

Optimizing Loan Contracting and Marketing Strategies Using Field Experimentation*

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November 11, 2006

Abstract

Managers of microfinance institutions (MFIs) typically lack the information required to optimize loan contract terms and marketing strategies. We outline a replicable randomized-control methodology that addresses MFI contracting and marketing strategies directly, and we present evidence from the first implementation of this methodology. We estimate consumer loan demand sensitivities with respect to interest rates, maturity, and the marketing presentation of loan options. We estimate repayment sensitivity with respect to price, and find uniquely clean evidence of specific market failures: adverse selection and moral hazard. We also measure how changes in MFI contracting and marketing strategy affects the social mission of microfinance programs by altering the demographic composition of clients. The clients in this particular study were very sensitive to maturity increases, certain marketing presentations, and price increases. They were less sensitive to price decreases. The findings suggest that MFIs may have more success balancing profitability and outreach by changing maturities and marketing content than by changing interest rates. But our results are merely suggestive. Our primary contribution is developing a replicable, cost-effective methodology, and we have additional research underway that will help shed light on optimal strategies in other markets. More research is needed and feasible.

* Contact information: dean.karlan@yale.edu and jzinman@dartmouth.edu. Thanks to Nate Goldberg for research assistance, and to the Lender for financing the loans and providing us the data from the experiment. We are grateful to the National Science Foundation (SES-0424067 and CAREER SES-0547898), BASIS/USAID (CRSP), and the Federal Reserve Bank of New York for funding research expenses. The views expressed are those of the authors and do not necessarily represent those of any of the funders or related organizations.

I. Introduction

Helping microfinance institutions (MFIs) reach profitability helps the poor through two channels: directly, because with profits comes sustainability and continued service, and indirectly, because profits attract investment and new entrants, providing greater service and convenience for clients at reduced cost. MFIs that aspire to profitability must, like any other banking entity, set interest rates high enough to cover their costs.

Unfortunately, MFI managers have little information available to guide them in this process. While they can use the experience of other MFIs to set interest rates such that revenues from interest, fees, and other sources are greater than operating and financial costs, this is different from setting *optimal* interest rates. Optimal interest rates maximize MFIs' "double bottom line" of financial and social performance and depend on the extent to which clients (and which *types* of clients) are sensitive to changes in interest rates. In setting optimal interest rates MFI managers must balance the increase in revenue generated by higher interest rates with the decrease in revenue from potential clients who decide not to borrow at higher prices, all the while making sure that the marginal cost of issuing more loans is equal to or lower than the marginal revenue generated. Managers also need to be aware that changes in interest rates affect both portfolio quality and the demographic composition of borrowers ("outreach").

There is a common perception in the microfinance industry that clients are mostly insensitive to interest rates. The argument goes that so long as the MFI's rates are lower than what villagers were paying local moneylenders (which can charge interest rates well in excess of 200 percent), the MFI will be preferred to the moneylender. This argument misses several possibilities. First, many poor individuals do *not* borrow from a moneylender. Second, those who do often do so for short time periods (because of the high cost!). This is not well-suited to longer-term productive investments. Financing for the long term is critical for helping the poor escape poverty. Third, the argument to raise rates is often based on assuming the poor have the highest marginal return to investments (which follows from their starting with lower levels of capital and assuming diminishing marginal returns to capital). This point ignores the many complementarities that are perhaps necessary to generate high returns to capital, such as education and health. Morduch (2000) provides a more thorough elaboration of these above three arguments. Fourth, moneylenders, arguably, provide a higher-quality service than microfinance institutions. Using their local knowledge and hence higher screening, monitoring and enforcement capabilities, they are able to provide more flexible products. Although some microfinance institutions have begun to provide more flexibility than historically, much rigidity remains (Karlan and Mullainathan 2006). The question remains whether pushing microfinance institutions to raise rates in order to generate profits damages their outreach to the poor, and hence impact on poverty.

With nearly 100 million borrowers worldwide (Daley-Harris 2005), clearly many microentrepreneurs are able to pay the interest rates charged by their MFIs. In recent years, however, industry observers and even program managers have expressed concern about the industry's track record of reaching the poorest segment of the population. If poorer clients can be served profitably, finding ways to increase demand among this group may be a win-win both for MFIs' missions and their bottom lines. Lowering interest rates may be one way to increase demand as it widens the pool of microentrepreneurs who are able to borrow profitably at those rates.

There is limited empirical evidence of exactly how sensitive potential clients are. Early studies of consumer credit markets in developed countries showed little or no sensitivity to interest rates among consumer credit borrowers. But this work did not isolate the causal relationship between rates and demand: without some variation in rates that is independent of client and loan officer decisions, the estimated price sensitivity may be driven by unobserved characteristics of the client rather than the rates themselves. Two recent studies in developing country settings deal with this methodological issue and cast serious doubt on the argument that microentrepreneurs will borrow at any price. Dehejia, Montgomery, and Morduch (2005) evaluates the change in demand for credit among SafeSave clients in the Dhaka slums after a rate hike in two of SafeSave's branches. The authors find price elasticities near -1, implying a one percent drop in demand for every one percent increase in interest rates. Karlan and Zinman (2006a), discussed below, uses evidence from a randomized field experiment with a consumer credit lender in South Africa.

We found smaller (but nontrivial) elasticities for interest rate drops but very large elasticities for interest rate hikes. In addition we were able to isolate asymmetric information (adverse selection and moral hazard) effects resulting from changes in interest rates (Karlan and Zinman 2006b). Together, these studies indicate that setting optimal interest rates is more nuanced than often assumed.

We also present findings highlighting that loan maturity (i.e., the total period of time over which the client must pay back the loan) and marketing (product presentation) can have large effects on loan demand. Indeed in our studies they had much larger effects than price reductions (Bertrand, Karlan, Mullainathan, Shafir and Zinman 2005; Karlan and Zinman 2006a). Our results suggest that extending maturities (e.g., from 4 months to 5 months) and improving marketing techniques may be more promising strategies for satisfying MFIs' double bottom line than raising interest rates.

While we note the consumer credit market is distinct from the targeted entrepreneurial lending typically characterized by the microfinance industry we believe the findings here apply equally well to both markets. Money, of course, is fungible, and in developing countries the line between entrepreneurial "investment" and consumption "smoothing" is

rarely clear. Entrepreneurs often use part of their investment borrowing to finance consumption and there is no restriction on consumption loans being used for investment (Menon 2003). Furthermore, the microcredit industry is trending steadily in the direction of the for-profit, more competitive delivery of individual, untargeted credit that characterizes the cash loan market (Robinson 2001; Porteous 2003).

This paper proceeds as follows: Section II describes the South African experiment; Section III presents findings of how interest rate changes affect customer acquisition; Section IV examines how interest rates affect repayment; and Section V discusses how MFIs can use these findings to set optimal interest rates. Section VI presents findings from the same experiment on the effect of non-financial marketing techniques. Section VII concludes by weighing the evidence for credit market failure and considers how MFIs and policymakers can use the findings from the experiment to serve the poor better.

II. The Experiment

The field experiment was conducted in 2003 with a company that competed in the “cash loan” industry in South Africa. Our cooperating Lender offered small, high-interest, short-term, uncollateralized credit with fixed repayment schedules to a “working poor” population.³ Cash lenders focusing on the high-risk market segment typically make one-month term loans at 30 percent interest per month. Rejection is prevalent even at these high rates: the Lender denied 50 percent of new loan applicants. Our Lender was not a microfinance program by traditional definition in other parts of the world in that it has no explicit focus on entrepreneurs or other targeted groups. However, cash lenders in South Africa have acted as substitutes for traditional informal sector moneylenders following deregulation of the usury ceiling in 1992, and they are regulated by the Micro Finance Regulatory Council (MFRC). Aggregate outstanding loans in this market segment equal 38% of non-mortgage consumer credit (Department of Trade and Industry South Africa 2003). The Lender’s median loan size of R1000 (\$150) was 32 percent of its median borrower’s gross monthly income. The Lender has been in business over 20 years and is one of the largest micro-lenders in South Africa, with over 100 branches throughout the country. Our experiment took place in a mix of 86 urban and rural branches throughout the provinces of Kwazulu-Natal, Eastern Cape, Western Cape, and Gauteng.

The experiment involved mailing “pre-qualified,” limited-time loan offers to 58,168 former clients with good repayment histories. The Lender randomized the interest rate offered to each client, with 96 percent of offers below the Lender’s standard rates (with an average discount of 3.2 percentage points), just over one percent of offers at higher than normal rates (with a 1.9 percentage point increase on average), the remaining three percent of offers at the normal interest rate. Clients eligible for maturities longer than four months also received a randomized example of either a four, six or twelve month loan. (This “maturity suggestion” had a big influence on the client’s maturity choice, creating effectively random variation in maturity that we use to measure maturity

³ Our cooperating Lender was merged into a bank holding company in 2005 and no longer exists as a distinct entity.

sensitivity below.) Clients wishing to borrow at the offer rate then went to a branch to apply, as per the Lender's normal operations.

The mailers also included several non-financial marketing features. These included different ways of presenting the offer: number of example loans, whether or not the interest rate was compared to competitors' rates, use of photographs, promotional giveaways, and suggestions of loan uses. By randomizing the marketing features in the same experiment as the interest rates we were able to compare the relative effectiveness of price changes and marketing, and calculate for each marketing feature the equivalent change in interest rates the Lender would have to offer to achieve the same effect on demand.

It is crucial for the analysis that the interest rates, maturity suggestion, and marketing features were randomly assigned. Random assignment assures us that, on average, there is no difference between clients who received a low interest rate and those who received a high interest rate. Therefore we know that the differences in take-up and repayment between the two groups are due to the differences in interest rates. If the Lender were to select one province, for instance, to receive high interest rates and another province to receive low rates, the differences in outcomes could be due to differences in economic conditions between the two provinces. It would be even worse if the Lender were to select only its best clients to receive low interest rates and draw conclusions about clients who receive low rates based on their outcomes.

III. Effect of interest rates on customer acquisition

We found that reductions in interest rates increase demand, though the effect is modest. The take-up elasticity is -0.28, meaning for the Lender a 100-basis-point decrease in the monthly interest rate increases take-up by 3/10 of a percentage point. The mean take-up rate in the experiment was 8.5 percent. Thus a price decrease from the maximum (11.75%) to the minimum (3.25%) rates offered in this sample would increase take-up by 2.6 percentage points, or 31 percent of the baseline take-up rate.

At rates *above* the Lender's standard rates, however, the sensitivity to interest rates was much higher—the elasticity was six times as high among this group, a finding which is more in line with the results from Dehejia, Montgomery, and Morduch (2005). It may be that this is a more appropriate comparison because Dehejia et. al. examined the effect of an interest rate increase, not a decrease.

IV. How do Interest Rates Affect Repayment?

Learning whether higher interest rates lead to higher default rates is not easy. First of all, comparing within firm is impossible when a firm does not vary its interest rates at all. Even if a firm changes its rates, it often does so all at once, and thus interpretation is difficult because other factors (such as macroeconomic conditions and presence of competition) are present. Comparing across firms is problematic for similar reasons: many things beyond just the interest rate differ across firms.

Furthermore, merely noting a correlation between interest rates and default does not allow the lender to understand *why* the relationship exists. Knowing why can help form prescriptions for how to better screen and/or incentivize for loan repayment. Do higher interest rates attract riskier clients in the first place (adverse selection)?, and/or do they weaken incentives for repayment once the loan starts (moral hazard)?

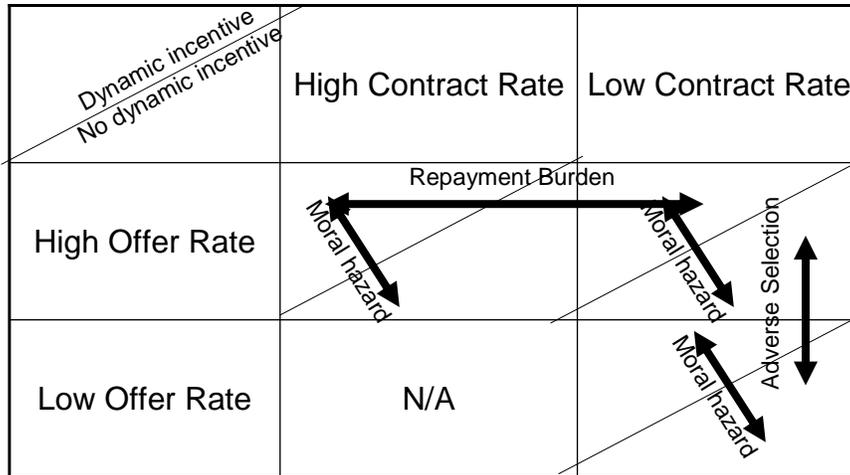
We used a unique feature of the field experiment to disentangle these effects. All of the Lender’s loan underwriting and transactions were conducted face-to-face in the branch network. This allowed us to randomly assign some clients a lower “contract” rate, *after* they had already decided to borrow at the “offer” rate advertised in the direct mail solicitation. This way we could compare the repayment rates of two types of clients who have identical contracts (they pay the same amount each month), but who agreed to borrow at different rates (one at high offer rate and the other at a low offer rate). If there is a difference in their repayment rates between these two types of clients it will be due to adverse selection—indicating only unobservably riskier clients were willing to pay the higher rates.

We can isolate the contribution of *unobservable* risk to repayment behavior because all of our randomizations condition on the Lender’s risk assessment, i.e., on the client’s *observable* risk. Unobservable risk creates inefficiency (missed opportunities) in credit markets if it prevents lenders from pricing (instead of rejecting) the risk of marginal applicants.

We also compare two types of clients who both agreed to borrow at high rates, but one randomly received the surprise lower contract rate. We know that any difference in repayment between these two individuals is not due to selection, since they both opted to borrow at the same interest rate. Instead, we can attribute any difference in default to the repayment burden of higher interest rates or the greater incentive the borrower with the higher monthly payment has to default (moral hazard). We were able to separate moral hazard from the repayment burden by giving some randomly selected clients an extra incentive to repay—offering them their lower interest rate for all loans for a year, so long as they remained in good standing. To the extent repayment increased based on this incentive we could determine that default was within clients’ control and not based on unwieldy monthly payments.

Figure 1 provides the intuition behind the experimental design, and how it allows us to separately measure the presence of adverse selection and moral hazard. The “offer rate” refers to the interest rate on the direct mail solicitation that they received. The “contract rate” refers to the rate given after the client agreed to borrow (which was lower than the contract rate in 40% of the cases). The diagonal lines through the cells refer to the dynamic incentive offered to some clients, whereby they were given the contract rate for either all future loans for one year, conditional on successful repayment, or just on the first loan during our study period.

Figure 1: Basic Intuition Behind Experimental Design



We find evidence for moral hazard and weaker evidence for adverse selection. Together these effects explain a substantial portion of the default in our sample—about 15 to 20 percent. Recalling that moral hazard represents borrowers’ behavioral response to the incentives of the loan contract, our findings provide empirical support that a common feature of microfinance loan contracts—future (and better) loans conditional on successful repayment of current loans—is well placed to mitigate this type of default. MFIs, in fact, are thought to keep borrowers deliberately undercapitalized to increase their incentive to repay the current loan.

Interestingly, we find adverse selection only among female borrowers. Though the evidence is weaker than for moral hazard, the high proportion of women served by the microfinance industry make it worthy of further attention and study in order to understand why.

V. Putting it Together: How MFI Managers Should Set Interest Rates

At this point we have examined how changes in interest rates affect demand, and how they affect default. MFI managers must combine these estimates into revenue terms before they can realistically determine how changes in interest rates will affect their profitability. To estimate the Lender’s optimal interest rate we aggregated the revenue and repayment results over the entire sample that received rates at or below the Lender’s standard ones. We found that while a decrease in the interest rate would reduce default, it would not offset the associated reduction in interest revenue.

The data showed that a 100-basis-point (1 percentage point) decrease in the interest rate will generate higher repayment (conditional on take-up) of R12.2. With a 7.4 percent

average take-up rate, this implies R0.90 more revenue (repayment) per client offered the loan. Interest revenue, however, would decrease by R2.6 less revenue per offered client, for a net revenue decrease of R1.7 per client.

We found that an interest rate increase would be unprofitable for the Lender as well. It would produce a “double whammy” of decreased gross revenues from reduced demand and increased loan losses from changes in default rates.

For managers who desire to determine accurately optimal interest rates through empirical testing, we recommend using a randomized design to ensure that differences in take-up rates are due to interest rates and not to other factors relating to particular sets of clients or areas. This is the common method employed by consumer finance firms in the United States (e.g., direct mail solicitations of credit card offers are often part of randomized-control trials). It would not be informative, for instance, if an MFI allowed its best-performing branches to lower their rates and then measured the increase in take-up. Such a measure would capture the difference between branches (e.g., motivated staff, a good local economy) rather than the difference in interest rates.

We can suggest a few approaches to implementing a randomized evaluation, depending on the MFI’s lending methodology and operating environment. MFIs can randomize interest rates by using scratch cards or specialized PDAs (as we are doing in ongoing projects), or by direct mail if the infrastructure permits (as done in South Africa). If individual-level randomization is not possible, it is feasible to divide the area into small geographic units, such as village or market, in order to minimize the likelihood that individuals offered different interest rates communicate with each other.

While such an evaluation will allow MFIs to determine their optimal interest rate for profitability, it will not yield information about *whom* the MFI is serving. For that one needs the elasticity broken down by poverty level, or better, the take-up rate by poverty level. The elasticity will tell the MFI only the percentage change in number of clients they can expect for a given change in the interest rate. For instance, the elasticity could tell them that lowering the interest rate from 40% to 30% will increase the number of poor clients by 20%. Calculating take-up rates by poverty level will provide information not just on the poor’s sensitivity to interest rates but will allow the program to measure the percentage of the poor who were not reached before who will now be reached by lowering the interest rate. Therefore if an MFI suspects that high interest rates are a reason why its program does not reach the poor in a given area, then it needs to know not just the elasticity but the take-up rate among the poor in order to know how much of the problem is in fact driven by price.

One potential method to determine take-up rates is to have credit officers (using PDAs) collect very simple socioeconomic data on each potential client solicited to participate in the program. With this information the MFI will be able to tell what percentage of potential clients at a given poverty level are opting to borrow at a given interest rate. For group-lending programs and other situations where new clients are solicited in a mass-marketing approach, it may be possible to determine elasticities and take-up rates by

poverty level by using census or survey data to estimate the distribution of income in the area and compare clients who borrow to this distribution.

VI. Maturity and Marketing Effects

Changing price is not the only way to affect loan demand.

We found that loan size sensitivity to *maturity* was much greater than sensitivity to price, and that the maturity effect was statistically significant only among relatively low-income borrowers. Both this finding and the relative inelasticity of demand for credit are consistent with severe liquidity constraints among the relatively poor. This indicates that poorer borrowers are willing to pay substantially more in interest in order to keep their monthly payments lower. It also suggests that extending maturities is an effective way of expanding outreach to relatively poor borrowers, although of course it is critical to account for the effects of changing contract terms on repayment as well as on demand.

Our study leaves several critical questions about maturity sensitivities unanswered. We could not get a precise estimate of whether extending maturities affected repayment in this study, since our sample of borrowers eligible for longer maturities was relatively small. It is also important to study how maturity choice responds when it is randomized directly, rather than through the subtle suggestions (example loans) we used. For example, we only found maturity sensitivities among those who borrowed: there was no effect on takeup. But this could be due to the subtle nature of our “treatment”, which randomized only the suggestion (product presentation in the solicitation) rather than the actual offer made by the loan officer.

We found that takeup did respond strongly to other marketing techniques that we drew from the consumer psychology literature. By including these marketing features in the same direct mailing we were able to compare the effects of each marketing technique to the change in take-up generated by changes in interest rates. In effect, we were able to put a dollar value on marketing.

The marketing features we tested were the number of example loans shown; whether the interest rate offer was compared to a competitor’s rates; use of photographs in the mailing; promotional giveaways; and suggestions for use of a loan. None of the marketing features changed the economic terms of the loan offer. Our core finding was the sheer magnitude of the marketing effects. In some cases we were able to generate increases in take-up that would have required the Lender to drop interest rates essentially to zero to achieve the same effect. It is important to keep in mind that this type of marketing “intervention” is virtually costless for a lender: the approach is not to do *more* marketing, but to do *better* marketing that is informed by cutting-edge social science.

Our result on the description of the number of example loans shown is particularly vivid in demonstrating the importance of psychology. Standard economic theory would predict that showing potential customers several choices should increase take-up because it helps them by providing greater information on the different repayment amounts they could

expect for different loan sizes. Psychologists, however, have shown that when confronted with many choices consumers can find it difficult to make any decision at all. This is borne out in our results; we found substantially higher take-up when we employed a simple description of the loan offer compared to when we showed many choices. Showing just one example loan in the offer letter has roughly the same effect on take-up as decreasing the monthly interest rate by 2.3 percentage points.

We also found a very large effect—driven by male borrowers—from including a female photo on the mailer; the increase in take-up is equivalent to the increase in demand from dropping the monthly interest rate by 4.5 percentage points. Other techniques did not have such strong effects, and the promotional giveaway (“WIN 10 CELLPHONES UP FOR GRABS EACH MONTH!”) even had a *negative* effect on take-up. Psychologists have shown that consumers are astute enough to realize that such giveaways represent a real cost to the bank, and if they do not value the promotional item highly they will be less likely to take up. Inclusion of the promotional feature did as much damage to takeup as *increasing* the interest rate by nearly 4 percentage points. We found no relationship between marketing presentation and repayment. This suggests that effective marketing can increase demand without any adverse effects on repayment.

VII. Conclusion

We have shown, using a field experiment in the South African consumer lending market, that the relationship between interest rates, profits, and the social mission of MFIs is a complicated but important one. Our field experiment has taken some initial steps in the process of mapping the sensitivity to interest rates among potential microfinance clients. Our results suggest that MFI borrowers have small demand price sensitivity with respect to price decreases, but very large demand price sensitivity to price increases. We also find important repayment sensitivities. Higher interest rates have an independent, negative effect on repayment that stems from asymmetric information problems. The implication in this particular study is that the MFI needed to think twice (about dramatically reduced demand, and significantly reduced repayments) before raising interest rates. Our Lender would have lost both profits and outreach by raising rates.

Our study also has generated clear empirical evidence of specific credit market failures. We found evidence of moral hazard and adverse selection and estimate that 15 to 20 percent of default can be attributed to these asymmetric information problems. This helps explain the prevalence of severe credit constraints (especially among poorer borrowers) even in a market that specializes in financing high-risk borrowers at very high interest rates. The strong evidence of moral hazard in particular suggests that even where MFIs are already using incentive-based contracts to mitigate moral hazard there may yet be profitable and welfare-enhancing opportunities to refine dynamic contracting schemes. While we investigated the effectiveness of future interest rate incentives, other options could be explored in a similar manner, including loan size, liability options (group or individual), and collateral requirements.

The other key findings in our study suggest that non-price attributes of the loan contract, and loan marketing, may in fact be the key to improving sustainability and outreach. In our study the Lender could not have improved either profitability or outreach much by changing interest rates. On the other hand, extending maturity and effective marketing had very large impacts on demand. Moreover extending maturities was a particularly effective way to increase lending to relatively poor borrowers.

Much work remains to be done of course.

We stress that the setting of this particular study is not necessarily comparable to other markets. The microfinance industry can greatly benefit from further evidence from a variety of settings on the sensitivity to interest rates among potential clients, and by subgroup including gender and poverty level. In particular it will be worthwhile to replicate this experiment among lenders who target entrepreneurial lenders and have an explicit targeting focus.

We also stress that such research is feasible and valuable for MFIs. We are now conducting randomized-control trials on loan and savings product pricing and marketing with several MFIs, in markets around the world. Randomized-control trials are readily adapted to the operational constraints and context of individual markets and MFIs; e.g., we are currently implementing several randomizations using PDAs in door-to-door and marketplace-based loan marketing.

Our findings also suggest that MFIs could more efficiently serve the poor by integrating risk assessment with risk-based loan contracts to allow for flexible contracts that vary loan terms based on the profile of the individual applicant. Credit scoring methodologies could be used to implement this comprehensive risk-based assessment and move beyond a simple accept/reject decision.

To form a complete picture of profitability, however, MFIs need to consider the fixed costs of their operations as well. The extent to which MFIs can increase their profitability by changing interest rates depends not just on their current expense ratios across all borrowers, but on the particular cost structures for each program. If a program has excess capacity in its existing centers and branches it could serve additional customers at very little marginal cost, whereas a program which is already stretching its existing staff and facilities will find it more expensive to serve additional clients.

Our most important message is that MFIs and other financial institutions can address the challenge of balancing sustainability and outreach by working with researchers to design and implement randomized-control trials. This approach produces evidence that informs policy and best practice debates, and helps MFIs optimize their loan contracting and marketing strategies.

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