loan, the credit line provides flexibility when the expected return is low.

⁴⁹ For $p_2 \geq 1 + r$ and $p_1 > 1 + r$ it is easy to show that the resulting debt can be fully repaid at the end of period 2, that is: $p_2(p_1 - r)L \geq (1 + r)L$.

⁵⁰ It is also possible to allow term loan traders to repay more than the required installment F , e.g., when expecting low sales. Our main results would still go through since credit line traders retain an advantage when prices/sales are high. In the data such prepayment is only allowed if the whole borrowing group agrees and is observed very rarely in the term loan administrative records.

⁵¹ For $p_2 \geq 1 + r$ the credit line trader's expected profits are $\Pi^{CL} = E(p_2)(p_1 - r)L - (1 + r)L$. For $p_2 \in (1, 1 + r)$ the credit line trader's expected profits are $\Pi^{CL} = E(p_2)(p_1 - 1 - r)L$. Using (2) it is easy to verify that $\Pi^{CL} > \Pi^{TL}$ in both cases.

⁵² Credit line traders choose $b_2^{CL} = 0$ if $p^r < 1 + r$ and $b_2^{CL} = L$ otherwise.

⁵³ See the expressions for Π^{CL} given in footnote 51.

A.3. Proofs

Lemma 1. A trader always earns higher expected profits using a credit line compared to using a term loan of the same size.

Denoting cash flow by c_t , in each period a term loan trader faces the budget constraint:

$$c_t + s_{t+1} \leq p_t s_t - F. \quad (\text{BCT})$$

In contrast, a credit line trader has the budget constraint:

$$c_t + s_{t+1} \leq p_t s_t + b_{t+1} - (1+r)b_t \quad (\text{BCC})$$

where, on the right hand side, $b_{t+1} - b_t$ is the change (positive or negative) in debt principal, $p_t s_t$ is sales revenue and rb_t is the required interest payment.

Note that, if a credit line trader sets $b_1 = s_1 = L$ and $b_{t+1} = (1+r)b_t - F$ for all $t = 1, \dots, T$, the budget constraints (BCC) become equivalent to the term loan trader's budget constraints (BCT). The credit limit $b_t \leq L$ is also satisfied at all t since

$$b_{t+1} = (1+r)b_t - F \leq (1+r)L - \frac{r(1+r)^T}{(1+r)^T - 1}L < L.$$

Because the traders' payoff function is the same, the above result implies that a credit line trader, by using the term loan trader's optimal debt and repayment schedules, can always replicate the term loan trader's stock and cash flow over time $\{s_t^{TL}, c_t^{TL}\}$ and hence achieve the same gross profits. While this strategy is always feasible for a credit line trader, in general it is not optimal – a credit line trader can choose a different debt profile $\{b_t\}$ and cashflow and stock paths $\{c_t, s_t\}$ and achieve strictly higher present-value expected profits (see the two-period example in the main text).

B. Additional tables

Table B.1

Product description.

Features	Credit line	Term loan
Eligibility criteria	Age between 21 and 59 years. Female. Has business in the local market where the loan is applied for. Has been opening shop regularly for the past three months. Business is not seasonal but conducted throughout the year.	
Guarantor/Joint liability group	Group of three guarantors with businesses in the same market. Each member guarantees repayment of at least the interest component of the loans of the other two members.	Group of three guarantors with businesses in the same market. Each member guarantees repayment of the loans of the other two members.
Required documents	Photo ID with date of birth and proof of address.	
Credit limit	INR 10,000 initially, can be increased to INR 20,000 upon regular repayment and business performance. If the initial scale of business is large enough the initial loan size can be INR 20,000.	
Loan period	36 months	12, 18 or 24 months
Interest rate	24% per year on the loan outstanding amount, accrued weekly.	
Processing fees	INR 100	
Other mandatory upfront charges	<i>Refundable:</i> Share capital: INR 500 Savings account minimum balance: INR 100 <i>Non-refundable:</i> Share registration: INR 100 Nominee/co-applicant: INR 100 Insurance premium: INR 94–363 based on loan amount	
Repayment	<i>Required:</i> weekly accrued interest <i>Recommended:</i> at least 10% of the outstanding loan amount per month	Instalment comprising principal and interest amortized weekly
Location	Collection of documents, disbursement, repayments and borrowing take place largely in the weekly market of business. Clients also have the option to withdraw or deposit at the bank during working hours.	

Table B.2

Initial loan disbursements timeline.

Month of initial loan disbursement	No. clients	% total sample	% offered a credit line
Dec 2014	66	0.18	0.50
Jan 2015	120	0.33	0.48
Feb 2015	81	0.23	0.56
Mar 2015	93	0.26	0.52
Total	360		

Table B.3

List of strata.

Strata name	No. clients	No. joint liability groups	% offered CL
AK03	6	2	0.500
Akluj	12	4	0.500
GONDAWALE	6	2	0.500
KH02	6	2	0.500
KH05	6	2	0.500
KH08	6	2	0.500
KH09	6	2	0.500
KHATAV	15	5	0.400
KO02	6	2	0.500
KO03	6	2	0.500
KO04	6	2	0.500
KOREGOAV	3	1	1.000
LO01	6	2	0.500
LO04	6	2	0.500
LO07	6	2	0.500
LO08	6	2	0.500
LONAND	12	4	0.500
NA01	6	2	0.500
NA05	6	2	0.500
NA06	6	2	0.500
NA13	6	2	0.500
NA14	6	2	0.500
NATEPUTE	21	7	0.571
PH02	6	2	0.500
PH03	6	2	0.500
PH05	6	2	0.500
PH09	6	2	0.500
PH15	6	2	0.500
PH16	6	2	0.500
PH17	6	2	0.500
PHALTAN	18	6	0.500
PI02	6	2	0.500
PILIV	3	1	1.000
PU03	6	2	0.500
PU05	6	2	0.500
PU06	6	2	0.500
PU08	6	2	0.500
PUSEGOAV	12	4	0.500
RA07	6	2	0.500
RA09	6	2	0.500
RAHIMATPUR	18	6	0.500
SA04	6	2	0.500
SATARA	9	3	0.667
SATARA-ROAD	12	4	0.500
VA01	6	2	0.500
VADUJ	6	2	0.500
VAL01	6	2	0.500
VATHAR	3	1	0.000
WA01	6	2	0.500
Total	360	120	0.508

Table B.4
Probability of receiving a loan upgrade.

	Dep. variable = Loan upgrade		
	(1)	(2)	(3)
Years in business		−0.001 (0.025)	0.009 (0.014)
Gross profits (before treatment)		−0.000 (0.001)	0.000 (0.000)
Sales (before treatment)		0.000 (0.000)	0.000 (0.000)
Household size		0.113 (0.072)	−0.023 (0.049)
Can read and write		−0.526 (0.428)	−0.278 (0.297)
Is married		−0.454 (0.517)	0.154 (0.375)
Sells perishables		0.330 (0.371)	0.073 (0.242)
Market FE	Yes	Yes	No
Month of initial loan disbursement FE	Yes	Yes	Yes
No. obs.	96	94	169
Pseudo R-squared	0.396	0.445	0.072
Prob > χ^2 (H_0 : covars = 0)	–	0.186	0.892

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions use data from the baseline (pre-treatment) survey and restrict the sample to the control group. Regressions are estimated using a Probit model, and include indicators of month of initial disbursement. Columns 1 and 2 also include market fixed effects. Columns 2 and 3 include additional covariates. Last row displays the p-value of the hypothesis of joint significance of these additional covariates. Smaller number of observations in columns 1 and 2 is due to loss of variability by the inclusion of fixed effects.

Table B.5

Additional indicators of loan use.

	Term loan (1)	Credit line (2)
Highest debt level reached, Rs.	17,423	18,472**
End debt ^a as % of borrower's highest debt	67.2	77.3***
Weekly repayment, Rs.	379	425***
Total repayments as % of initial loan balance	53.3	64.9***
Total withdrawals ^b as % of initial loan balance	35.1	76.4***
Coefficient of variation of repayments	0.22	0.31***
Coefficient of variation of debt balance	0.18	0.21*

Notes: all variables are averages across the borrowers of each product type.

^a End debt is the last observed outstanding debt balance in the data.^b Total withdrawals include loan size upgrades, accrued interest and other borrowing but exclude the initial loan balance. ***, ** and * denote two-sample equal means *t*-test *p*-values < 1%, <5% and <10% respectively.

Table B.6

Comparison of pre-treatment characteristics by time of initial loan disbursement.

Variable	Month of initial loan disbursement		Late applicants Feb–Mar 2015		p-value (1)=(3)
	Early applicants Dec 2014–Jan 2015				
	Mean	S.D.	Mean	S.D.	
	(1)	(2)	(3)	(4)	(5)
<i>A. Profitability and sales</i>					
Gross profit	644	435	672	356	0.518
Sales	3351	2245	2751	1879	0.007
Cost of sales	2632	1912	2098	1648	0.005
<i>B. Stock and other expenses</i>					
Initial stock	13,984	21,657	11,080	16,453	0.161
Final stock	10,720	19,630	8884	15,797	0.336
Other expenses	229	148	215	144	0.365
<i>C. Business characteristics</i>					
Monthly business income	10,868	6364	9124	4542	0.003
Sells perishables	0.371	0.484	0.345	0.477	0.606
Years in business	9.6	7.3	9.8	7.9	0.878
Balance in savings account	7745	9251	8582	9577	0.400
<i>D. Sources of working capital</i>					
Bank or microfinance	0.086	0.281	0.103	0.305	0.573
Savings or business profits	0.694	0.462	0.759	0.429	0.168
Wholesaler	0.134	0.342	0.075	0.264	0.066
<i>E. Demographics</i>					
Household size	4.7	1.7	4.8	2.0	0.454
Can read and write	0.785	0.412	0.839	0.369	0.191
Is married	0.909	0.289	0.879	0.327	0.367
No. Joint liability groups	62		58		
No. clients	186		174		

Notes: All monetary values are in Indian Rupees (INR). Profits, sales, costs of sales, stock and expenses refer to daily values. The data used are from the baseline survey or pre-treatment financial diaries. Early and late applicants are classified based on the month of initial loan disbursement, see Table 3. Column 5 displays the p-values of a means comparison test.

Table B.7

Comparison of loan size and repayment by time of initial loan disbursement.

Variable	Month of initial loan disbursement				p-value (1)=(3)
	Early applicants Dec 2014–Jan 2015		Late applicants Feb–Mar 2015		
	Mean (1)	S.D. (2)	Mean (3)	S.D. (4)	
Offered credit line	0.484	0.501	0.534	0.500	0.338
Loan upgraded	0.253	0.436	0.282	0.451	0.537
No. missed payments	0.720	1.953	1.339	1.823	0.002
Initial balance	16,720	4849	14,158	5118	0.000
Additional borrowing	5153	6571	4599	6362	0.417
Total payments (principal + interest)	9922	3626	6658	2621	0.000
Outstanding balance (end of period)	11,951	4101	12,099	5098	0.762
No. Joint liability groups	62		58		
No. clients	186		174		

Notes: All monetary values are in Indian Rupees (INR). Profits, sales, costs of sales, stock and expenses refer to daily values. The data used are from the baseline survey or pre-treatment financial diaries. Early and late applicants are classified based on the month of initial loan disbursement, see Table 3. Column 5 displays p-values of a means comparison test.

Table B.8
Effect of credit line on repayment by time of initial loan disbursement.

	Dep. variable = nr. missed payments		Late applicants	
	Early applicants Dec'14-Jan'15 (1)	(2)	Feb-Mar'15 (3)	(4)
Credit line	0.247 (0.161)	0.266 (0.160)	0.194 (0.297)	0.187 (0.272)
Controlling for predicted prob. of loan upgrade	No	Yes	No	Yes
Mean of outcome variable (control group)	0.521		1.358	
No. observations	186	186	174	174
No. clients	0.766	0.772	0.583	0.584

Notes: Robust standard errors in parentheses. Standard errors are clustered by joint liability group. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions include strata fixed effects. Columns 2 and 4 also add as control variable the predicted probability of loan upgrade (estimated in Column 1 of Table B.4).

C. Additional figures

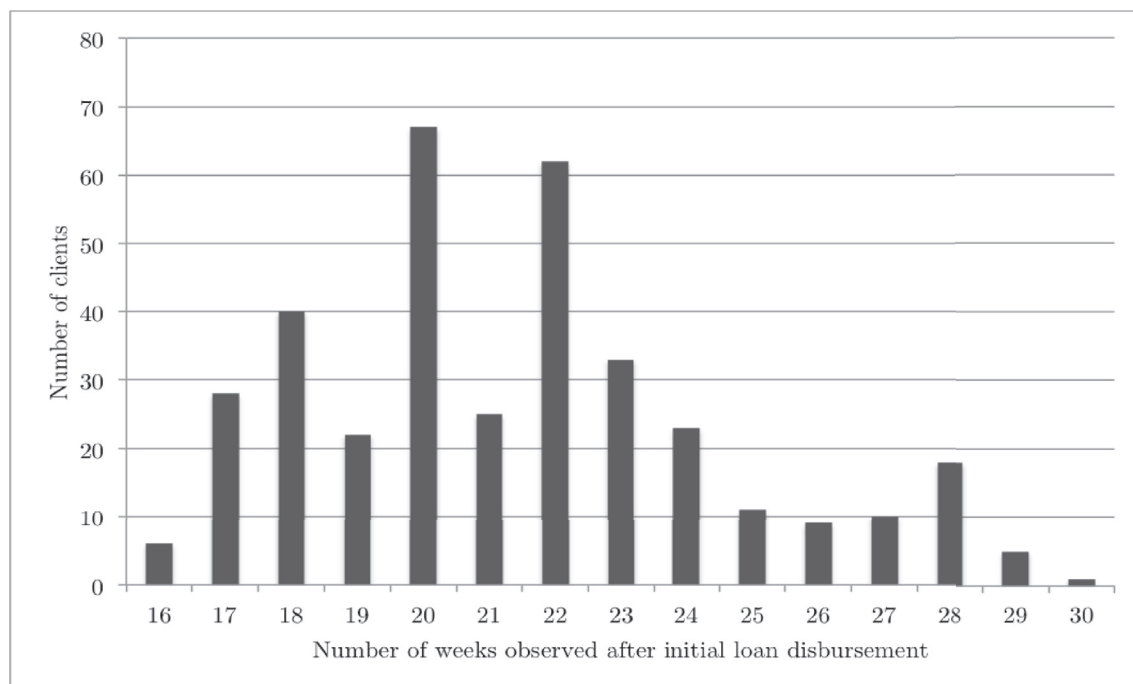


Fig. C.1 Weekly observations per client.

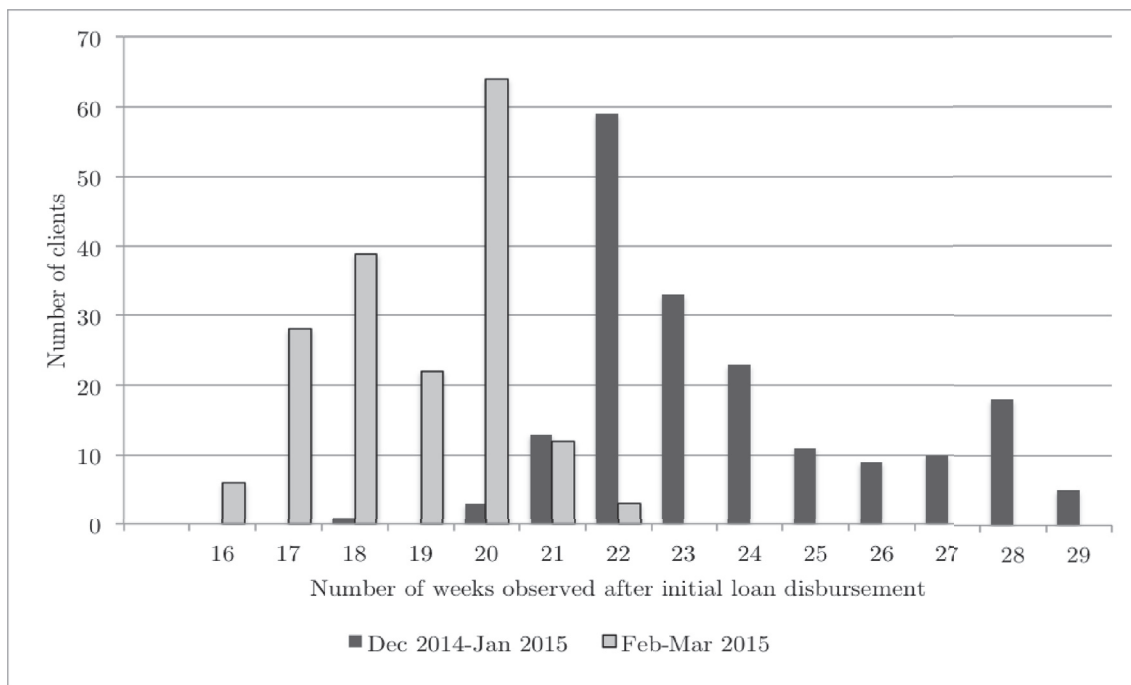


Fig. C.2 Weekly observations per client, by period of loan approval.

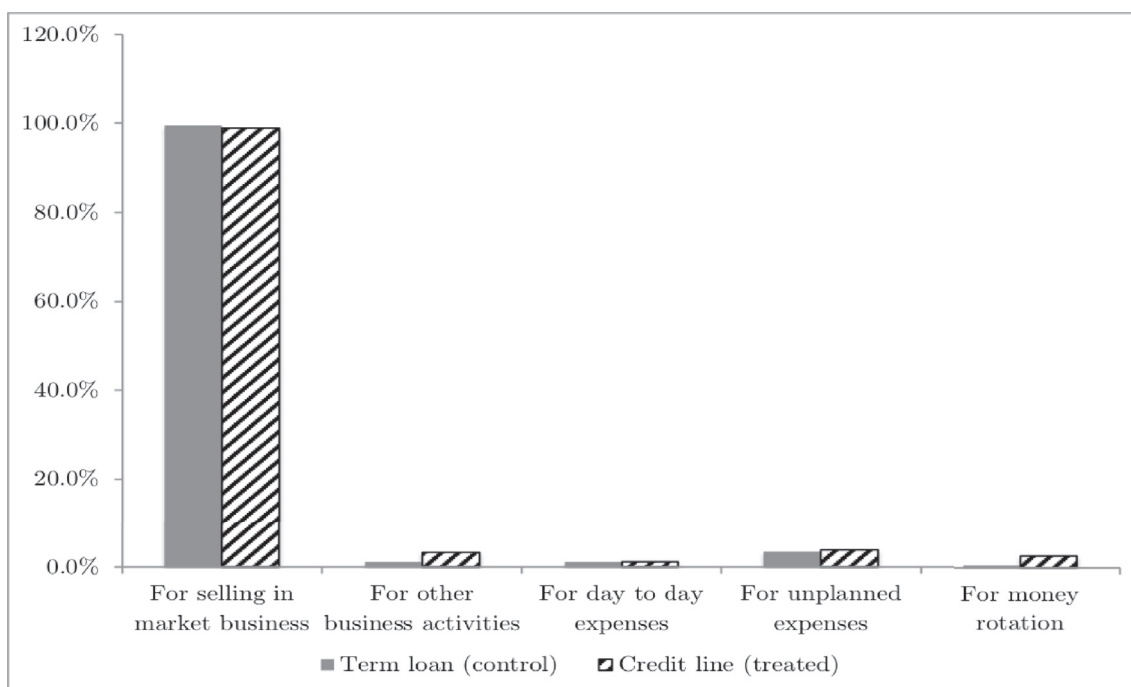


Fig. C.3 Self-reported use of loan.

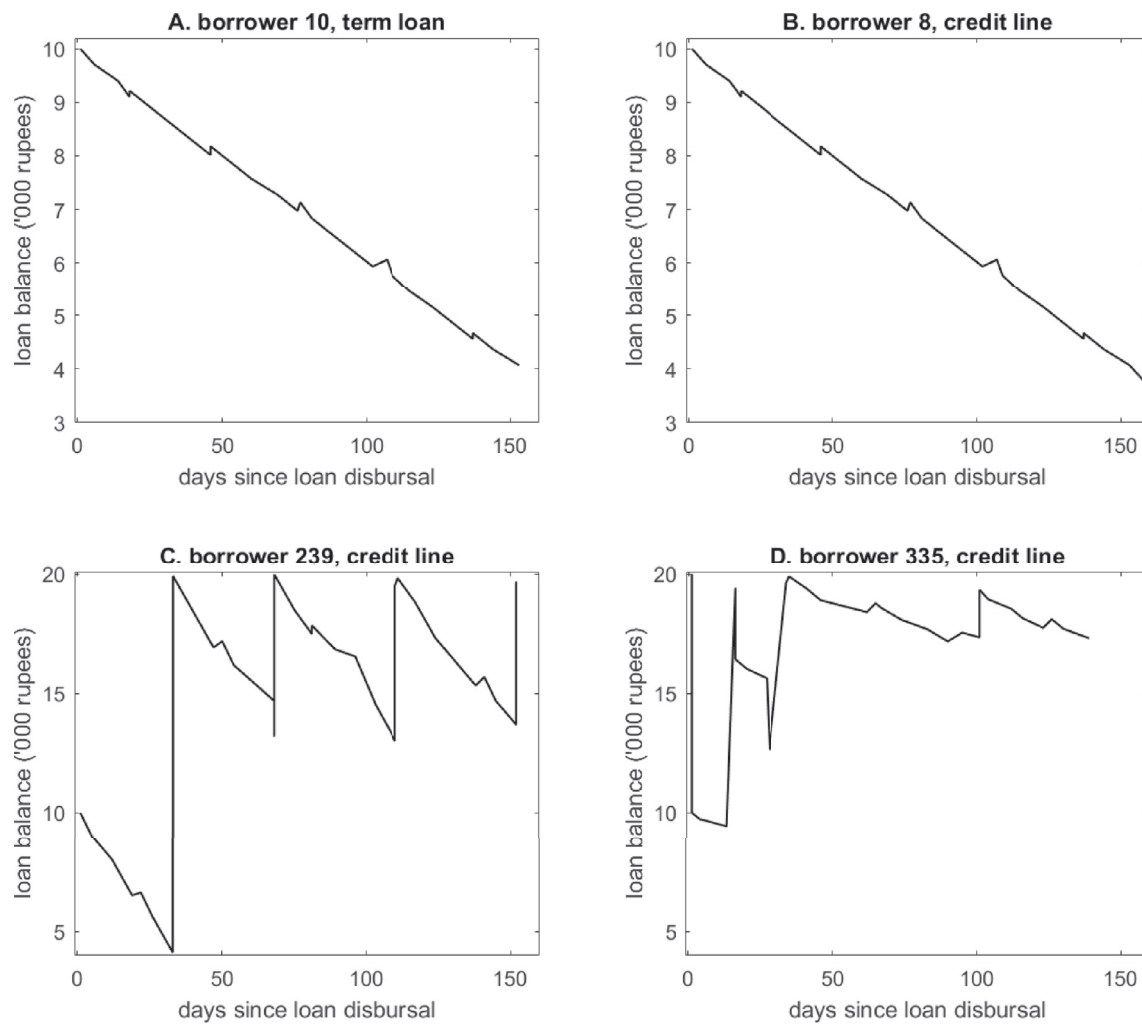


Fig. C.4 Examples of client's outstanding balances over time.

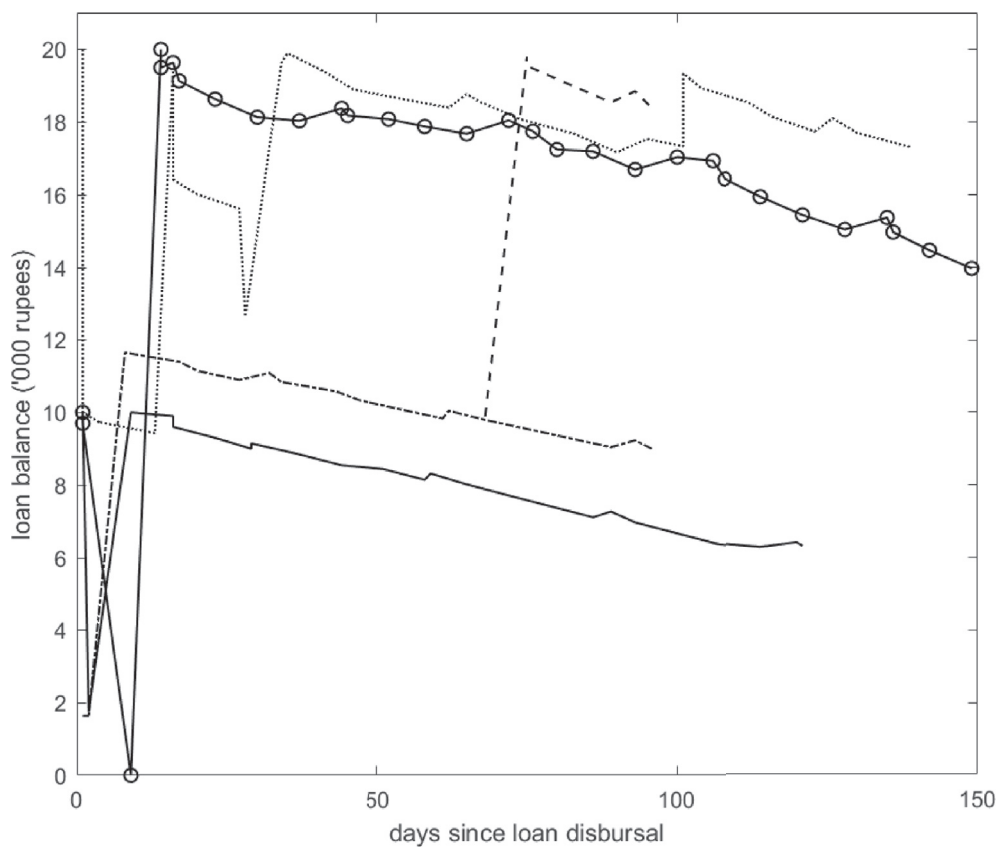


Fig. C.5 The 5 credit line borrowers with the highest total loan use intensity.

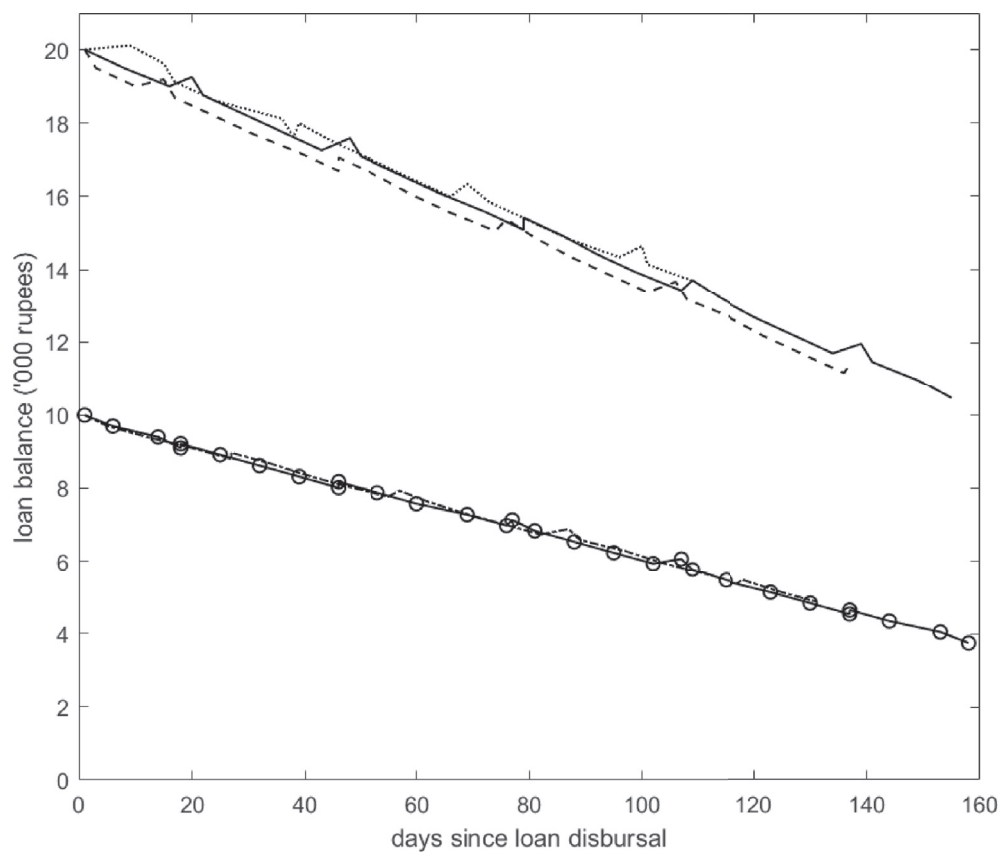


Fig. C.6 The 5 credit line borrowers with the lowest total loan use intensity.

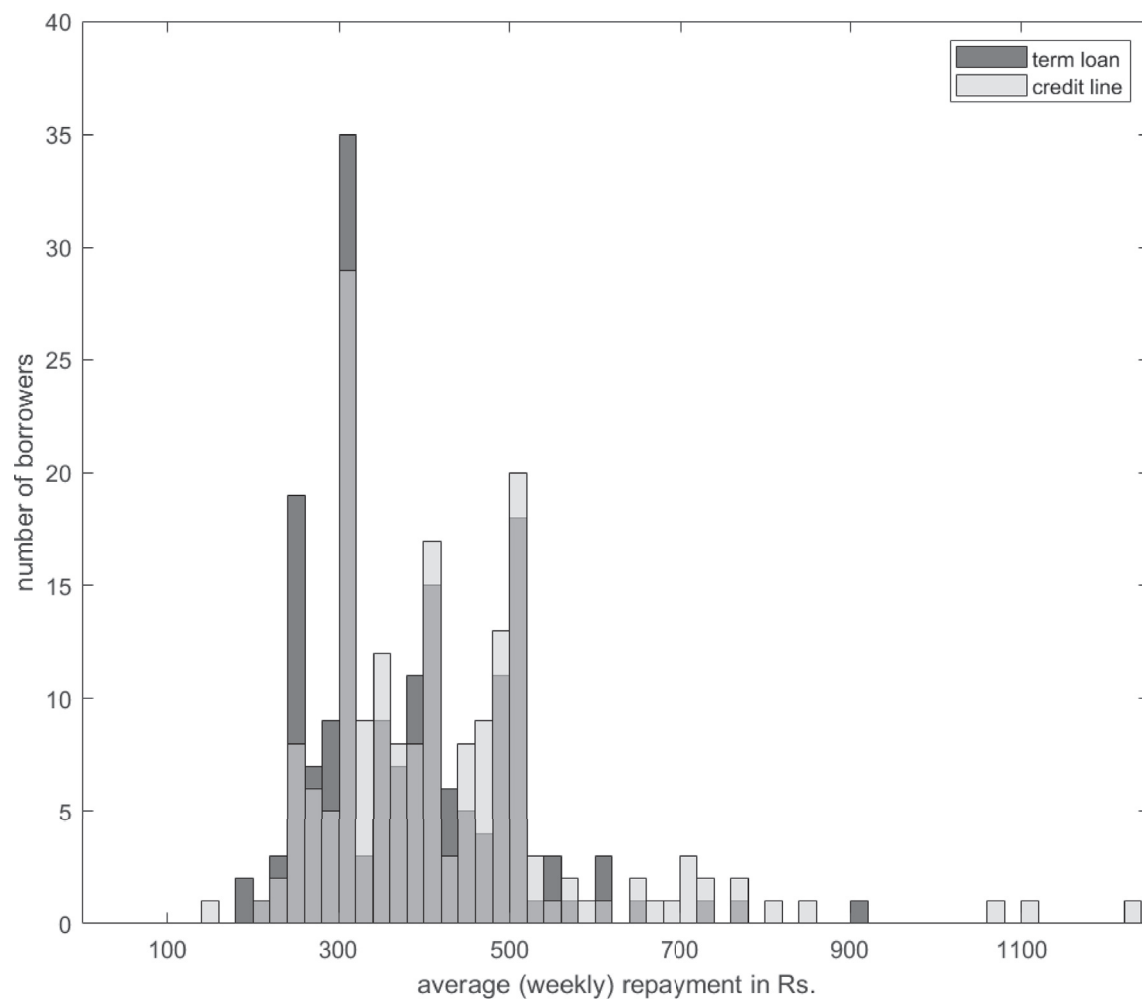
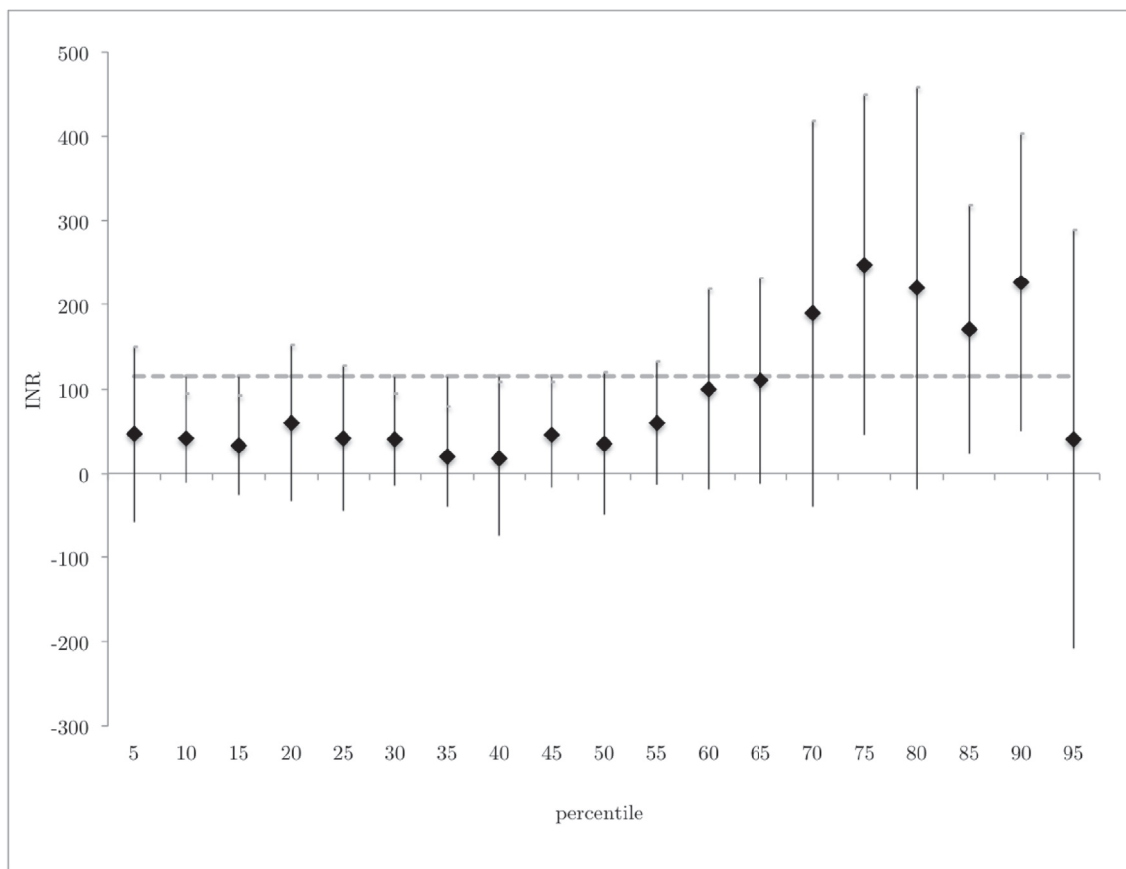


Fig. C.7 Average repayments.



Notes: The figure plots the estimates from bootstrapped quantile regressions (denoted by diamonds) and the respective 95% confidence intervals (vertical lines). The regressions include only district fixed effects. The outcome variable is the average daily profit 13 to 30 weeks after loan disbursement. The horizontal dashed line plots the average effect from an OLS regression. $N = 360$.

Fig. C.8 Quantile regression estimates - gross profit levels.

D. Financial diary questionnaire

Financial Diary

No.	Question	Detail	Response	Instructions
1.	Name of customer			
2.	Customer ID			
	Account Number			
3.	Name of market			
4.	Date			
4.1	Time			
5.	When you came to the market today, how much own cash did you have?			This will include borrowing at village or elsewhere outside the market
6.	Before you came to the market today what was the buying cost of goods brought for sale?	Of buying and preparing self-produced goods brought for sale?		Ask if the respondent has goods that she makes such as food etc.
		Purchased goods brought for sale?		
		Of left over stock from yesterday's sales		
7.	How much cash did you borrow today for buying or making goods for sale before you came to the market?	Amount (Rs.)		
		From whom? Options: 1.....Moneylender 2.....Friend 3.....Family 4.....Other pl. specify		
		Interest rate percentage		Daily.....1 Weekly.....2 Monthly.....3
		No. of days to repay this amount		
8.	How much cash did you borrow today for running your business after you came to the market?	Amount (Rs.)		
		From whom? Options: 1.....Wholesaler 2.....Moneylender 3.....Friend/relative 4.....MFI/Bank 5.....MannDeshi Weekly Market Acct 6.....Other pl. specify		
		Interest rate percentage		Daily.....1 Weekly.....2 Monthly.....3
		No. of days to repay this amount		

9	How much cash did you borrow today for other reasons (not work buying or making goods for sale) from anywhere today	Amount: (Rs.)		
		From whom? Options: 1.....Wholesaler 2.....Moneylender 3.....Friend/relative 4.....MFI/Bank 5.....Manndeshi Weekly Market Acct 6.....Other pl. specify		
		Interest rate percentage		Daily.....1 Weekly.....2 Monthly.....3
		No. of days to repay this amount		
10	What is the total price at which you bought any goods at the market today for sale?	By Cash from own savings (Rs.)		
		By Cash from borrowing (Rs.)		
		On Credit (Rs.)		
11	What is the amount of other business expenses made today (rent, travel to the market etc)			
12	How much did you spend on personal expenses only (not business expenses) such as given to husband/children, food, family expenses etc. totally today?			
13	How much cash did you spend on repayments of loans taken for running business today?	To wholesaler		
		Manndeshi		
		Moneylender		
		Other		
14	How much cash did you spend on repayments of loans taken for other (non-business) expenses today?	To wholesaler		
		Manndeshi		
		Moneylender		
		Other		
15	What is the total amount of cash received from sale of goods at the market today?			
16	What is the buying cost of goods unsold at the end of the day today?	Perishable today (Rs.)		
		Non-perishable (Rs.)		
17	How much cash will you be taking home?			

References

- Armendáriz, B., Morduch, J., 2010. *The Economics of Microfinance*. MIT press.
- Attanasio, O., Augsburg, B., De Haas, R., Fitzsimons, E., Harmgart, H., 2015. The impacts of microfinance: evidence from joint-liability lending in Mongolia. *Am. Econ. J. Appl. Econ.* 7 (1), 90–122.
- Banerjee, A., 2013. Microcredit under the microscope: what have we learned in the past two decades, and what do we need to know? *Annu. Rev. Econ.* 5 (1), 487–519.
- Banerjee, A., Karlan, D., Zinman, J., January 2015a. Six randomized evaluations of microcredit: introduction and further steps. *Am. Econ. J. Appl. Econ.* 7 (1), 1–21.
- Banerjee, A., Duflo, E., Glennerster, R., Kinnan, C., 2015b. The miracle of microfinance? Evidence from a randomized evaluation. *Am. Econ. J. Appl. Econ.* 7 (1), 22–53.
- Barboni, G., 2017. Repayment flexibility in microfinance contracts: theory and experimental evidence on take up and selection. *J. Econ. Behav. Organ.* 142, 425–450.
- Battaglia, M., Gulesci, S., Madestam, A., 2018. Repayment Flexibility and Risk Taking: Experimental Evidence from Credit Contracts. working paper.
- Carpena, F., Cole, S., Shapiro, J., Zia, B., 2012. Liability structure in small-scale finance: evidence from a natural experiment. *World Bank Econ. Rev.* 27 (3), 437–469.
- Crépon, B., Devoto, F., Duflo, E., Parienté, W., 2015. Estimating the impact of microcredit on those who take it up: evidence from a randomized experiment in Morocco. *Am. Econ. J. Appl. Econ.* 7 (1), 123–150.
- Czura, K., 2015. Do Flexible Repayment Schedules Improve the Impact of Microcredit? Evidence from a Randomized Evaluation in Rural India. Technical Report, Munich Discussion Paper.
- Field, E., Pande, R., 2008. Repayment frequency and default in microfinance: evidence from India. *J. Eur. Econ. Assoc.* 6 (2–3), 501–509.
- Field, E., Pande, R., Papp, J., Park, J., 2012. Repayment flexibility can reduce financial stress: a randomized control trial with microfinance clients in India. *PLoS One* 7 (9), e45679.
- Field, E., Pande, R., Papp, J., Rigol, N., 2013. Does the classic microfinance model discourage entrepreneurship among the poor? Experimental evidence from India. *Am. Econ. Rev.* 103 (6), 2196–2226.
- Fischer, G., 2013. Contract structure, risk-sharing, and investment choice. *Econometrica* 81 (3), 883–939.
- Fischer, G., Ghatak, M., 2016. Repayment Frequency in Microfinance Contracts with Present-Biased Borrowers. working paper.
- Ghatak, M., Guinnane, T., 1999. The economics of lending with joint liability: theory and practice. *J. Dev. Econ.* 60 (1), 195–228.
- Giné, X., Karlan, D., 2014. Group versus individual liability: short and long term evidence from Philippine microcredit lending groups. *J. Dev. Econ.* 107, 65–83.
- Karlan, D., Zinman, J., 2009. Observing unobservables: identifying information asymmetries with a consumer credit field experiment. *Econometrica* 77 (6), 1993–2008.
- Karlan, D., Mullainathan, S., 2007. Is Microfinance Too Rigid? *Financial Access Initiative Concept Note*.
- McIntosh, C., 2008. Estimating treatment effects from spatial policy experiments: an application to Ugandan microfinance. *Rev. Econ. Stat.* 90 (1), 15–28.
- Morduch, J., 1999. The microfinance promise. *J. Econ. Lit.* 37 (4), 1569–1614.