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The miracle of microfinance?
Evidence from a randomized evaluation

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The miracle of microfinance? Evidence from a randomized evaluation[*]

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Abstract

This paper reports on the first randomized evaluation of the impact of introducing the standard microcredit group-based lending product in a new market. In 2005, half of 104 slums in Hyderabad, India were randomly selected for opening of a branch of a particular microfinance institution (Spandana) while the remainder were not, although other MFIs were free to enter those slums. Fifteen to 18 months after Spandana began lending in treated areas, households were 8.8 percentage points more likely to have a microcredit loan. They were no more likely to start any new business, although they were more likely to start several at once, and they invested more in their existing businesses. There was no effect on average monthly expenditure per capita. Expenditure on durable goods increased in treated areas, while expenditures on "temptation goods" declined. Three to four years after the initial expansion (after many of the control slums had started getting credit from Spandana and other MFIs), the probability of borrowing from an MFI in treatment and comparison slums was the same, but on average households in treatment slums had been borrowing for longer and in larger amounts. Consumption was still no different in treatment areas, and the average business was still no more profitable, although we find an increase in profits at the top end. We found no changes in any of the development outcomes that are often believed to be affected by microfinance, including health, education, and women's empowerment. The results of this study are largely consistent with those of four other evaluations of similar programs in different contexts. JEL codes: O16, G21, D21

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1   Introduction

Microfinance institutions (MFIs) have expanded rapidly over the last 10 to 15 years: according to the Microcredit Summit Campaign (2012), the number of very poor families with a microloan has grown more than 18-fold from 7.6 million in 1997 to 137.5 million in 2010.

Microcredit has generated considerable enthusiasm and hope for fast poverty alleviation. In 2006, Mohammad Yunus and the Grameen Bank were awarded the Nobel Prize for Peace, for their contribution to the reduction in world poverty. In 2009, the Consultative Group to Assist the Poor (CGAP), an international organization housed at the World Bank and dedicated to accelerating financial inclusion, cited the following as contributions of microfinance for which there was already evidence: eradication of poverty and hunger, universal primary education, the promotion of gender equality and empowerment of women, reduction in child mortality, and improvement in maternal health. CGAP was far from alone in its enthusiasm.

The possibility of a "win-win" opportunity, in which the poor could be given the means to pull themselves out of poverty and microfinance organizations could make a profit (potentially a big one, as the successful IPO of Compartamos in Mexico, or SKS in India, have demonstrated) exerts a powerful attraction on policymakers, funding agencies, and academics alike. In the last several years, however, the enthusiasm for microcredit has been matched by an equally strong backlash . For instance, a November 2010 article in *The New York Times*, appearing in the wake of a rash of reported suicides linked to MFI over-indebtedness, quotes Reddy Subrahmanyam, an official in Andhra Pradesh, accusing MFIs of making "hyperprofits off the poor." He argues that "the industry [has] become no better than the widely despised village loan sharks it was intended to replace.... The money lender lives in the community. At least you can burn down his house. With these companies, it is loot and scoot" (Polgreen and Bajaj 2010). MFIs have come under attack in India (in Andhra Pradesh, an ordinance making it difficult for them to operate has pushed several to the brink of bankruptcy), in Latin America (with the "No Pago" movement), and even in Bangladesh (with a standoff between Yunus and the government over the leadership of the Grameen Bank). Not unlike credit cards companies or payday lenders in the US, MFIs are now accused of pushing their clients into debt traps. The stellar repayment rates, once heralded as the great success of microcredit, are now cited as examples of the MFIs'

unscrupulous methods.

What is striking about this debate is the relative paucity of evidence to inform it. Anecdotes about highly successful entrepreneurs or deeply indebted borrowers tell us nothing about the effect of microfinance on the average borrower, much less the effect of having access to it on the average household. Even representative data about microfinance clients and non-clients cannot identify the causal effect of microfinance access, because clients are self-selected and therefore not comparable to non-clients. Microfinance organizations also purposely choose some villages and not others. Difference-in-difference estimates can control for fixed differences between clients and non-clients, but it is likely that people who choose to join MFIs would be on different trajectories even absent microfinance. This invalidates comparisons over time between clients and non-clients (see Alexander-Tedeschi and Karlan 2007).

These issues make the evaluation of microcredit particularly difficult, and there is so far no consensus among academics on its impact. For example, Pitt and Khandker (1998) use the eligibility threshold for getting a loan from Grameen bank as a source of identifying variation in a structural model of the impact of microcredit, and find large positive effects, especially for women. However, Jonathan Morduch (1998), and Roodman and Morduch (2010) criticize the approach, pointing out among other issues that there is in fact no discontinuity in the probability to borrow at that threshold.[1]

As early as 1999, Morduch wrote that "the 'win-win' rhetoric promising poverty alleviation with profits has moved far ahead of the evidence, and even the most fundamental claims remain unsubstantiated." In 2005, Beatriz Armendáriz and Morduch reiterated the same uncertainty in their book *The Economics of Microfinance*, noting that the relatively few carefully conducted longitudinal or cross-sectional impact studies yielded conclusions much more measured than MFIs' anecdotes would suggest, reflecting the difficulty of distinguishing the causal effect of microcredit from selection effects. These cautions were repeated in the book's second edition in 2010 .

Given the complexity of this identification problem, the ideal experiment to estimate the effect

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[1]Kaboski and Townsend (2005) use a natural experiment (the introduction of a village fund whose size is fixed by village) to estimate the impact of the amount borrowed and find impacts on consumption, but not investment. This is a government-provided form of credit and differs in a number of ways from the standard microcredit product.

of having access to microcredit is to randomly assign microcredit to some areas, and not others, and compare outcomes in both. Randomization ensures that, on average, the only difference between residents is the greater ease of access to microcredit of those in the treatment area.[2]

In this paper we report on the first randomized evaluation of the effect of the canonical group-lending microcredit model, which targets women who may not necessarily be entrepreneurs.[3] This study also follows the households over the longest period of any study (it followed households for about three to 3.5 years after the introduction of the program in their slums areas), which is necessary since many impacts may be only expected to surface over the medium run. A number of recent papers have reported on subsequent randomized evaluations of similar programs in Morocco (Crépon et al., 2011), Bosnia-Herzegovina (Augsburg et al., 2012), Mexico (Angelucci et al., 2012) and Mongolia (Attanasio et al. 2011). We will compare their results to ours in the last section of this paper.[4]

The experiment was conducted as follows. In 2005, 52 of 104 poor neighborhoods in Hyderabad were randomly selected for opening of an MFI branch by one of the fastest-growing MFIs in the area, Spandana, while the remainder were not. Hyderabad is the fifth largest city in India, and the capital of Andhra Pradesh, the Indian state were microcredit has expanded the fastest. Fifteen to 18 months after the introduction of microfinance in each area, a comprehensive household survey was conducted in an average of 65 households in each neighborhood, for a total of about 6,850 households. In the meantime, other MFIs had also started their operations in both treatment and comparison households, but the probability of receiving an MFI loans was still 8.8 percentage points (48%) higher in treatment areas than in comparison areas (27.1% borrowers in treated areas versus 18.3% borrowers in comparison areas). Two years after this first endline survey, we surveyed the same households once more. By that time, both Spandana and other organizations had started lending in the treatment and control groups, so the fraction of households borrowing from microcredit organizations was not significantly different (38.5% in

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[2]An alternative to measure the impact of borrowing is to randomize microcredit offer among applicants. This approach was pioneered by Karlan and Zinman (2009), which uses individual randomization of the "marginal" clients in a credit scoring model to evaluate the impact of consumer lending in South Africa, and find that access to microcredit increases the probability of employment. Karlan and Zinman (2011) use the same approach to measure impact of microcredit among small businesses in Manila.

[3]The two studies mentioned in Footnote 2 evaluate slightly different programs: consumer lending in the case of Karlan and Zinman (2009), and "second generation" individual liability loans to existing entrepreneurs in the case of Karlan and Zinman (2010).

[4]See Banerjee (2013) for a comprehensive summary of the recent literature on microcredit.

treatment and 33% in control). But households in treatment groups had larger loans and had been borrowing for a longer time period. This second survey thus gives us an opportunity to examine some of the longer-term impacts of microcredit access on households and businesses.

To frame the analysis, we propose a model where a household may wish to acquire lumpy investment (a durable good, or an asset for a business). One key result of the model is that households who have access to microcredit may sacrifice short- or even medium-term consumption when microcredit becomes available in order to get the durable good, or to invest in a business. Other households may decide to expand their labor supply. Non-durable consumption may thus initially fall, and even total consumption may not increase. Of course, if the household has invested in a profitable business, we could eventually expect consumption to increase: this underscores the importance of following households over a long enough period of time.

We examine the effect consumption, new business creation, business income, etc., as well as measures of other human development outcomes such as education, health and women's empowerment. At the first endline, we see no difference in monthly per capita consumption and monthly non-durable consumption. We do see significant positive impacts on the purchase of durables. There is evidence that this is financed partly by an increase in labor supply and partly by cutting unnecessary consumption: households have reduced expenditures on what that they themselves describe as "temptation goods."

Thus, in our context, microfinance plays a role in helping households make different intertemporal choices in consumption. This is not the only impact that is traditionally expected from microfinance, however. The primary engine of growth that it is supposed to fuel is business creation. Fifteen to 18 months after gaining access, households are no more likely to be entrepreneurs (that is, have at least one business), but they are more likely to start more than one business, and they invest more in the businesses they do have (or the ones they start). There is an increase in the average profits of the businesses that were already in existence before microcredit, but this is entirely due to very large increases in the upper tail. At every quantile between the 5th and the 95th percentile, there is no difference in the profits of the businesses. The median marginal new business is both less profitable and less likely to have even one employee in treatment than in control areas.

After three years, when microcredit is available both in treatment and control groups but

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treatment group households have had the opportunity to borrow for a longer time, businesses in the treatment groups have significantly more assets, and business profits are now larger for businesses above the 85th percentile. However, the average business is still small and not very profitable. In other words, contrary to most people's belief, to the extent microcredit helps businesses, it may help the larger businesses more. There is still no difference in average consumption.

We do not find any effect on any of the women's empowerment or human development outcomes either after 18 or 36 months. Furthermore, almost 70% of eligible households do not have an MFI loan, preferring instead to borrow from other sources, if they borrow (and most do).

Our results find a strong echo in the four other studies that look at similar programs in different contexts. This gives us confidence in the robustness and external validity of our findings. In short, microcredit is not for every household, or even most households, and it does not lead to the miraculous social transformation some proponents have claimed. Its principal impact seems, perhaps unsurprisingly, to allow some households to sacrifice some instantaneous utility (temptation goods or leisure) to finance lumpy purchases, either for their home or in order to establish or expand a business.

2 Experimental Design and Background

2.1 The Product

Until the major crisis in Indian microfinance in 2010, Spandana was one of the largest and fastest growing microfinance organizations in India, with 1.2 million active borrowers in March 2008, up from 520 borrowers in 1998-9, its first year of operation (MIX Market, 2009). From its birthplace in Guntur, a dynamic city in Andhra Pradesh, it has expanded across the state and into several others.

The basic Spandana product is the canonical group loan product, first introduced by the Grameen Bank. A group is comprised of six to ten women, and 25-45 groups form a "center." Women are jointly responsible for the loans of their group. The first loan is Rs. 10,000, about $200 at market exchange rates, or $1,000 at 2007 purchasing power parity (PPP)-adjusted exchange

rates (World Bank, 2007).[5] It takes 50 weeks to reimburse principal and interest rate; the interest rate is 12% (non-declining balance; equivalent to a 24% APR). If all members of a group repay their loans, they are eligible for second loans of Rs. 10,000-12,000; loan amounts increase up to Rs. 20,000.

Unlike other microfinance organizations, Spandana does not require its clients to start a business (or pretend to) in order to borrow: the organization recognizes that money is fungible, and clients are left entirely free to choose the best use of the money, as long as they repay their loan. Also unlike other microlenders, most notably Grameen, Spandana does not insist on "transformation" in the household. Spandana is primarily a lending organization, not directly involved in business training, financial literacy promotion, etc.

Eligibility is determined using the following criteria: clients must (a) be female,[6] (b) be aged 18 to 59, (c) have resided in the same area for at least one year, (d) have valid identification and residential proof (ration card, voter card, or electricity bill), and (e) at least 80% of women in a group must own their home. Groups are formed by women themselves, not by Spandana. Spandana does not determine loan eligibility by the expected productivity of the investment, although selection into groups may screen out women who cannot convince fellow group-members that they are likely to repay.

2.2   Experimental Design

Spandana initially selected 120 areas (identifiable neighborhoods, or *bastis*) in Hyderabad as places in which they were interested in opening branches. These areas were selected based on having no preexisting microfinance presence, and having residents who were desirable potential borrowers: poor, but not "the poorest of the poor." Areas with high concentrations of construction workers were avoided because they move frequently which makes them undesirable as microfinance clients. While the selected areas are commonly referred to as "slums," these are permanent settlements with concrete houses and some public amenities (electricity, water, etc.).

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[5]In 2007 the PPP exchange rate was $1=Rs. 9.2, while the market exchange rate was $1≃Rs. 50. All following references to dollar amounts are in PPP terms unless noted otherwise.

[6]Spandana also offers an individual-liability loan. Men are also eligible for individual-liability loans, and individual borrowers must document a monthly source of income, but the other criteria are the same as for joint-liability loans. 96.5% of Spandana borrowers were female in 2008 (Mix Market, 2009). Spandana introduced the individual-liability loan in 2007; very few borrowers in our sample have individual-liability loans.

Within eligible neighborhoods, the largest ones were not selected for the study, since Spandana was keen to start operations there. The population in the neighborhoods selected for the study ranges from 46 to 555 households.

In each area, we conducted a small baseline neighborhood survey in 2005, collecting information on household composition, education, employment, asset ownership, expenditure, borrowing, saving, and any businesses currently operated by the household or stopped within the last year. We surveyed a total of 2,800 households in order to obtain a rapid assessment of the baseline conditions of the neighborhoods. However, since there was no existing census, and the baseline survey had to be conducted very rapidly to gather some information necessary for stratification before Spandana began their operations, the households were not selected randomly from a household list: instead field officers were asked to map the area and select every n^{th} house, with n chosen to select 20 household per area. But this procedure was not very rigorous, and we are not confident that the baseline is representative. Thus, the baseline survey was used as a basis for stratification, a descriptive analysis below, and area-level characteristics are used as control variables.[7] Beyond this, we do not use the baseline survey in the analysis that follows.

After the baseline survey, but prior to randomization, sixteen areas were dropped from the study because they were found to contain large numbers of migrant-worker households. Spandana (like other MFIs) has a rule that loans should only be made to households who have lived in the same community for at least one year because the organization believes that dynamic incentives (the promise of more credit in the future) are more important in motivating repayment for these households. The remaining 104 areas were grouped into pairs of similar neighborhoods, based on average per capita consumption and per-household debt, and one of each pair was randomly assigned to the treatment group.[8]

Table 1 uses the baseline sample to show that treatment and comparison areas did not differ in their baseline levels of demographic, financial, or entrepreneurship characteristics in the baseline survey. This is not surprising, since the sample was stratified according to per capita consumption, fraction of households with debt, and fraction of households who had a business.[9]

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[7]Omitting these controls does not affect the results.

[8]Pairs were formed to minimize the sum across pairs A, B (area A avg loan balance – area B avg loan balance)^2 + (area A per capita consumption – area B per capita consumption)^2. Within each pair one neighborhood was randomly allocated into treatment.

[9]Since the sample of households was not random at baseline, we also verify that the households surveyed at

The baseline data also provides a snapshot of households' characteristics prior to Spandana's expansion, which we discuss further below.

Spandana then progressively began operating in the 52 treatment areas, between 2006 and 2007. Note that in the intervening periods, other MFIs also started their operations, both in treatment and comparison areas, and we did nothing to stop that. We will show below that there is still a significant difference between MFI borrowing in treatment and comparison groups.

To create a proper sampling frame for the endline, we undertook a comprehensive census of each area in early 2007, and included a question on borrowing. The census revealed low rates of MFI borrowing even in treatment areas, so the endline sample consisted of households whose characteristics suggested high likelihood of having borrowed: households who had resided in the area for at least three years and contained at least one woman aged 18 to 55. Spandana borrowers identified in the census were oversampled, and the results presented below correct for this oversampling so that the results are representative of the population as a whole. Since they were not representative, baseline households were not purposely resurveyed in the follow-up. We began the endline survey in August 2007 and ended it in April 2008. In each area, this first endline survey was conducted at least 12 months after Spandana began disbursing loans, and generally 15 to 18 months after. The overall sample size for the endline survey was 6,864 households.

Two years later, in 2009-2010, we undertook a second endline survey, following up on the same households, asking the same set of questions as in 2007-2008 to insure comparability. Appendix Table 2, Panel A shows, the re-contact rate at endline 2 for household initially interviewed at endline 1 was very high, at 89.9% in the treatment group and 90.2% in the control group. Panel B shows average characteristics of the recontacted versus attrited households. The samples do not differ significantly along most dimensions. However, those who attrited had higher per capita expenditure at endline 1, by Rs. 131 (column 1). Attritors were five percentage points less likely to have an MFI loan at endline 1 (column 5), and 1.5 percentage points less likely to have a business created in the one year prior to endline 1 (column 7). This is consistent with businesses and microloans being associated with lower mobility, and higher consumption/permanent income

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endline are similar in treatment and control groups, in terms of a number of characteristics which are fixed over time (Table A1).

being associated with higher mobility. Panel C shows that one important characteristic differentially predicts attrition in treatment versus control, namely MFI borrowing: the attrited sample is nine percentage points less likely than the non-attrited sample to have had an MFI loan in treatment areas. This suggests that Spandana was effective in either targeting households that were going to stay put, or convincing them not to leave the area.[10]

2.3 The context

Table 1 shows a snapshot of households from the 104 sampled areas in 2005. Recall that these numbers need to be viewed with some caution, as the households sampled at baseline were not necessarily representative of the area as a whole, and were not purposely resurveyed at endline. At baseline, the average household (averaging over treatment and control areas) was a family of five, with monthly expenditure of just under Rs. 5350, or $540 at PPP-adjusted exchange rates ($108 per capita) (World Bank, 2005). A majority of households (67%) lived in a house they owned, and 27% in a house they rented.[11] Almost all of the 7 to 11 year olds (98%), and 86% of the 12 to 15 year olds, were in school.

There was almost no MFI borrowing in the sample areas at baseline. However, 68% of the households had at least one outstanding loan. The average amount outstanding was Rs. 21,658 (median Rs. 11,000), and the average interest rate was 3.89% per month. Most loans were taken from moneylenders (50%), friends or neighbors (25%), and family members (13%). Commercial bank loans were very rare (3%).

Although business investment was not commonly named as a motive for borrowing, 24% of households ran at least one small business at the baseline, compared to an OECD-country average of 12% who say that they are self-employed. However, these businesses were *very* small. Only 7.5% had any employees; typical assets included sewing machines, tables and chairs, balances and

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[10]While attrition rates are comparable in treatment and comparison areas, the differential attrition according to propensity to borrow from an MFI is potentially concerning, not only for the analysis of endline 2 data, but possibly for endine 1 as well: endline 1 data may suffer from attrition, although we do not observe it since we do not have a baseline. To address this concern, we have re-estimated all the regressions below with a correction for sample selection inspired by Dinardo, Fortin and Lemieux (2010), where we re-weight the data using the inverse of the propensity to be observed at endline 2, so that the distribution of observable characteristics (at endline 1) among households observed at endline 2 resembles that in the entire endline 1 sample. We then apply the same weights to endline 1 data (implicitly assuming a similar selection process between the onset of microfinance and endline 1). The results, available upon request, are very similar to what we present here.

[11]The remaining 6% had missing information to the home ownership question.

pushcarts, and 15% of businesses had no assets whatsoever. Average revenues were approximately Rs. 9,900 ($980 in PPP terms) per month on average. Business income (i.e., profits) were approximately Rs. 3,300 ($325 at PPP). Total household income, from entrepreneurship, wage labor, irregular labor, etc. averaged approximately Rs. 4,840. Forty-two percent of working individuals worked for a wage.

Baseline data revealed more limited use of consumption smoothing strategies other than borrowing: 34% of the households had a savings account, and only 23% had a life insurance policy. Almost none (0.03%) had any health insurance. Forty percent of households reported spending Rs. 550 ($54) or more on a health shock in the last year; 50% of households who had a sick member had to borrow for a health-related purpose.

Growth between 2005 and 2010

Table 2, shows some of the same key statistics for the endline 1 and endline 2 (EL1 and EL2) samples in the control group.

Comparing the control baseline sample (2005) with the control households in the EL1 (2008) and EL2 (2010) samples reveal rapid secular growth in Hyderabad over 2005-2010.[12] Average household consumption rose from Rs. 5,485 to Rs. 7,662 in 2007 and Rs. 11,497 (all expressed in 2007 rupees). in EL2. There was a 12 percentage point increase in the likelihood the family's house was waterproof between baseline and EL2 (68% versus 56%). Eighty-one percent of families owned a color TV at EL2, up 20 percentage points from two years before and 50 percentage points from the baseline. The fraction owning a cellphone increased from 17% at baseline to 64% at EL1 and 86% at EL2.

The percentage of households who ran at least one small business increased from 24% at baseline to 34% at EL1 and 42% at EL2. Forty-three percent of these businesses were primarily operated by a woman. However, the businesses remain very small: only 9% (10%) had any employees at EL1 (EL2). Yet despite remaining very small in terms of employment, average revenues rose from approximately Rs. 9,900 ($980 in PPP terms) per month on average at baseline to just over Rs. 11,000 at EL1 and almost 16,000 at EL2. At EL2, business owners

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[12]While the comparison may not be perfect since the baseline survey was not conducted on the same sample as the endline, the growth between EL1 and EL2 is for the same set of households, using the same survey instruments, and thus gives us a good sense of the dynamism of this economy.

reported business income (profits) of almost Rs. 5,000 (~$540 at PPP), up from about Rs. 2,500 ($275) at EL1. (These profit estimates do not account for the cost of the proprietors' time.)

The fraction of households with at least one outstanding loan rose from 68% at baseline to 89% in EL1 and 90% in EL2. The use of consumption-smoothing strategies other than borrowing also increased. From 34%, the fraction of households with a savings account skyrocketed to 82% at EL1 and 85% at EL2, and the fraction with health insurance rose from almost 0 at baseline to 12% at EL1 and 76% at EL2, likely due to the expansion of the government's RSBY health insurance program from those below the poverty line. Nonetheless, at EL1 (EL2), 64% (78%) of households reported spending Rs. 500 or more on a health shock in the last year. The fraction of households who had a sick member that had to borrow held fairly constant: 50% at baseline to 53% at EL1 and 45% at EL2.

2.4 Treatment impact on MFI borrowing and borrowing from other sources

Treatment communities were randomly selected to receive Spandana branches, but other MFIs also started operating both in treatment and comparison areas. We are interested in testing the impact of *microcredit*, not only borrowing from Spandana. Table 3 Panel A shows that, by the first endline, MFI borrowing was indeed higher in treatment than in control slums, although borrowing from other MFIs made up for part of the difference in Spandana borrowing. Households in treatment areas are 13.3 percentage points more likely to report being Spandana borrowers–18.5% versus 5.2% (Table 3 Panel A, column 2). The difference in the percentage of households saying that they borrow from any MFI is 8.8 points (Table 3 Panel A, column 1), so some households who ended up borrowing from Spandana in treatment areas would have borrowed from another MFI in the absence of the intervention. While the absolute level of total MFI borrowing is not very high, it is about 50% higher in treatment than in comparison areas. Columns 5 and 7 show that treatment households also report significantly more borrowing from MFIs (and from Spandana in particular) than comparison households. Averaged over borrowers and non-borrowers, treatment households report Rs. 1,391 more borrowing from Spandana than do control households, and Rs. 1,355 more from all MFIs.

While both the absolute take up rate and the implicit "first stage" are relatively small, this appears to be similar to what was found in other evaluations of the impact of access to

microfinance, despite the different contexts. In rural Morocco, Crépon et al. (2011) find that the probability of having any loan from the MFI Al Amana in areas which got access to it is 10 percentage points, whereas it is essentially zero in control, and moreover, since there is really no other MFI, this represents the total increase in microfinance borrowing. In Mexico, Angelucci, Karlan and Zinman (2012) find an increase in 10 percentage points in the probability of borrowing from the MFI Compartamos in areas that got access to the lender, relative to a base of five percentage points in the control (they don't report the probability to borrow from any other MFI). In Mongolia, Attanasio et al. (2011) find a much larger increase, 48 percentage points, but this is among a sample that had already expressed interest in obtaining a loan from the lender and formed a potential borrowing group before randomization.[13]

The fairly low take up rate in these difference contexts is in itself is a perhaps surprising result, given the high levels of informal borrowing in these communities and the purported benefits of microcredit over these alternative forms of borrowing. . In all cases, except when the randomization was among those who had already expressed explicit interest in microcredit, only a minority of "likely borrowers" end up borrowing.

Table 3 also displays the impact of microfinance access on other forms of borrowing. A sizable fraction of the clients report repaying a more expensive debt as a reason to borrow from Spandana, and we do indeed see some action on this margin, but column 3 shows that the share of households who have some informal borrowing–defined as borrowing from family, friends, moneylenders and goods purchased on credit–goes down by 5.2 percentage points in treatment areas, but bank borrowing is unaffected. The point estimate of the amount borrowed from informal sources is also negative, suggesting substitution of expensive borrowing with cheaper MFI borrowing (an explicit objective of Spandana), and the point estimate, though insignificant, is quite similar in absolute value to the increase in MFI borrowing (column 8). However, given the high level of informal borrowing, this corresponds to a decline of only 2.6%: When we examine the distribution of endline 1 informal borrowing, in Figure 1, informal borrowing is significantly lower in treatment areas from the 30th to 65th percentiles.

After the end of the first endline, following our initial agreement with Spandana, the control

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[13]The last study with which we consider, Augsburg et al. (2012), is not strictly comparable to ours because the sampling frame is made up of people who had applied for a loan. But even there the difference in borrowing rates between treatment and control group is fairly low, only 20 percentage points.

slums were "released," and Spandana was free to expand in these areas. Other MFIs also continued their expansion. However, two years later a significant difference still remained between Spandana slums and others: Table 3 Panel B shows that 18% of the households in the treatment slums borrowed from Spandana, against 11% in the control slums. Other MFIs continued to expand both in the former treatment and control slums, and MFI lending overall was almost the same in the treatment and the control group. By the second endline survey, 33.1% of households had borrowed from an MFI in the former control slums, and 33.7% in the treatment slums. Since lending started later in the control group, however, households in the treatment group had on average been borrowing for longer than those in the control group, which is reflected in the fact that they had completed more loan cycles. On average, there was a difference of 0.13 loan cycles between the treatment and the control households at endline 2 (column 10), which is almost unchanged from endline 1. . The key difference between treatment and control group at endline 2 is thus the length of access to microfinance. Since microfinance loans grow with each cycle, treatment households also had larger loans. Among those who borrow, there was by the endline 2 a significant difference of Rs. 2,344 (or 14%) in the size of the loans (column 6). Since about one third of households borrow, this translates into an (insignificant) difference of about Rs. 869 in average borrowing (column 5).

3   Theory

Since the stated goal of many MFIs is to help their client escape poverty by investing in their own businesses, evaluations of microfinance programs (including this one) typically focus on business investments and overall consumption per capita as key measures of success. However, to the extent that microfinance successfully relaxes credit constraints, we may see households sacrifice short-run non-durable consumption to invest in durable goods (either for home consumption or for their businesses). The short-run impact (as people take the loan and then repay it) may therefore be to reduce non-durable consumption or even overall consumption. The increase in welfare would either come from the utility arising from the durable consumption or, in the longer run, if the investment makes the borrower's businesses more profitable and that feeds into increases in consumption. This suggests that if consumption is a main outcome of interest, we

need to pay attention to its composition. Also, a relatively long horizon may be necessary to determine the full effects. The simple model below clarifies this intuition in order to provide a conceptual frame to our analysis.

3.1 Basic Model

A consumer lives for $T \gg 2$ periods. We assume just for expositional convenience that T is even. She consumes two goods which we will call non-durable and durable. The non-durable is fully divisible and is consumed in the period it is bought. Denote non-durable consumption by c_n. The durable lasts for two periods, and yields durable services in both periods. The durable is indivisible and costs an amount c_d, and yields durable services of ac_d in each period. Moreover there are no additional benefits from owning a second durable. Assume that durable services and non-durables are perfect substitutes in the sense that the consumer's per-period utility function is $u(c)$, where $c = c_n$ if she has not purchased the durable in the current or previous period and $c = c_n + ac_d$ otherwise. Assume that $0 < a < 1$. Therefore in the current period purchasing the durable leads to a net loss in flow utility, but it might still be optimal because a could be greater than $1/2$. The consumer does not discount and the future and therefore maximizes total of present and future utility.

The consumer earns a labor income of y in units of the non-durable every period and there is no savings or investment, so the total amount y is spent every period. However, the household has the option of borrowing up to an amount b^{max} for one period at a gross interest rate r. We assume, in keeping with the microfinance application, that the person cannot borrow again till after the loan is fully repaid. In other words, if the borrower borrows in period s, she will have to repay in period $s + 1$ and can only borrow again in period $s + 2$. Finally we assume that the durable costs more than the maximum possible amount of debt: $c_d > b^{max}$

Given this, the consumer's problem in each period depends just on whether she already owns the durable and her existing stock of debt. If she owns the durable she has no reason to buy it in the current period; if she has debt then she has to repay it in the current period and cannot borrow until the next period.

3.2 Analysis of the model

The structure of this model yields a very useful simplification. In the Theoretical Appendix we show that the consumer's decision can be analyzed by simply looking at the decision in the first two periods, assuming that there are no further periods. The decision in the first period will be repeated in all subsequent odd periods and what happens in period 2 will be repeated in all subsequent even periods.

This is very convenient because we can study the decision diagrammatically. In Figure 2, the horizontal axis represents consumption in period 1 and the vertical axis is consumption in period 2. UU and $U'U'$ are two potential indifference curves. They both have slope $1/\delta$ when they intersect the 45 degree line, OO' at points E and E'. The point E represents the endowment, the vector (y, y). The line EF, which has the slope r, represents the set of options open to the consumer if he borrows in period 1 but does not purchase the durable. The distance along the horizontal direction from E to F represents b^{max}, the maximum possible loan size. As drawn, we are assuming that $r < 1/\delta$, which gives the consumer a reason to borrow–the highest indifference curve reachable on EF is typically higher that the one through E.

The other option is to buy the durable. The point A represents the case of just buying the durable and not borrowing, i.e. it is the point $(y - (1 - a)c_d, y + ac_d)$. The line segment AB represents the set of choices for someone who borrows and buys the durable. The horizontal distance from A to B is b^{max} and the slope of the line is r. As drawn, it is clear that the point B lies on the highest indifference curve that is available and the consumer will choose both to borrow and to buy the durable. However, her first-period consumption is still lower than at point E. Non-durable consumption and even total consumption goes down in the first period as a result of purchasing the durable.

However, this is not the only possibility. The point B' represents what happens when b^{max} is higher (F' is the corresponding point where the consumer borrows without purchasing the durable). In this case, borrowing and buying the durable is still the best option, but total consumption goes up in both periods. Finally, the point B'' represents the case where b^{max} is small. F'' is the corresponding value in the case where there is no durable purchase. In this case, borrowing without buying the durable is the best option, and first-period consumption goes up.

Figure 3 captures the case where $r\delta > 1$. In this case there is no reason to just borrow–the

line EF lies everywhere under the indifference curve through E. However, borrowing to buy the durable still makes sense and improves welfare.

In general, more credit (weakly) increases the incentive to buy the durable relative to either not buying but borrowing or not buying and not borrowing. To see this denote the utility of buying the durable as $v_d(b^{max})$, and that of not buying the durable by $v_n(b^{max})$.

$$\frac{d}{db^{max}}v_d(b^{max}) = max\{\frac{d}{db}[u(y-(1-a)c_d+b)+\delta u(y+c_d-rb)], 0\} = max\{u'(y-(1-a)c_d+b)-\delta r u'(y+ac_d-rb), 0\}$$

which, by the concavity of u is always at least as large as $\frac{dv_n(b^{max})}{db^{max}} = max\{\frac{d}{db}[u(y+b)+\delta u(y-rb)], 0\} = max\{u'(y+b)-\delta r u(y-rb), 0\}$. Therefore this is also true at the point where $v_d(b^{max}) = v_n(b^{max})$, which tells us that if is tells us that if at any level of b^{max} $v_d(b^{max}) > v_n(b^{max})$, then this is also true at all higher values of b^{max}. In this sense, increased access to credit favors buying the durable.

Moreover, it is evident that when the consumer switches to buying the durable as a result of increased credit access, his borrowing must go up. Hence, compared to someone who has less credit access, his second-period non-durable consumption, $y - rb$ must be lower.

Result 1: Compare two people, one of whom has higher access to credit. She is more likely to buy the durable, but her first-period total non-durable consumption and even total consumption may be higher or lower. Her second-period non-durable consumption will be lower.

3.3 Extensions

We have so far ignored possibility of making a productive investment. Note however that the model where there are no durables but the consumer has a choice of investing a fixed amount $(1 - a)c_d$ in period 1 to get a return of ac_d in period 2 is formally identical to the model with durables and the same reasoning applies. However, the change in interpretation makes worth emphasizing that since a higher a means a more productive project, for a high enough a the investment will be made even when access to credit is very limited or absent. Conversely, increased access to credit will encourage consumers with relatively low values of a to invest.

Result 2: Increased access to credit increases the likelihood that the consumer makes a fixed investment but reduce the average product of the projects that get implemented. Total

first-period consumption can go up or down with greater credit access. However, in this case the person will have higher second-period non-durable consumption, since that is the reason for the investment.

Next, consider a variant of the model where the consumer also has a labor supply decision. Assume that the consumer can earn w units of non-durable consumption per unit of labor and supplies l_1 and l_2 units of labor in periods 1 and 2. The disutility of labor is given by the function $v(l)$ which is assumed to be increasing, convex, differentiable everywhere and satisfying the Inada condition at $l = 0$. The consumer now maximizes

$$u(y - (1 - a)c_d + b + wl_1) - v(l_1) + \delta[u(y + c_d - rb + wl_2) - v(l_2)$$

if she buys the durable and

$$u(y + b + wl_1) - v(l_1) + \delta[u(y - rb + wl_2) - v(l_2)]$$

if not.

By our assumptions about v, an interior optimum for l always exists and is given by

$$u'(c) = v'(l).$$

It is evident that l is decreasing in c. Furthermore, if $u_l(x) = max_l\{u(x + wl) - v(l)\}$, it is easy to show that $u_l(x)$ inherits the concavity of $u(c)$ and therefore Result 1 extends to this case. In other words, improved loan access may lead to a reduction in non-durable and even total consumption in the first period. If total consumption goes down, labor supply will go up in that period.

Result 3: Increased access to credit can lead to an increase in labor supply in the first period.

Finally, the assumption that durables and non-durables are perfect substitutes is convenient for diagrammatic analysis but not essential for our results. Suppose, on the contrary, durable consumption of c_d leads to an utility equal to the service flow from the durable ac_d, which is separable from the utility from non-durables. Then it is easily shown by following the same

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argument that Result 1 will still hold. The only change is that now labor supply only depends on non-durable consumption, and since non-durable consumption can be lower in both periods, labor supply may be permanently raised by improved credit access.[14]

Result 4: If durables and non-durables are not perfect substitutes, increased access to credit may raise labor supply in both periods.

3.4   Discussion

The main point made in the theoretical section is that increased access to credit can lead to lowered non-durable consumption, both when the loan is taken and while it is being repaid, and increased labor supply, potentially once again both when the loan is taken and while it is being repaid. Durable consumption must, of course, go up if the point of the borrowing is to buy a durable (though it may not be picked up depending on when in the borrowing cycle the comparison is made), but not necessarily if the point is to start a business.

To interpret the results below, we consider that the period between the baseline and endline 1 corresponds to two model periods (one borrowing cycle), and the period between endline 1 and endline 2 corresponds to the next two model periods (one borrowing cycle). This is realistic, as the baseline happened roughly 15 to 18 months after Spandana started its operation in each slum, and the average borrowing household had been borrowing for a quarter.

The model tells us that the second borrowing cycle can be just like the first, if there are multiple durables to buy. In this case, we may see very little difference between those who got credit access on the first round with those who got it later, except to the extent that the loan size goes up from round to round–bigger loans may allow buying bigger durables. Of course, if the durables actually last for more than two periods, those who have access to microfinance earlier will have a larger stock of durables. On the other hand, if credit is used in both periods to invest in a business and those businesses are in fact profitable, consumption should be higher in endline 2 for households in the initial treatment group since they are already enjoying the business returns, while control households have yet to do so.[15] Observing the dynamic of treatment effect

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[14]The same result also holds when instead of durables and non-durables, the consumer chooses between a divisible consumption good and a non-divisible one (say, a wedding).

[15]This is, of course, unless they borrow more and invest everything in the business, in which case we may see higher profits, but potentially consumption that is no higher.

across two borrowing cycles, with one group gaining access one round later, is therefore useful in assessing the overall impact of microcredit on poverty.

4   Results

To estimate the impact of microfinance becoming available in an area, we focus on intent to treat (ITT) estimates; that is, simple comparisons of averages in treatment and comparison areas, averaged over borrowers and non-borrowers. We present ITT estimates of the effect of microfinance on businesses operated by the household; and for those who own businesses, we examine business profits, revenue, business inputs, and the number of workers employed by the business. (The construction of these variables is described in Appendix 2.) Each column reports the results of a regression of the form

$$y_{ia} = \alpha + \beta \times Treat_{ia} + X_a^{'}\gamma + \varepsilon_i$$

where y_{ia} is an outcome for household i in area a, $Treat_{ia}$ is an indicator for living in a treated area, and β is the intent to treat effect. $X_a^{'}$ is a vector of control variables, calculated as area-level baseline values: area population, total businesses, average per capita expenditure, fraction of household heads who are literate, and fraction of all adults who are literate.[16] Standard errors are adjusted for clustering at the area level and all regressions are weighted to correct for oversampling of Spandana borrowers.

4.1   Consumption

Table 4 gives intent to treat estimates of the effect of microfinance on household spending. Columns 1 and 2 of Panel A shows that there is no significant difference in total household expenditures–either total or non-durable–per adult equivalent, between treatment and comparison households. The point estimate is essentially zero in both cases and we can reject the null hypothesis that there was a Rs. 85 per month increase in consumption per adult equivalent and Rs. 56 (about 6% of the average in control for consumption, and 4% for non-durable con-

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[16]Table A1 shows that treatment and comparison areas are balanced in terms of these characteristics so, as expected, the results are very similar, although slightly less precise, if these controls are omitted.

sumption) increase. Thus enhanced microcredit access does not appear to be associated with a significant increase in consumption after 15 to 18 months. Of course, this may partly be due to the fact that relatively few people borrow, and that some in the control group borrow from another MFI; still, even if the entire increase (decrease) in total (non-durable) consumption was due to borrowers, these point estimates thus suggest very modest effects of borrowing.[17]

While there are no significant impacts on average consumption and non-durable consumption, there are shifts in the composition of expenditure: column 4 shows that households in treatment areas spent a statistically significant Rs. 1154 more on durables over the past year than did households in comparison areas. Note that this is probably an underestimate of the total effect of loans on durable purchases, since our measure would miss anyone who borrowed more than a year before the survey (the survey was 15 to 18 months after the centers opened) and immediately bought a durable with the loan proceeds. The most commonly purchased durables include gold and silver, motorcycles, sarees (purchased in bulk, presumably mainly for weddings), color TVs, fridges, rickshaws, computers and cellphones.

Consistent with the model, column 2 shows that while there was no detectable change in non-durable spending otherwise, the increase in durable spending by treatment households was essentially offset by reduced spending on "temptation goods" and festivals. Temptation goods are goods that households in our baseline survey said that they would like spend less on (this is thus the same list of goods for all households). They include alcohol, tobacco, betel leaves, gambling, and food consumed outside the home. Spending on temptation goods is reduced by about Rs. 9 per family per month (column 3). We also see in column 5 a large fall in festival spending per capita in the previous year (Rs. 763, significant at the 10% level). Together, the average drop in consumption in temptation goods and festivals over the year is Rs. 1255 per family and per year, which is reasonably close to the average increase in durables spending of Rs. 1154 plus the average interest difference of Rs. 325. The remaining difference of about Rs. 225 per family per year is probably matched by extra labor earnings (labor supply increases by 3.23 hours per week).[18] The decrease in festival expenditures does not come from large changes

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[17]For total consumption, the implied IV estimate is a Rs. 113 (10/.088) or 5% increase, and for non-durable it is a Rs. 75 (4%) decrease.

[18]Rs. 1255 comes from 763+8.73*4.68*12 where 8.73 is the reduction on temptation good spending per capita per month and 4.68 is average household size. Rs. 325 comes from 0.24*1355 where 24% is the interest paid on the net extra MFI borrowing of Rs. 1355. Households in the treatment group also spend on average an extra Rs.

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in large, very expensive ceremonies such as weddings (we see very few of them in the data) but rather appears to come from declines at all levels of the distribution of spending on festivals. This is consistent with the model, assuming that every month (a subperiod of our model), some households get a chance to make a lumpy expenditure if they can and want to pay for it. We then see them undertake a large expense (this is more likely in microcredit borrower households because they have the money). The expense is paid from small, monthly cuts in the non-necessary non-durable goods (temptation goods and festivals) and spread across both households who have already made the lumpy purchase and households that anticipate doing so in the future.[19]

Panel B of Table 4 reports on the impact effects at the time of the second endline, when both treatment and control households have access to the microfinance program. The effects on both total per capita spending and total per capita non-durable spending (columns 1 and 2) are negative with t-statistics around 1. Spending on temptation goods is still lower by about Rs. 10 per month (column 3), similar to endline 1, though the effect is now insignificant. The effect on festivals is now positive but nowhere near being significant. Overall, the substantial gap between treatment and control households in terms of avoidable non-durable spending we saw in the first endline has shrunk to about Rs. 375 per year in endline 2. Correspondingly, there is no difference on average in durable goods spending in endline 2 (column 4). Given that the main difference between treatment and control households at endline 2 is that treatment households have been borrowing for longer, this suggests that, in the second cycle, households in the treatment seem to just repeat the first cycle with another durable (of roughly the same size), while households in the control group also acquire a durable.

The absolute magnitude of these changes is relatively small: for instance, the Rs. 1154 of increased durables spending at endline 1 is approximately $125 at 2007 PPP exchange rates. However, this represents an increase of about 17% relative to total spending on durable goods in comparison areas. Furthermore, this figure averages over non-borrowers and borrowers. *If* all of this additional spending were coming from the extra 8.8% who do borrow (that is, if there were no spillover effects to non-borrowers), then the implied increase per additional borrower would

389 per year acquiring business assets compared to households in control group but they also make Rs. 357 more in profits (not significant) which would potentially balance it out.

[19]Households do not have to spend the loan as soon as they get it. We see examples of households taking a loan and putting it in a savings account for some time before they spend it.

be more than twice the level of durable goods spending in comparison areas. However, since it is entirely possible that there are spillover or general equilibrium effects (as analyzed by Buera et al. 2011), and effects that operate through the *expectation* of being able to borrow when needed (such as reductions in precautionary savings, as documented in Thailand by Kaboski and Townsend (2011) and in India by Fulford (2011)), or through general-equilibrium effects on prices or wages (Giné and Townsend 2004), we will focus here on reduced-form/intent to treat estimates.

4.2   New businesses and business outcomes

The basic version of our model describes the situation of a household deciding whether to acquire a durable good. However, as we discuss in the extension (Section 3.3), it can also apply to the decision to invest in a new or existing business. Most microcredit organizations seek to help poor women become entrepreneurs or improve the profitability of their business, and it is thus important to investigate the effect on business creation and expansion.

Panel A in Table 5 presents the results from the first endline on business outcomes. Column 1 indicates that the probability that a household starts a business is in fact not significantly different in treatment and control areas. In comparison areas, 4.7% of households opened at least one business in the year prior to the survey, compared to 5.6% in treated areas. However, treatment households were *somewhat more likely to have opened more than one business* in the past year, and column 2 shows that more businesses were created in treatment areas overall: 5.3 per 100 households in control versus 6.9 per 100 households in treatment. The numbers are small because there are few businesses opened in any given year, but the treatment effect represents a significant proportional increase (30% more business were created in treatment than in comparison areas).

Consistent with the fact that Spandana loans only to women, and with the stated goals of microfinance institutions, the marginal businesses tend to be female-operated: column 3 shows that when we look at creation of businesses that are owned by women,[20] we find that almost all of the differential business creation in treatment areas is in female-operated businesses–there

[20]A business is classified as owned by a woman if the first person named in response to the question "Who is the owner of this business?" is female. Only 72 out of 2674 businesses have more than one owner. Classifying a business as owned by a woman if any person named as the owned is female does not change the result.

are 0.015 percentage points more female-owned businesses in treatment than in control areas, an increase of 58%. Households in treated areas were no more likely to report closing a business, an event reported by 3.9% of households in treatment areas and 3.7% of the households in comparison areas (column 4).[21]

Consistent with the fact that treatment households start more businesses, they invest more in durables for the business. Since only a third of households have a business, and most businesses use no asset whatsoever, the point estimate is small in absolute value (Rs. 389 over the last year, or a bit less than a third of the increase in average MFI borrowing in treatment households) but the increment in treatment is more than the total value of business durables purchased in the last year by comparison households (Rs. 280), and is statistically significant.

The rest of the columns in the Panel A of Table 5 report on current business status and last month's revenues, inputs costs, and profits. In these regressions, we assign a zero to those households who do not have a business, so these results give us the overall impact of credit on business activities, including both the extensive and intensive margins. Consistent with the prior results, treatment households are no more likely to have a business (summing over those created in the last year and those created before) but they have more business assets (although the t-statistic on the asset stock is only 1.58). The treatment effects on revenues and inputs are both positive but insignificant.

Finally, there is an insignificant increase in business profits. Since this data includes zeros for households who do not have a business, this answers the question of whether microcredit, as it is often believed, increases poor households' income by expanding their business opportunities. The point estimate, at Rs. 357 per month corresponds to a roughly 50% increase relative to the profits received by the average comparison household. This is thus large in proportion of profits, but it represents only a very small increase in disposable income for an average households–recall that the average total consumption of these households is about Rs. 7,000 per month and an increase of Rs. 357 per month in business revenues is certainly not going to change the life of the average person who gets access to microcredit.

That does not rule out that the businesses of some specific groups could have benefit from

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[21]It is possible that households not represented in our sample, such as households who had not lived in the area for three years, may have been differentially likely to close businesses in treated areas. However, the relatively small amount of new business creation makes general-equilibrium effects on existing businesses rather unlikely.

the loan. To look at this in more detail, we focus on businesses that were already in existence before microcredit started. We do this in Table 6.[22] For businesses that existed before Spandana expanded, we find an average increase in profits of Rs. 2194 in treatment areas, which is significant and more than double the control mean. This increase, however, is entirely concentrated in the upper tail (quantiles 95 and above), as shown in Figure 4. At every other quantile, there is very little difference between the profits of existing businesses in treatment and control areas. The 95th percentile of monthly profit of existing businesses is Rs. 14600 (or $1590 at PPP), which makes them quite large and profitable businesses in this setting. The vast majority of the small businesses make very little profits to start with, and microcredit does nothing to help them. This absence of an effect on the average business is consistent with the results of Karlan and Zinman (2011), who evaluate individual loans given to micro-entrepreneurs in the Philippines, and do not find that the loans result in an increase in profits. The finding that microcredit is most effective in helping larger businesses is contrary both to much of the rhetoric of microcredit and the view of microcredit skeptics.

Finally, we have seen that the treatment led to some more business creation, particularly female-owned businesses. In Figure 5, and Tables 7 and A3, we show more data on the characteristics of these new businesses. The quantile regressions in Figure 5 (profits for businesses that did not exist at baseline) show that all businesses between the 35th and 65th percentiles have significantly lower profits in treatment areas. Table 7, column 1 shows that the mean profit is not significantly different across treatment and control due to the noisy data, but the median new business in treatment areas has Rs. 1250 lower profits, significant at the 5% level (Table 7, column 2). The average new business is also significantly less likely to have employees in the treatment areas: the proportion of the new businesses that have any employee falls from 9.4% to only 4.5% (column 5).

These results could in principle be a combination of a treatment effect and a selection effect, but since the effect on existing businesses suggests a treatment effect which is close to zero for most businesses (and the point estimate is positive), the effect for new businesses is likely due to selection–the marginal business that gets started in treatment areas is less profitable

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[22]In Table 5, we show that households are no more or less likely to close a business in the last year, thus there is no sample selection induced by microfinance.

than the marginal business in the control areas. The hypothesis that the marginal business which gets started is different in the treatment group gains some additional support in Appendix Table 3, which shows a comparison of the industries of old businesses and new businesses, across treatment and comparison areas.[23] Industry is a proxy for the average scale and capital intensity of a business, which is likely to be measured with less error than actual scale or asset use. The industry composition of new businesses do differ. In particular, the fraction of food businesses (tea/coffee stands, food vendors, kirana stores, and agriculture) is 8.5 percentage points (about 45%) higher among new businesses in treatment areas than among new businesses in comparison areas, and the fraction of rickshaw/driving businesses among new businesses in treatment areas is 5.4 (more than 50%) percentage points lower. Both these differences are significant at the 10% level. Food businesses are the least capital-intensive businesses in these areas, with assets worth an average of just Rs. 930 (mainly dosa tawas, pots and pans, etc.). Rickshaw/driving businesses, which require renting or owning a vehicle, are the most capital-intensive businesses, with assets worth an average of Rs. 12,697 (the bulk of which is the cost of the vehicle). The result that the marginal business created is less profitable in treatment than in control areas is consistent with our model (see Result 2), but the fact that they are smaller bears some discussion. Indeed, these households clearly do not need a loan to be able to start a business that requires Rs. 930 worth of assets. We therefore interpret this as a labor supply effect along the lines of Result 3: households use most of the loan to pay for something like a durable and then increase their labor supply to pay back the loan, perhaps using a small part of the loan to buy some inputs that they need to work.

Another explanation for both results could be that the marginal businesses are more likely to be female owned, and are thus started in sectors where women are active, and businesses operated by women tend in general to be less profitable, perhaps because of social constraints on what they can do and how much effort they can devote to it.[24]

Panel B of Table 5 shows the results for the business performance variables at the time of the second endline. As remarked already, by this time treatment and control households are equally likely to have a microcredit loan, but the loan in treatment areas is bigger and borrowers have

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[23]Respondents could classify their businesses into 22 different types, which we grouped into the following: food, clothing/sewing, rickshaw/driving, repair/construction, crafts vendor, and "other."

[24]This is true in our data, and also found for example in Sri Lanka by de Mel et al. (2009).

been borrowing for a longer time. The results follow a clear pattern, consistent with the idea that control households now borrow at the same rate. We find no difference in business creation in treatment and control areas. The new businesses are in the same industries in treatment and control areas, and the negative effects at the median have disappeared (result omitted). For the contemporaneous flow investment outcomes such as new business creation, business assets acquired in the previous year, etc. (columns 1 through 5) the point estimate is very close to zero (however the standard errors are large). On the other hand, businesses in treatment areas have significantly larger asset stock (column 6), which reflects the cumulative effect of the past years during which they had a chance to borrow and expand. Despite this, their profits are still not significantly larger, though the point estimate is around 60% of the sample mean (with a t-statistics of around 1.2). As shown in Figure 6, the positive increase is once again concentrated in the top and bottom tails, although it starts being positive a little earlier, at the 85th percentile.

Overall, these results lead us to revise downward the role of microcredit as primarily being an engine of escape from poverty through small business growth. Microfinance is indeed associated with (some) business creation: in the first year, it does lead to an increase in the number of new businesses created, particularly by women (though not in the number of households that start a business). However, these marginal businesses are even smaller and less profitable than the average business in the area (the vast majority of which are already small and unprofitable). It does also lead to a greater investment in the existing businesses, and an improvement in the profits for the most profitable of those businesses. For everyone else, business profits do not increase, and on average microfinance does not help the businesses to grow in any significant way. (Even after three years, there is no increase in the number of employees of businesses that existed before Spandana started its operation.)

4.3 Labor supply

Our last theoretical result is on labor supply: access to credit can lead to an increase of labor supply, as households who have acquired a durable good give up leisure to finance the purchase. Table 8 shows the impact of the program on labor supply. In endline 1, adults (head and spouse) in treatment households increase their overall labor supply by an average of 3.22 hours. The increase occurs entirely in the households' own businesses, and there is no increase number

of hours worked for wages: those hours may be much less elastic, if the households do not fully choose them. However, unlike Augsburg et al. (2012), we do not find the increase in teenagers' labor supply that is sometimes feared to be a potential downside of microfinance (as the adolescents are drawn into the business by their parents). By endline 2, as control households have started borrowing, the difference between treatment and control disappears.

4.4 Microfinance as social revolution: education, health, and women's empowerment?

The evidence so far suggests a different picture from the standard description of the role of microfinance in the life of the poor: the pent-up demand for it is not overwhelming; many households use their loan to acquire an household durable, reducing avoidable consumption to finance it; some invest in their businesses, but this does not lead to significant growth in the profitability of their business(es). Another staple of the microfinance literature is that because the loans are given to women and give them a chance to start their own business, this would lead to a more general empowerment of women in the households, and this empowerment would in turn translate in better outcomes for everyone, including education, health, etc. (e.g. CGAP, 2009). To examine these questions, Table 9 examines the effects of access to microfinance on measure of women's decision-making and children's health. Column 1 shows that women in treatment areas were no more likely to be the primary decision-makers regarding decisions about household spending, investment, savings, or education. Column 2 shows that even focusing on decisions other than what food to purchase, which might be more sensitive to changes in empowerment, does not change the finding. Column 3 shows that, among households with loans (88% of all households), women in treatment-area households were no more likely to report being the person in the household who decided to take the loan.

A finding of many studies of household decision-making is that an increase in women's bargaining power leads to an increase in food and health expenditure (See Thomas (1990) and Duflo (2003)). Thus, health investments and outcomes are interesting in their own right, and increased spending in these areas might also demonstrate greater decision-making or bargaining power for women. However, we find no effect on health outcomes.[25] In Table 4, column 8, we find that

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[25]We do not find changes in food expenditure or food share either.

households in treatment areas spend no more on health and sanitation items than do comparison households. Table 9, column 4 shows that, among households with children, households in treatment areas were no less likely to report that a child had a major illness in the past year. In Table 4, we show that in endline 1, there was no impact on education expenditures either. We also find that there is no change in the probability that children or teenagers are enrolled in school (Table 9, columns 5 and 6), private school fees (Table 4, column 10), or in private school versus public school enrollment (results not reported to save space).

Because there are many possible proxies for women's empowerment, and many "social" outcomes we could consider, examining one at a time will create a multiple inference problem–out of 20 outcomes, we expect that one would differ between treatment and control at the 5% level of significance even if the microcredit intervention had no impact. To address this, we use the approach of Kling et. al. (2007) to test the null hypothesis of no effect of microcredit on "social outcomes" against the alternative that microcredit improves social outcomes. We construct an equally weighted average of z-scores for the 16 social outcomes; this method gives us maximal power to detect an effect on social outcomes, if such an effect is present.[26] Column 7 shows that there is no effect on the index of social outcomes (point estimate .007 standard deviations) and we can rule out an increase of more than one twentieth of a standard deviation with 95% confidence.

This suggests that there is no *prima facie* evidence that microcredit leads to important changes in household decision-making or in social outcomes. Furthermore, this is not only because we observe this only in the short run. Nothing major changes by endline 2: the effect of microfinance access on the index of women empowerment is still very small and insignificant, and anything but a small effect can still be ruled out. Recall that we are comparing households who, by EL2, are equally likely to borrow: the main difference by EL2 is that households in the treatment group have had greater access to microfinance for the first 18 months; this may limit power to detect differences in the social outcomes at the community level. Nevertheless, there are two interesting differences: First, while there is still little difference in overall education

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[26]The 16 outcomes we use are: indicators for women making decisions on each of food, clothing, health, home purchase and repair, education, durable goods, gold and silver, investment; levels of spending on school tuition, fees, and other education expenses; medical expenditure; teenage girls' and teenage boys' school enrollment; and counts of female children under one year and one to two years old. We selected these outcomes because they would likely be affected by changes in women's bargaining power within the household.

expenditure, there is by endline 2 a significant difference in how much is spent on private school fees (see Table 4, Panel B, column 10). Conversely, there is a decline in health expenditures, which seems to be mostly accounted for by the highest quantiles (quantile plot available on request). These could be statistical accidents–they go in opposite direction and the effect overall index is not significant. But the positive impact on school fees is consistent with claims that microfinance clients are more likely to send their children to private schools (the first sign of an increase in educational aspirations in India).

5   External validity and multiple inference: Comparing our results with other evaluations of similar programs

External validity and multiple inference are two issues that arise with any sort of evaluation of a program like microcredit that operates in many very different locations and has the potential to affect many different outcomes (and thus does not offer a single "litmus test" of success). The external validity question is straightforward: are the results obtained in a booming city like Hyderabad any guide to what one would obtain in rural areas, or in another country? One advantage of microcredit is that while there are several different models, there is a standard "plain vanilla" model, adopted by Spandana and thousands of other organizations all over the world. (This features group lending, weekly or monthly repayment, and fixed-term loans usually lasting close to a year.)[27] The second issue is that of multiple inference. Since we are looking at many different outcomes (as we should, given the nature of the program), there is always the possibility that the results we obtain are the statistical artifacts of multiple hypothesis testing. For example, one of our interesting results is the significant decline in temptation goods consumption. But this is one of several consumption categories and it could just be due to chance (though this was an hypothesis we formed before the study was started) that it happens to be smaller in the treatment group.

Fortunately, four RCTs of the same or a very similar model, run by different organizations, were launched right after ours, and they are all now reporting results at the time of the first follow-up (after up to two years). These studies have looked at the same outcomes as the ones we

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[27]Interest rates differ from country to country since they are closely tied to the salaries of the credit officers.

look here, and explicitly tested key hypotheses suggested by our results. Thus, when we compare our results to theirs, we address both issues of external validity and multiple inference, since our set of results provides a clear (and limited) set of hypotheses that can be tested in their studies as well.

Here we thus compare our result to four studies.

(1) Crepon et al. (2011)–CDDP–an evaluation of Al Amana's program in rural Morocco, a context where there was essentially no access to credit (even informal) whatsoever before the introduction of the microcredit program, and in which there was no competition between this MFI and others.

(2) Angelucci et al. (2012)–AKZ–an evaluation of Compartamos's program in Mexico, implemented in both urban and rural area in the state of Sonora.

(3) Attanasio et al. (2011)–AADFH–an evaluation of XacBank's MFI program in rural Mongolia, randomized at the village level. Two versions of the program were tested, a group liability offer and an individual liability offer. We report the group results here, for comparability.

(4) Augsburg et al. (2012)–AHHM–an evaluation of a EKI in Bosnia, where microcredit and formal credit were quite developed when the MFI program was offered to treatment clients (who were randomly selected out of those who had been rejected for a loan). Unlike the previous three studies, this is an individual-level randomization among people who applied for a loan, and this is an individual loan product.

Our results and the results of these four studies, for the headline results of our study, are presented in Table 10. The five papers' main results are strikingly consistent for most economic outcomes.

We have already discussed the increase in microfinance access due to the entry of one new microfinance institution. Access to microfinance from the MFI who participated in the trials is 13 percentage points higher in our study, 10 percentage point higher in CDDP and in AKZ, and 57 percentage points higher in AADFH. The higher first stage in AADFH is not comparable to what is found in the other studies, since they it used an oversubscription-type design in which all surveyed households (in both treated and comparison villages) contained a woman who had explicitly expressed interest in borrowing prior to randomization, knowing that there was a 2/3

chance that her village would be randomly assigned to one of the treatment groups.[28] Increase in access to microfinance from any MFI is 8.8 percentage point in our study, 10 percentage points in CDDP, 24 percentage points in AADFH, and is not reported in AKZ.

For the whole sample, all of the papers find insignificant impact on monthly consumption and non-durable consumption; the point estimate for non-durable consumption is negative in all papers, except in AADFH where it is positive but very small and insignificant. All papers find decline in either temptation goods expenditures, or spending on festivals and parties, or both; four out of five papers find significant decrease in temptation goods expenditures. The only study that does not is CDDP, but it does find a significant decline expenditures on festivals and parties (which we also find–the other studies don't report this outcome). The main difference between our study and most others is that we find an increase in the purchase of durable goods used at home in the last year, which is not present in any of the other studies except AADFH. However, it is worth nothing that all endlines were conducted more than a year after microfinance started, while the durable purchase is over the last year: it is thus possible that the asset purchase took place early on, and is not detected by the survey. Consistent with that, CDDP reports a increase in the household assets index owned for the median household, as well as an increase in the number of cows owned, and AADFH finds increases in ownership of VCRs, radios, and large household appliances.

All of these studies find an expansion in self-employment activities (business, farming or cattle raising), which shows up either in revenue expansion (positive in all studies, significant in two of the four studies where it is reported), or in investment in business assets or inventories when this data has been collected (positive and significant whenever measured, except AADFH). In all studies, the impact on businesses comes from the intensive margin (investment in existing businesses, or households investing in more than one business at the same time), rather than because new households are induced to start an activity.[29]In all studies except CDDP, this expansion does not translate into significantly higher profit on average. It also does not translate into significant increase of the profits of the median business: in all studies that report it, the

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[28]There is no comparable result for AHHM, since their design involves randomization among rejected applicants.
[29]The only place where there is an impact on the probability that a household has a business is in AHHM, but in this case, it is because treatment households are less likely to shut a business (in a context of a crisis), not because they are more likely to set one up.

impact is very small and insignificant at the median. However, there is positive and significant in profit increase in profits the upper tail of businesses (90th or 95th percentile) in all three studies that report it.

All studies that report it also find an increase in labor supply in the household's own business, at least for some members of the households. AKZ do not report labor supply estimates. CDDP finds a significant increase in in hours worked in own business among prime age adults (20-40). AHHM finds an increase in labor supply in the household business among teenagers only. Like our study, these studies also find no increase (and even a significant decrease in the case of CDDP) in hours of work outside the own business. Unlike our study, there is no increase in hours worked overall in any these studies.

Interestingly, it is on the social outcomes, where economic theory makes little prediction, that the four studies have quite different results. While CDDP, like us, finds no impacts on women's empowerment and AHHM and AADFH do not even report the effects, AKZ finds an increase in women's decision-making power in the treatment group. On education, AKZ and our study find no impact on enrollment, though by endline 2 we find that households spend more on school fees, CDDP has a small positive impact on the probability that children are in school, and AHHM finds a negative impact on the probability that teenagers are in school (and no impact on the younger children). We find a decline in health expenditures by endline 2, while CDDP finds an increase in health expenditures.

One explanation for these divergent outcomes is that they may depend more than the basic economic results on the MFI's vision and ideology, and less on standard economic forces. For example, Al Amana in Morocco lends to both men and women; Spandana, while it lends to both, does not insist that the loan is to finance a woman's business (or in fact any business). Compartamos's program, Crédito Mujer, is in principle targeted at women who are micro-entrepreneurs (although only about half of them are). These outcomes may also be much more influenced by the context.

6 Conclusion

This study–the first and longest running evaluation of the standard group-lending loan product that has made microfinance known worldwide–yields a number of results that may prompt a rethinking of the role of microfinance.

The first result is that, in contrast to the claims sometimes made by MFIs and others, demand for microloans is far from universal. By the end of our three-year study period, only 38% of households borrow from an MFI[30] , and this is among households selected based on their relatively high propensity to take up microcredit. This does not appear to be an anomaly: the two other randomized interventions that have a similar design (in Morocco and in Mexico) also find relatively low take-up, while another study in rural South India that focuses specifically on take-up of microfinance also finds it to be low (Banerjee, Chandrasekhar, Duflo, and Jackson 2012). Perhaps it should not be surprising that most households either do not have a project with a rate of return of at least 24%, the APR on a Spandana loan, or simply prefer to borrow from friends, relatives, or moneylenders due to the greater flexibility those sources provide, despite costs such as higher interest (from moneylenders) or embarrassment (when borrowing from friends or relatives) (Collins, Morduch, Rutherford, and Ruthven 2009).

For those who choose to borrow, while microcredit "succeeds" in leading some of them to expanding their businesses (or choose to start a female-owned business), it does not fuel an escape from poverty based on those small businesses. Monthly consumption, a good indicator of overall welfare, does not increase for those who had early access to microfinance, neither in the short run (when we may have foreseen that it would not increase, or perhaps even expected it to *decrease*, as borrowers finance the acquisition of household or business durable goods), nor, more tellingly, in the longer run, after this crop of households have access to microcredit for a while, and those in the former control group should be the ones tightening their belts. Business profit does not increase for the vast majority of businesses, although there are significant increases in the upper tail. This study took place in a dynamic urban environment, in a context of very high growth. Microcredit seems to have played very little part in it. However, these results are not specific to this context: similar findings emerge from four other studies run on different

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[30]The takeup rate is 42% in treatment areas and 33% percent in control areas.

continents, in booms and busts, and in both urban and rural contexts.

Furthermore, in the Hyderabadi context, we find that access to microcredit appears to have no discernible effect on education, health, or women's empowerment in the short run . In the longer run (when borrowing rates are the same, but households in the treatment groups have on average borrowed for longer), there is still no impact on women's empowerment, and while there is an apparent increase in money spent on school fees, there is an apparent decline in health expenditures. The results differ from study to study on these outcomes, but as a whole they don't paint a picture of dramatic changes in basic development outcomes for poor families.

Microcredit therefore may not be the "miracle" that it is sometimes claimed to be, although it does allow some households to invest in their small businesses. One reason may be that the average business run by this target group is tiny (almost none of them have an employee), not particularly profitable, and difficult to expand, even in a high-growth context, given the skill sets of the entrepreneurs and their life situations. And, consistent with theory, the marginal businesses that get created thanks to microcredit are probably even less profitable and dynamic: we find that the average new business in a microcredit treatment area less likely to have an employee than the new business in the control areas, and the median new business is even less profitable in treatment versus control areas.

Nevertheless, microcredit does affect the structure of household consumption. We see households invest in home durable goods and restrict their consumption of temptation goods and expenditures on festivals and parties. They continue to do so several years later, and this decrease in not due to a few particularly virtuous households, but seems to be spread across the sample. Similar declines in these types of expenses are also found in all the other studies. Altered consumption thus does not seem to be tied to the ideology of a particular MFI.

Microfinance affects labor supply choices as well: households that have access to loans seem to work harder on their own businesses. Thus, microcredit plays its role as a financial product in an environment where access not only to credit, but also to saving opportunities, is limited. It expands households' abilities to make different intertemporal choices, including business investment. The only mistake that the microcredit enthusiasts may have made is to overestimate the potential of businesses for the poor, both as a source of revenue and as a means of empowerment for their female owners.

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Figure 1:

Treatment effect on informal borrowing*
(endline 1)

| | OLS | Quantile treatment effect | 90% C.I |
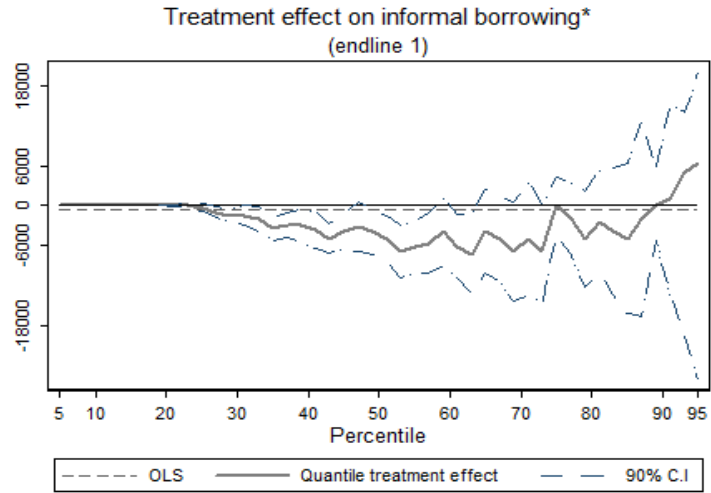
Informal borrowing: borrowing from moneylenders, friends and
family, and buying goods on credit.
Confidence intervals are cluster-bootstrapped at the neighborhood
level. For quantiles .05 to .20, confidence intervals are not reported
because the quantile does not vary sufficiently across neighbor-
hoods to bootstrap standard errors. The point estimates are zero
for these quantiles.

Figure 2:
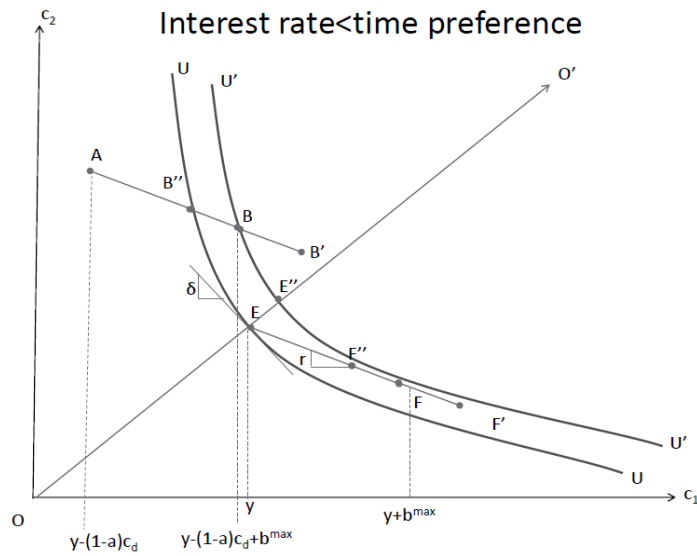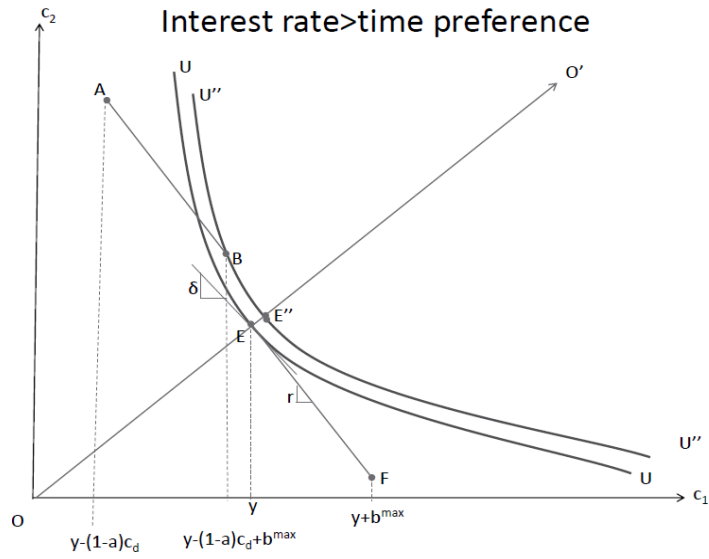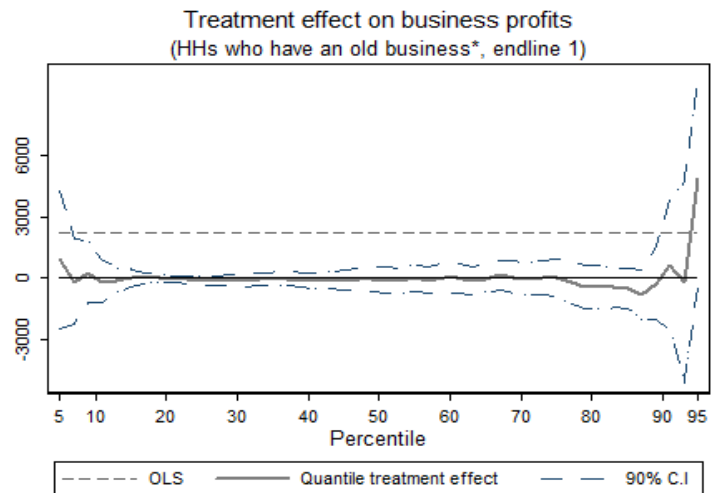
Interest rate<time preference

Figure 3:

Interest rate>time preference

Figure 4:

Treatment effect on business profits
(HHs who have an old business*, endline 1)

| - - - - - OLS | —— Quantile treatment effect | — — 90% C.I |

Old business: business started at least one year before the survey.

Figure 5:

Treatment effect on business profits
(HHs who do not own an old business*, endline 1)

Old business: business started at least one year before the
survey.

Figure 6:

Treatment effect on business profits
(full sample of business owners, endline 2)
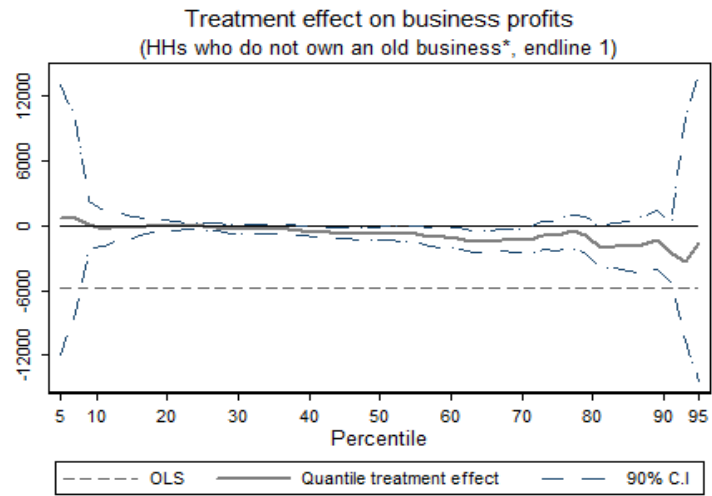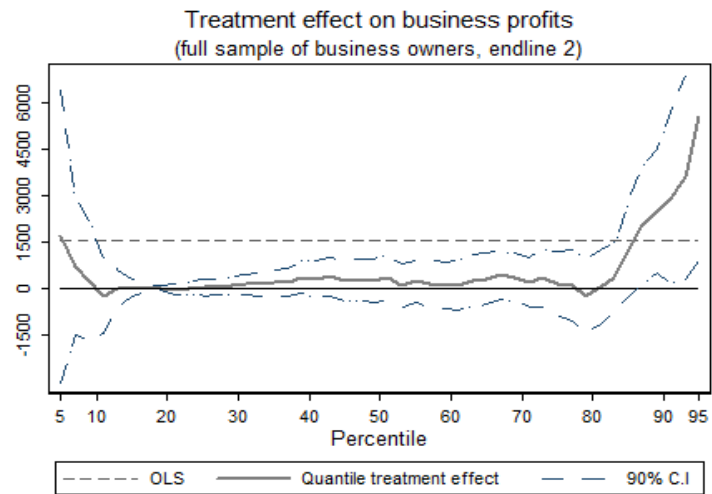
Table 1: Baseline Characteristics

	Treatment	Control	Difference	Obs
PANEL A: Demographics	(1)	(2)	(3)	(4)
Household size	5.13	5.04	0.095	2,440
	[1.78]	[1.67]	(0.092)	
Household expenditure (Rs/mo)	5,485	5,208	277	2,440
	[4,820]	[4,224]	(232)	
Household owns home	0.676	0.674	0.002	2,435
			(0.040)	
Household rents home	0.288	0.272	0.016	2,435
			(0.034)	
School attendance (7-11 yrs old)	0.981	0.974	0.007	1,290
			(0.010)	
School attendance (12-15 yrs old)	0.853	0.856	-0.002	1,135
			(0.025)	
Working for a wage (Wage Labor /Job Work)	0.410	0.407	0.003	4,460
			(0.034)	
Business income (business owners only, Rs/mo)	3,265	3,393	-128	650
	[3,982]	[7,469]	(541)	
Total household income (Rs/mo)	4,921	4,825	96	2,440
	[4,818]	[5,861]	(293)	
PANEL B: Household savings/insurance/shocks				
Household with at least 1 outstanding loan	0.684	0.682	0.002	2,440
			(0.029)	
Average loan outstanding (Rs)	20,228	23,779	-3,551	4,279
	[39,131]	[145,791]	(3587)	
Average interest rate (monthly)	4.017	3.771	0.245	3,727
	[10.18]	[2.50]	(0.441)	
Loans taken from moneylender	0.498	0.512	-0.014	4,249
			(0.045)	
Loans taken from friends or neighbors	0.252	0.255	-0.003	4,249
			(0.039)	
Loans taken from family members	0.137	0.129	0.007	4,249
			(0.018)	
Loans taken from commercial banks	0.028	0.03	-0.002	4,249
			(0.007)	
Household with a savings account	0.322	0.34	-0.019	2,439
			(0.028)	
Household with life insurance	0.23	0.237	-0.007	2,440
			(0.023)	
Household with health insurance	0.003	0.003	0	2,440
			(0.002)	
Household spent Rs. 500 on health shock, previous year	0.425	0.38	0.045	2,439
			(0.033)	
Household w/ sick member had to borrow	0.5	0.581	-0.081	774
			(0.04)	
PANEL C: Business				
Number of businesses per household	0.301	0.32	-0.019	2,440
	[0.62]	[0.68]	(0.034)	
Households with at least one business	0.233	0.242	-0.009	2,440
			(0.025)	
Business with any employees (%)	0.094	0.056	0.038	735
			(0.028)	
Business without any assets (%)	0.15	0.157	-0.007	747
			(0.044)	
Average revenues (Rs/mo)	9,396	10,051	-655	695
	[13,945]	[15,582]	(1242)	

Note: Standard deviations of nonbinary variables in brackets (cols 1 and 2). Standard errors of differences, clustered at the area level, in parentheses (col 3). All monetary amounts in 2007 Rs. See Appendix 2 for variable definitions.

Table 2: Descriptive statistics, control households (endline 1 and 2)

	EL 1 Control		EL 2 Control		Difference (EL2-EL1)		Obs. (EL 1)	Obs. (EL 2)
PANEL A: Demographics	(1)		(2)		(3)		(4)	(5)
Household-level characteristics								
Household size (number people)	5.640	[2.15]	6.269	[2.55]	0.63	(0.037)	3,248	2,943
Household expenditure (Rs/mo)	7,662	[5,822]	11,497	[8,732]	3,835	(212)	3,248	2,943
Household is owner	0.754		0.644		-0.113	(0.026)	3,263	2,943
Household is renter	0.089		0.087		0.002	(0.01)	3,264	2,943
Waterproof house	0.558		0.679		0.121	(0.020)	3,254	2,941
Household has a color TV	0.603		0.806		0.203	(0.011)	3,252	2,942
Household has a cell phone	0.642		0.861		0.218	(0.013)	3,253	2,942
Total income (Rs/mo)	4,009	[5,012]	7,735	[6,898]	3,726	(358)	3,248	2,943
Business income (business owners only, Rs/mo)	2,532	[5,268]	4,991	[6,771]	2,459	(324)	1,105	1,231
Person-level characteristics								
School attendance (7-11 yr olds)	0.979		0.982		0.003	(0.005)	1,799	1,621
School attendance (12-15 yr olds)	0.881		0.867		-0.014	(0.013)	1,424	1,314
Working for a wage (all working individuals)	0.589		0.540		-0.049	(0.013)	6,482	6,338
PANEL B: Savings/insurance/ shocks								
Household-level characteristics								
Household with at least 1 outstanding loan	0.887		0.905		0.018	(0.008)	3,264	2,943
Household with a savings account	0.819		0.848		0.029	(0.053)	1,920	2,943
Household with life insurance	0.241		0.316		0.074	(0.018)	3,263	2,943
Household with health insurance	0.122		0.765		0.643	(0.030)	3,263	2,943
Household spent Rs. 500 on health shock, previous yr	0.635		0.781		0.146	(0.012)	3,264	2,950
Household w/ sick member had to borrow	0.530		0.454		-0.077	(0.022)	1,905	2,121
Loan-level characteristics								
Average loan amount outstanding (Rs)	20,914	[57,724]	25,315	[51,348]	4,401	(937)	9,602	10,304
Average interest rate (mnthly, loans w/ interest rt data)	2.492	[15.86]	2.437	[8.93]	-0.055	(0.324)	3,362	7,642
Loan from moneylender	0.264		0.231		-0.031	(0.013)	10,407	10,316
Loan from friends or neighbors	0.154		0.111		-0.043	(0.010)	10,407	10,316
Loan from family members	0.011		0.003		-0.007	(0.003)	10,407	10,316
Loan from commercial banks	0.072		0.026		-0.046	(0.009)	10,407	10,316
PANEL C: Businesses								
Household-level characteristics								
Number of businesses per household (all HHs)	0.436	[0.72]	0.561	[0.79]	0.125	(0.019)	3,234	2,943
Number of female-owned businesses (all HHs)	0.183	[0.49]	0.234	[0.51]	0.052	(0.012)	3,209	2,943
Households with at least one business (all HHs)	0.342		0.418		0.077	(0.009)	3,234	2,943
Business-level characteristics								
Business with any employees	0.092		0.104		0.011	(0.009)	1,385	1,636
Business without any assets	0.348		0.092		-0.256	(0.032)	1,543	1,652
Average revenues (Rs/mo)	11,317	[49,475]	15,682	[42,973]	4,365	(1,891)	1,422	1,619

Notes: Summary statistics for comparison areas only. Standard deviations of nonbinary variables in brackets (cols 1 and 2). Standard errors of differences, clustered at the area level, in parentheses (col 3). All monetary amounts in 2007 Rs. See Appendix 2 for variable

Table 3: Borrowing

	Borrows from:				Amount borrowed from:					
	Any MFI	Spandana	Informal lender	A bank	Any MFI	Any MFI (borrowers only)	Spandana	Informal lender	A bank	Number of cycles borrowed from an MFI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: endine 1										
Treatment	0.088***	0.13***	-0.052**	0.0026	1355***	1030	1391***	-1072	49	0.11***
	(0.027)	(0.021)	(0.021)	(0.012)	(447)	(785)	(239)	(2519)	(2157)	(0.041)
Mean in control	0.18	0.052	0.76	0.079	2374	12976	597	41045	8422	0.32
Stdev in control	0.39	0.22	0.43	0.27	6652	10216	2907	78033	101953	0.67
Nobs	6811	6811	6811	6811	6811	1616	6811	6811	6811	6816
Panel B: endine 2										
Treatment	0.0058	0.067***	0.0024	0.00042	869	2344**	1046***	137	-1187	0.133*
	(0.030)	(0.020)	(0.018)	(0.0085)	(690)	(1052)	(306)	(2922)	(1081)	(0.068)
Mean in control	0.33	0.11	0.6	0.073	5544	16752	1567	32356	6127	0.72
Stdev in control	0.47	0.31	0.49	0.26	11348	14192	5618	76704	40308	1.09
Obs	6142	6142	6142	6142	6142	2094	6142	6142	6142	5926

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) "Informal lender" includes moneylenders, loans from friends/family, and buying goods/services on credit. Number of loan cycles from an MFI (col 10) is the maximum number of loan cycles borrowed with a single MFI, including the current loan (if any); number of cycles is zero for MFI never-borrowers.

(3) All monetary amounts in 2007 Rs.

(4) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 4: Consumption

	Monthly (per capita)			Yearly (total)						
	Total	Non durable	Tempt-ation goods	Durable (total)	Festivals	Home repairs (any>Rs 500)	Home repairs (mean if any>Rs 500)	Health	Education: total	Education: Fees
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: endine 1										
Treatment	10.1	-6.6	-8.73*	1154*	-763*	-0.03	-1613	-10	-6.93	8.37
	(37.2)	(31.8)	(4.88)	(682)	(454)	(0.020)	(3588)	(53)	(48.0)	(31.5)
Mean in control	1419.2	1304.8	83.9	6609	3732	0.51	18313	630	777	346
Stdev in control	978.3	852.4	130.2	19481	5851	0.5	65428	1916	1179	679
Nobs	6827	6781	6863	6781	6827	6834	2198	6827	5415	5404
PANEL B: endline 2										
	-48.3	-44.9	-9.99	62	205	0.004	584	-130*	70	88**
	(51.4)	(46.9)	(6.64)	(524)	(205)	(0.017)	(7039)	(75)	(69)	(42)
	0.0054	0.0065	0.007			0.0028				
Mean in control	1914.3	1755.2	117.7	8639	5994	0.57	28876	1022	1142	513
Stdev in control	1354.9	1209.5	182.4	18438	6901	0.5	192246	2655	1691	1211
Obs	6142	6142	6142	6140	6103	6141	3439	6141	4910	4910

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) See Appendix 2 for description of the construction of the profits, sales, and inputs variables.

(3) All monetary amounts in 2007 Rs.

(4) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 5: Business Creation and outcomes (entire sample)

	in the last year					currently			in the last month		
	Started a business	Num. business started	Num. female business started	Closed a business	Value of business assets acquired	Value of business assets	Has at least a business	Num. business owned	Business revenue	Business inputs	Business profits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A: endine 1											
Treatment	0.0093	0.016**	0.015***	0.002	389*	606	0.01	0.022	920	244	357
	(0.0061)	(0.0075)	(0.0054)	(0.0076)	(212)	(383)	(0.022)	(0.033)	(1181)	(1052)	(313)
Mean in control	0.047	0.053	0.026	0.037	280	2498	0.34	0.44	4856	4055	745
Stdev in control	0.21	0.25	0.17	0.19	4038	10802	0.47	0.72	33108	30446	10695
Nobs	6757	6757	6762	2352	6800	6800	6805	6805	6608	6685	6239
Panel B: endine 2											
Treatment	-0.00049	0.0023	-0.005	-0.00042	-134	1288**	0.023	0.047	267	-540	557
	(0.010)	(0.013)	(0.0062)	(0.0064)	(208)	(531)	(0.023)	(0.040)	(527)	(543)	(371)
Mean in control	0.083	0.093	0.047	0.053	1007	5003	0.42	0.56	5847	5225	953
Stdev in control	0.28	0.33	0.23	0.23	9623	14423	0.49	0.79	16784	20603	11280
Obs	6142	6142	6142	6142	6142	6142	6142	6142	6116	6116	6090

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) The outcome variables are set to zero when the household does not have a business.

(3) business outcomes are aggregated at the household level when the households have more than one businesses.

(4) Information on closing a businesses in the year prior to the endline 1 survey was only collected for those who had a business as of endline 1.

(5) Observations with missing or inconsistent itemized sales or revenues are dropped in columns 9 to 11.

(6) See Appendix 2 for description of the construction of the profits, sales, and inputs variables.

(7) All monetary amounts in 2007 Rs.

(8) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 6: Treatment effect on pre-existing business outcomes

	monthly			currently			
	Profit (Rs.)	Inputs (Rs.)	Revenues (Rs.)	Has any employees?	Num. of employees	Wages paid out (Rs per month)	Assets used in business
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: endine 1							
Treatment	2194**	1605	5356	-0.056	0.0058	-117	855
	(1105)	(3269)	(3744)	(0.084)	(0.019)	(156)	(1080)
Mean in control	2000	12417	14578	0.42	0.12	445	6862
Stdev in control	12315	51033	47922	1.74	0.33	3158	17336
Obs	1598	1994	1929	2054	1927	2054	2054
Panel B: endine 2							
Treatment	1019	-3637**	-31	-0.16	0.0093	-362	1817
	(1160)	(1709)	(1502)	(0.12)	(0.019)	(293)	(1759)
Mean in control	2392	15199	15386	0.56	0.13	1187	12405
Stdev in control	19878	36234	24607	2.93	0.34	7079	22077
Obs	1525	1543	1540	1559	1559	1559	1559

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) The sample is restricted to households who owned a business prior to Spandana's entry.

(3) All monetary amounts in 2007 Rs.

(4) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 7: Treatment + selection effects on new business outcomes (endline 1)

	monthly				currently			
	Profit (Rs.)	Profit (median)	Inputs (Rs.)	Revenues (Rs.)	Has any employees?	Num. of employees	Assets used in business	Standardized outcome: scale (1 through 7, except 2)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	-3517	-1250***	-4965	-8093	-0.049*	-0.20*	-812	-0.096*
	(3802)	(404)	(4038)	(7291)	(0.028)	(0.11)	(2205)	(0.055)
Mean in control	6081	1609	12114	17423	0.094	0.29	8411	0.0058
Stdev in control	43517		53020	91782	0.29	1.33	24130	0.7
Obs	270	270	339	332	319	356	356	356

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) The sample is restricted to households who did not own a business prior to Spandana's entry.

(3) The outcome var in col 8 is an average of z-scores of the outcomes in cols 1 and 3-7 (value - control mean)/(control std dev).

(4) All monetary amounts in 2007 Rs.

(5) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 8: Labor supply

	Hours worked by head and spouse, total	Hours worked by head and spouse for wage	Hours worked by head and spouse, own business	Hours worked by children aged 9-17
	(1)	(2)	(3)	(4)
Panel A: endline 1				
Treatment	3.22**	0.44	2.78*	0.19
	(1.42)	(1.42)	(1.48)	(0.38)
Mean in control	57.8	32	25.8	3
Stdev in control	35.9	34.4	34.6	10.9
Nobs	6827	6827	6827	3880
Panel B: endline 2				
Treatment	1.07	-0.7	1.77	-0.12
	(1.18)	(1.48)	(1.58)	(0.30)
Mean in control	51.3	25.9	25.4	2.76
Stdev in control	35.4	31.4	33.4	9.83
Obs	6142	6142	6142	3570

Notes:
(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.
(2) Column 4 includes only households with children aged 9-17.
(3) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 9: Social outcomes and women's empowerment

	Woman primary decision-maker	Woman primary decision-maker (non-food)	Woman primary decision-maker on loans	Child's major illness	Girls' education	Teenage boys' education	Index of social outcomes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: endine 1							
Treatment	0.0071	0.021	0.014	-0.014	-0.046	-0.016	0.0071
	(0.034)	(0.032)	(0.017)	(0.016)	(0.034)	(0.034)	(0.023)
Mean in control	0.66	0.52	0.28	0.28	1.21	0.83	0.00
Stdev in control	0.47	0.50	0.40	0.45	0.84	0.64	0.46
Nobs	6855	6855	6033	3943	4062	1971	6862
Panel B: endine 2							
Treatment	0.012	-0.009	0.0037	-0.00033	0.04	0.023	-0.0089
	(0.024)	(0.023)	(0.017)	(0.012)	(0.033)	(0.032)	(0.020)
Mean in control	0.61	0.50	0.35	0.39	1.2	0.85	0.00
Stdev in control	0.49	0.50	0.41	0.49	0.82	0.63	0.52
Obs	6142	6142	5562	5942	3592	1776	6142

Notes:

(1): The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with control variables listed in the text). Cluster-robust standard errors in parentheses. Results are weighted to account for oversampling of Spandana borrowers.

(2) In column (3) the sample is restricted to households that have taken a loan.

(3) In column (4) the sample is restricted to households with children between the age of 0 and 18.

(4) In column (5) the sample is restricted to households with girls between the age of 4 and 18.

(5) In column (6) the sample is restricted to households with boys between the age of 13 and 18.

(6) The outcome var in col 7 is an average of z-scores of 16 social outcomes; see section 4.4 text for details. Z-score is (value - control mean)/(control std dev).

(7) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table 10: Findings from RCTs of microfinance

	Length of followup	Increase in borrowing from an MFI	Consumption per capita	Non durable consumption per capita	Temptation goods and/ or festivals	Home use durable purchase	Has a self employed activity	Investment in self employed activities	Gross revenue self employed activity	Profit of self employed activity : Mean	Profit of self employed activity: Median	Profit of self employed activity: 90th percentile	Women's empowerment	Education	Labor supply overall	Labor supply, own business
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Bosnia (AHHM)	14 months	20 percent. points	negative, insig	negative, insig	-12.01% (p<0.1)	negative, insig	9.31% (p<0.1)	26.5% (p<0.01)	positive, insig	positive, insig	N.A	N.A	N.A	-9.57% for school attendance ages: 16-19	positive, insig	542.22% (p<0.05) for 16-19 year olds, insig overall
Mexico (AKZ)	2-3 years	increase of 12.74% (p<0.01) in total no. loans received in last 2 yrs; increase of 18.61% (p<0.01) in total loan amt received in last 2 yrs	positive, insig effect on "nights did not go hungry"	negative, insig for "Amount spent on groceries"	decrease of 5.91%, (p<0.05) on amount spent on temptation goods; negative insig for spending on family events	negative, insig (Made home improve-ment)	negative insig	increase of 36.25% (p<0.05) for variable inputs; not reported for fixed investment	increase of 26.73% (p<0.05)	negative, insig	small and insig	positive, sig (p<10), value not specified	increase of 0.82% (p<0.01) in Participates in any financial decisions increase of in # of household issues has a say on	positive insig for "Amount spent on school and medical expenses"	negative insig for participate in an economic activity	N.A
Morocco (CDDP)	2 years	increase in credit access: 495.24% (p<0.05), increase in loan amount 479.77% (p<0.05)	negative, insig for total consump-tion	negative insig	negative, insig for sin; -5.55% (p<0.10) for "social"	negative, insig	no effect on business as main income source	positive, insig for fixed investment, 13.18% (p<0.05) for variable inputs (expenses)	positive insig for "global monetary revenues"; 35.87% (p<0.01) for agriculture and 11.10% (p<0.1) for livestock	positive, insig	small and insig	increase of 2.3: 57.57% (p<0.15)	insig	neg insig for schooling expend.	insig	increase of 8.1% (p<.10) for agriculture, positive insig for livestock activities, negative insig for business

(cont.)

Table 10: Findings from RCTs of microfinance (con't)

	Length of followup	Increase in borrowing from an MFI	Consumption per capita	Non durable consumption per capita	Temptation goods and/ or festivals	Home use durable purchase	Has a self employed activity	Investment in self employed activities	Gross revenue self employed activity	Profit of self employed activity : Mean	Profit of self employed activity: Median	Profit of self employed activity: 90th percentile	Women's empowerment	Education	Labor supply overall	Labor supply, own business
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Mongolia	1.5 years	increase of 48% in the probability of receiving microcredit	positive insig	positive insig	negative significant for cigarettes consumption (p<0.10)	negative insig	positive insig for probability of any type of business	positive, insig for probability of tools, probability of unsold stock and raw materials and probability of riding equipment. Negative, insig for number of cattle and number of animals.	N.A	negative, insig	N.A	N.A	increase of 16.20% (p<0.10) in the probability of female business	N.A	insig	positive, insig
India (BDGK)	1.5 years MFI exposure (endline 1) and 3 years vs. 1.5 years MFI exposure (endline 2)	Endline 1: increase of 48.3% from any MFI (p<0.01) and 257.25% from Spadana (p<0.01); endline 2: positive insig	positive insig (endline 1 and 2)	negative, insig (endline 1 and 2)	Endline 1: -10.41% for temptation goods (p<0.10); 20.46% for festivals (p<0.10); endline 2 insig	Endline 1: 17.46% for durables (total) (p<0.10); negative insig for home repairs; endline 2 insig	Endline 1: positive insig for stated any business; 3% for number of business started (p<0.05)	Endline 1: 138.88% for value of business assets acquired (p<0.10)	positive, insig (endline 1 and 2)	positive, insig (endline 1 and 2)	insig (endline 1 and 2)	postivie, insig, endline 1; increase of 20% (p<.05) endline 2 (for all businesses)	positive insig	17.21% for education fees in endline 2 (p<0.05), insig in endline 1	Endline 1: increase of 5.58% (p<0.05); endline 2 insig	Endline 1: increase of 11% (p<.05), endline 2 insig

Notes: (1) Bosnia results are from Augsburg, De Haas, Harmgart and Meghir (2012); Mexico results are from Angelucci, Karlan and Zinman (2012); Morocco results are form Crépon, Devoto, Duflo and Parienté (2011). India results are from Banerjee et al. (2012).

(2): Effect sizes for India, Mexico and Morocco studies are percentages of endline control group means. Effect sizes for Bosnia study are percentages of overall baseline. Effect sizes for Mongolia study are percentages of control baseline means (when available).

Table A1: Treatment-Control balance in fixed characteristics (Endline 1)

	Spouse is literate	Spouse works for a wage	Household size	Prime-aged women (18-45)	Any teen (13-18) in HH	Old businesses owned	Own land, Hyderabad	Own land, village	Adult labor supply	Adult labor supply, HH business
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treatment	-0.011	-0.011	-0.032	-0.022	0.023	0.006	-0.0028	0.0045	-0.28	0.74
	(0.021)	(0.024)	(0.083)	(0.026)	(0.016)	(0.030)	(0.0069)	(0.027)	(2.17)	(1.31)
Control Mean	0.54	0.23	5.64	1.46	0.49	0.38	0.061	0.19	88.1	18.8
Control Std Dev	0.5	0.42	2.15	0.82	0.5	0.67	0.24	0.4	58.5	35.5
Obs	6139	6229	6827	6862	6862	6762	6830	6819	6827	6827

Note: The table presents the coefficient of a "treatment" dummy in a regression of each variable on treatment (with no control variables). Cluster-robust standard errors in brackets. Results are weighted to account for oversampling of Spandana borrowers. Spouse is the wife of the household head, if the head is male, or the household head if female. Household size is the total number of household members (not adult equivalents). An old business is a business started at least 1 year before the survey. Adult labor supply is total work hours by HH members aged 18-60. * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table A2: Endline 2 Attrition

Panel A: Attrition in treatment vs. control

Found in endline 2, in treatment	0.8889
Found in endline 2, in control	0.9017
p-value of difference	*0.248*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exp per capita	Tempta-tion goods	Durables	Festival spending	Has MFI loans	Old business	New business	Business profit

Panel B: Attrition and household characteristics (endline 1)

Attrited	130.9***	0.032	1702.8	188.9	-0.055***	-0.015	-0.015*	751.3
	(42.4)	(21.2)	(1273.9)	(197.6)	(0.015)	(0.031)	(0.0083)	(882.3)
Non-attriter mean	1423.2	348	7075.8	3477.3	0.24	0.39	0.063	890.6
Obs	6827	6827	6781	6827	6811	6762	6757	6239

Panel C: Attrition and household characteristics (endline 1) in treatment vs. control

Attrited X treatment	-18.8	40	-110.9	-91.7	-0.090***	-0.069	0.0016	820.6
	(82.7)	(41.8)	(2429.5)	(388.5)	(0.028)	(0.061)	(0.016)	(1584.8)
Non-attriter mean, C	1405.4	369.9	6439.3	3707.4	0.18	0.38	0.054	718.4
Obs	6827	6827	6781	6827	6811	6762	6757	6239

Notes:

(1): Panel B presents the coefficient from regressing a dummy for "attrited between endline 1 and endline 2" on various endline 1 characteristics, to compare attritors and non attritors.

(2): Panel C investigates whether the characteristics of th attritors is different in treatment and control. The regression controls for the main effects of attrition and of treatment (coefficients not reported).

(3) All monetary amounts in 2007 Rs.

(4) * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Table A3: Industries of old and new businesses

	Old business, treatment	Old business, control	Treatment-control difference	New business, treatment	New business, control	Treatment-control difference
	(1)	(2)	(3)	(4)	(5)	(6)
Food/agriculture	0.227	0.243	-0.017	0.299	0.214	0.085*
			[0.028]			[0.044]
Clothing/sewing	0.210	0.186	0.024	0.135	0.185	-0.050
			[0.020]			[0.033]
Rickshaw/driving	0.103	0.103	0.000	0.056	0.110	-0.054*
			[0.021]			[0.028]
Repair/construction	0.042	0.052	-0.010	0.016	0.035	-0.019
			[0.010]			[0.015]
Crafts/vendor	0.020	0.029	-0.010	0.024	0.040	-0.017
			[0.008]			[0.017]
Other	0.397	0.380	0.018	0.470	0.416	0.054
			[0.042]			[0.056]
Nobs	1424	1261		251	173	

Notes:

Old (new) businesses are those started more (less) than 1 year before the survey. Cluster-robust standard errors in brackets. Results are weighted to account for oversampling of Spandana borrowers. * significant at the 10% level, ** at the 5% level, *** at the 1% level.

Appendix 1: Theoretical appendix

Consider the decision to buy a durable. First take a case where the consumer does not buy the durable in period 1. The condition for this is simple. Assuming that if she is indifferent she buys the durable the condition is:

$$max_{0 \leq b \leq b^{max}} \{u(y+b) + \delta u(y-rb)\} > max_{0 \leq b \leq b^{max}} \{u(y-(1-a)c_d+b) + \delta u(y+ac_d-rb)\}$$

Now consider the decision in period $s > 1$, assuming that in all previous periods the durable was not purchased. The only possible difference with period 1 is that they might have borrowed in the past. If they have not it is the same problem and has the same answer. The interesting case is when they have borrowed an amount $b_{-1} > 0$ in the previous period. The question therefore comes down to whether

$$u(y-rb_{-1}) + \delta u(y) > u(y-(1-a)c_d - rb_{-1}) + \delta u(y+ac_d).$$

By the concavity of u

$$u(y-rb_{-1}) - u(y-(1-a)c_d - rb_{-1}) > u(y+b') - u(y-(1-a)c_d + b')$$

for any $b' \geq 0$.

Now let $b' = argmax_{0 \leq b \leq b^{max}} \{u(y+b) + \delta u(y-rb)\} \geq 0$. Then from above

$$u(y+b') + \delta u(y-rb') > u(y-(1-a)c_d + b') + \delta u(y+ac_d - rb')$$

which can be rewritten to say

$$u(y+b') - u(y-(1-a)c_d + b') > \delta u(y+ac_d - rb') - \delta u(y-rb').$$

Finally by the concavity of u,

$$\delta u(y + ac_d - rb') - \delta u(y - rb') \geq \delta u(y + ac_d) - \delta u(y).$$

Combining these inequalities we end up with

$$u(y - rb_{-1}) - u(y - (1-a)c_d - rb_{-1}) > \delta u(y + ac_d) - \delta u(y),$$

which is exactly what we needed to show that there is no durable purchase in period s.

In other words, if there are no durable purchases in period 1, there are none in any subsequent period.

Conversely, if there is a period s such that the borrower has not purchased the durable or borrowed in period $s - 1$ and does not plan to borrow in period $s + 1$, then that period just like period 1, and she should make exactly the same choice as in period 1 in period s. So if she buys the durable in period 1, she should buy it in period s. If she borrows b in period 1, she should borrow the same amount in period s.

Among other things, this tells us that if there is no borrowing in period 2, then the decision in period 1 will be reproduced in every odd period *until the first period $2m+1$ (such that $m > 0$) where the person borrows in period $2m + 2$.*

To complete the argument, we need to rule out this last possibility. Consider the first pair of periods, $(2m + 1, 2m + 2)$ where the consumer borrows in the even period. This means that $2m + 2$ is not the last period but also that she does not borrow in period $2m + 3$. Here there are four possible scenarios; in one she buys the durable in both period $2m + 1$ and $2m + 3$, one in which she borrows in neither and one each where she buys the durable in one of those two periods. In the first case, her utility from periods $2m + 1$ to $2m + 3$ will be

$$u(y - (1-a)c_d) + \delta u(y + ac_d + b) + \delta^2 u(y - (1-a)c_d - rb),$$

where $b > 0$ is the amount she borrows in period $2m + 2$. Consider the alternative plan where she borrows the same amount, but in period $2m + 1$, and does not borrow in period $2m + 3$.

Then her utility from the same three periods will be

$$u(y - (1-a)c_d + b) + \delta u(y + ac_d - rb) + \delta^2 u(y - (1-a)c_d).$$

Now first consider the decision to borrow in period $2m + 2$. A necessary condition for this borrowing is that

$$u'(y + ac_d) > \delta r u'(y - (1-a)c_d),$$

which implies that δr has to be less than 1.

Next consider the expression

$$u(y-(1-a)c_d+b)+\delta u(y+ac_d-rb)+\delta^2 u(y-(1-a)c_d)-u(y-(1-a)c_d)-\delta u(y+ac_d+b)-\delta^2 u(y-(1-a)c_d-rb),$$

which using the Intermediate Value Theorem can be rewritten as

$$bu'(y_1) + \delta^2 r b u'(y_3) - \delta(b + rb)u'(y_2)$$

where

$$y_1 \in (y - (1-a)c_d, y + b - (1-a)c_d)$$

$$y_2 \in (y + ac_d, y + ac_d + b)$$

$$y_3 \in (y - (1-a)c_d - rb, y - (1-a)c_d)$$

It is clear that $y_3 \le y_1$ and $y_2 \ge y_1$ (the latter because $b < c_d$) and therefore

$$bu'(y_1) + \delta^2 r b u'(y_3) - \delta(b + rb)u'(y_2) \ge bu'(y_1)[1 - \delta - \delta r + \delta^2 r] > 0$$

as long as $\delta r < 1$. Hence the original plan cannot have been a maximum. Analogous arguments can be made in all the other cases.

This concludes the argument. Every pair of periods will be like the first pair. We just need

to determine the choice in the first two periods assuming that there are no further periods and then apply to all future pairs of periods.

Appendix 2: Variable definitions

Go to http://www.povertyactionlab.org/projects/project.php?pid=44 to download the survey instruments (both in English and in Telugu).

Business variables

Business: The survey defined a business as follows: "each business consists of an activity you conduct to earn money, where you are not someone's employee. Include only those household businesses for which you are either the sole owner or for which you have the main responsibility. Include outside business for which you are the person in the household with the most responsibility." Households who indicated that they owned a business were asked to answer a questionnaire about each business. The person in the household with the most responsibility for the business answered the questions about that business.

All variables reported in the paper are at the household level, i.e. if a household owns multiple businesses, the values for each business are summed to calculate a household-level total.

Business revenues: Respondents were asked: "For each item you sold last month, how much of the item did you sell in the last month, and how much did you get for them?" The respondent was asked to list inputs one by one. They were also asked for an estimate of the total revenues for the business. If the itemized total and the overall total did not agree, respondents were asked to go over the revenues again and make and changes, and/or change the estimate of the total revenues for the business last month.

Business inputs: Respondents were asked: "How much did you pay for inputs (excluding electricity, water, taxes) in the last day/week/month, e.g. clothes, hair, dosa batter, trash, petrol/diesel etc.? Include both what was bought this month and what may have been bought at another time but was used this month. List all inputs and then list total amount paid for each input. Do not include what was purchased but not used (and is therefore stock), i.e. if you purchased five saris this months but sold only four, then we need to record the purchase

price of four saris, not five." The respondent could give a daily, weekly, or monthly number. All responses were then converted to monthly.

The respondent was asked to list inputs one by one. They were also asked for an estimate of the total cost of inputs for the business. If the itemized total and the overall total did not agree, they were asked to go over the inputs again and make and changes, and/or change the estimate of the total cost of inputs for the business last day/week/month.

Respondents were asked about electricity, water, rent and informal payments. If they had not included them previously, these costs were added.

Business profits: Computed as monthly business revenues less monthly business input costs.

Employees: Respondents were asked: "How many employees does the business have? (Employees are individuals who earn a wage for working for you. Do not include household members)."

Expenditure

Expenditure comes from the household survey, which was answered by the person "who (among the women in the 18-55 age group) knows the most about the household finances." Respondents were asked about "expenditures that you had last month for your household (do not include business expenditures)" in categories of food (cereals, pulses, oil, spices, etc.), fuel, and 16 categories of miscellaneous goods and services. They were asked annual expenditure for school books and other educational articles (including uniforms); hospital and nursing home expenses; clothing (including festival clothes, winter clothes, etc.) and gifts; and footwear.

Per capita expenditure is total expenditure per adult equivalent. Following the conversion to adult equivalents used by Townsend (1994) for rural Andhra Pradesh and Maharastra, the weights are: for adult males, 1.0; for adult females, 0.9. For males and females aged 13-18, 0.94, and 0.83, respectively; for children aged 7-12, 0.67 regardless of gender; for children 4-6, 0.52; for toddlers 1-3, 0.32; and for infants 0.05. Using a weighting that accounts for within-household economies of scale does not affect the results (results available on request).

Expenditure: Sum of monthly spending on all goods where monthly spending was recorded, and 1/12 of the sum of annual spending on all goods where annual spending was recorded.

Non-durable expenditure: Total expenditure minus spending on assets (see below).

"Temptation goods": Sum of monthly spending on meals or snacks consumed outside the home; pan, tobacco and intoxicants; and lottery tickets/gambling.

Assets

Assets information comes from the household survey, which was answered by the person "who (among the women in the 18-55 age group) knows the most about the household finances." Respondents were asked about 41 types of assets (TV, cell phone, clock/watch, bicycle, etc.): if the household owned any, how many; if any had been sold in the past year (for how much); if any had been bought in the past year (for how much); and if the asset was used in a household business (even if it was also used for household use).

Assets expenditure (monthly): Total of all spending in the past year on assets, divided by 12.

Business assets expenditure (monthly): Total of all spending in the past year on assets which are used in a business (even if also used for household use), divided by 12.