The miracle of microfinance? Evidence from a randomized evaluation*

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First version: May 4, 2009

This version: June 30, 2010

Abstract

Microcredit has spread extremely rapidly since its beginnings in the late 1970s, but whether and how much it helps the poor is the subject of intense debate. This paper reports on the first randomized evaluation of the impact of introducing microcredit in a new market. Half of 104 slums in Hyderabad, India were randomly selected for opening of an MFI branch while the remainder were not. We show that the intervention increased total MFI borrowing, and study the effects on the creation and the profitability of small businesses, investment, and consumption. Fifteen to 18 months after lending began in treated areas, there was no effect of access to microcredit on average monthly expenditure per capita, but expenditure on durable goods increased in treated areas and the number of new businesses increased by one third. The effects of microcredit access are heterogeneous: households with an existing business at the time of the program invest more in durable goods, while their nondurable consumption does not change. Households with high propensity to become new business owners increase their durable goods spending and see a decrease in nondurable consumption, consistent with the need to pay a fixed cost to enter entrepreneurship. Households with low propensity to become business owners increase their nondurable spending. We find no impact on measures of health, education, or women's decision-making.

JEL codes: O16, G21, D21

*Thanks to Spandana, especially Padmaja Reddy whose commitment to understanding the impact of microfinance made this project possible. This paper is the result of a research partnership between the Abdul Latif Jameel Poverty Action Lab at MIT and the Center for Microfinance at IFMR. Aparna Dasika and Angela Ambroz provided excellent assistance in Hyderabad. Justin Oliver at the Centre for Microfinance and Annie Duflo at Initiatives for Poverty Action shared valuable advice and logistical support. Adie Angrist, Shehla Imran, Seema Kacker, Tracy Li, and Aditi Nagaraj provided excellent research assistance at different stages of the project. ICICI provided financial support.

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1 Introduction

Microfinance institutions (MFIs) have expanded rapidly in recent years: According to the Microcredit Summit Campaign, microfinance institutions had 154,825,825 clients, more than 100 million of them women, as of December 2007. In 2006, Mohammad Yunus and the Grameen Bank were awarded the Nobel Prize for Peace, for their contribution to the reduction in World Poverty.

CGAP, a branch of the World Bank dedicated towards promoting micro-credit, reports in the FAQ section of its web-site that "There is mounting evidence to show that the availability of financial services for poor households – microfinance – can help achieve the MDGs." Specifically to answer the question "What Do We Know about the Impact of Microfinance?" it lists 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 as contributions of microfinance for which there is already evidence.

However evidence such as presented by CGAP is unlikely to satisfy the critics of microfinance who fear that it is displacing more effective anti-poverty measures or even contributing to overborrowing and therefore even greater long term poverty. For instance, an August 2009 article in *The Wall Street Journal* states that Indian households are being "carpet bombed" by loans, leading to extreme overindebtedness. One borrower states that she would like to see microlenders banished from her community "forever." (Gokhale 2009).

However, anecdotes about highly successful entrepreneurs or deeply indebted borrowers tell us nothing about the effect of microfinance for the average borrower, much less 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, and some households purposely choose to borrow while other do not. Difference in difference estimates can control for fixed differences between clients and non-clients, but it is likely that those who choose 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 the impact of microcredit a particularly difficult problem. Thus, there is so far no consensus among academics on the impact of microcredit. 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) criticizes the approach, pointing out that there is in fact no discontinuity in the probability to borrow at that threshold.[1]

In 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. They repeated these cautions in the book's second edition in 2010.

Given the complexity of this identification problem, the ideal experiment to estimate the effect of microcredit appears to be to randomly assign microcredit to some areas, and not some others, and compare outcomes in both sets of areas: randomization would ensure that the only difference between residents of these areas is the greater ease of access to microcredit in the treatment area. Another possibility would to randomly assign *individuals* to treatment and comparison groups, for example by randomly selecting clients among eligible applicants: the difficulty may then be that in the presence of spillovers, the comparison between treatment and comparison would be biased.

Randomized designs have been used to explore the impact of number of microfinance product design such as group lending and repayment schedules (e.g. Giné and Karlan (2006, 2009), Field and Pande (2008), Fischer (2010), and Feigenberg et al. (2010)), while Kaboski and Townsend (2009a, 2009b) use a natural experiment in Thailand to study the intensive-margin impact of a village credit program in Thailand. In work close in spirit to ours, Karlan and Zinman (2009)

[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.

use 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, and Karlan and Zinman (2010) use a similar random assignment procedure in Manila to study the impacts of "second generation" individual-liability microfinance on male and female borrowers. However, to date, to the best of our knowledge, there have not been any large-scale randomized trials with the potential to examine what happens when "first generation" microcredit (i.e., very small, joint-liability, female-directed loans) becomes available in a new market.

In this paper we report on the first randomized evaluation of the effect of the canonical group-lending microcredit model. In 2005, 52 of 104 neighborhood in Hyderabad (the fifth largest city in India, and the capital of Andhra Pradesh, the Indian state were microcredit has expended the fastest) 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. 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 to receive an MFI loans was still 8.3 percentage points (44%) higher in treatment areas than in comparison areas (27% borrowers in treated areas vs. 18.7% borrowers in comparison areas).

Inspired by claims similar to those on the CGAP website and in the *The Wall Street Journal,* we examine the effect on both outcomes that directly relate to poverty like consumption, new business creation, business income, etc. as well as measures of other human development outcomes such as education, health and women's empowerment. On balance our results show significant and not insubstantial impacts on how many new businesses get started. We also see significant impacts on the purchase of durables, and especially business durables. However there is no impact on average consumption, although as we will argue later, there may well be a delayed positive effect on consumption. Nor is there any discernible effect on any of the human development outcomes, though, once again, it is possible that things will be different in the long run.

The lack of an effect on average consumption masks important treatment-effect heterogeneity

across households with different characteristics. Treatment-area households who had an existing business before the program invest more in durable goods, while their nondurable consumption does not change. Households with high propensity to become new business owners increase their durable goods spending and see a *decrease* in nondurable consumption, consistent with the need to pay a fixed cost to enter entrepreneurship. Households with low propensity to become business owners increase their nondurable spending. Their nondurable consumption increase is too large to be due to the income effect of paying off higher-interest debt, suggesting that these households are instead borrowing against future income.

Our results suggest that microcredit is an important financial tool for some households: for households already engaged in entrepreneurship, it allows expansion of the household business; for those with high returns to entrepreneurship, but rates of time preference high enough that they did not become entrepreneurs in the absence of microcredit, access to microcredit makes it possible to pay the fixed cost of starting a business; and for households with low returns to entrepreneurship and high rates of time preference, microcredit facilitates borrowing against future income to finance current consumption. For all of these groups, the welfare impact is ambiguous: existing businesses may or may not become more profitable when they scale up; new businesses may or may not generate future profits that compensate their owners for the drop in consumption that partially financed their creation; households who borrow to finance current consumption may be more-efficiently timing their consumption, raising welfare, or they may be borrowing unsustainably, leading to eventual lower consumption. Finally, even in treated areas, over 70% of households do not take microloans, preferring to borrow from other sources. In short, microcredit is not for every household, or even most households, in Hyderabad, and it does not lead to the miraculous social transformation some proponents have claimed. But for some households it has precisely the types of impacts we would expect of a new source of credit.

2 Experimental Design and Background

2.1 The Product

Spandana is 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 birth place in Guntur, a dynamic city in Andhra Pradesh, it has expanded in the State of Andhra Pradesh, and 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 10 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 PPP-adjusted exchange rates (World Bank 2006).[2]. 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 borrow to start a business: the organization recognizes that money is fungible, and clients are left entirely free to chose the best use of the money, as long as they repay their loan.

Eligibility is determined using the following criteria: clients must (a) be female,[3] (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.

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. (Though of course business and financial skills may increase as a result of getting a loan.)

[2] In 2006 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.

[3] 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.

2.2 Experimental Design

Spandana 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 pre-existing 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 people who move frequently are not desirable microfinance clients. While those areas are commonly referred to as "slums", these are permanent settlements, with concrete houses, and some public amenities (electricity, water, etc.). Within eligible neighborhoods, the largest areas were not selected for the study, since Spandana was keen to start operations in the largest areas. The population in the neighborhoods selected for the study ranges from 46 to 555 households.

In each area, a baseline survey was conducted in 2005. Households were selected for the baseline survey conditional on having a woman between the ages of 18-55 in the household. Information was collected on household composition, education, employment, asset ownership, decision-making, expenditure, borrowing, saving, and any businesses currently operated by the household or stopped within the last year. A total of 2,800 households were surveyed in the baseline.[4]

After the baseline survey, but prior to randomization, sixteen areas were dropped from the study. These areas were dropped because they were found to contain large numbers of migrant-worker households. Spandana (like other microfinance agencies) has a rule that loans should only be made to households who have lived in the same community for at least one year because dynamic incentives (the promise of more credit in the future) are more effective in motivating repayment for these households. The remaining 104 areas were paired based on minimum distance according to per capita consumption, fraction of households with debt, and fraction of households who had a business, and one of each pair was randomly assigned to the treatment group. (We control for dummy variables for these strata in our estimation.) Spandana then progressively began operating in the 52 treatment areas, between 2006 and 2007. Note that

[4] Unfortunately, the baseline sample survey was not a random survey of the entire area. In the absence of a census, the first step to draw the sample was to perform a census of the area. The survey company did not survey a comprehensive sample, but a sample of the houses located fairly close to the area center. This was rectified before the endline survey, by conducting a census in early 2007.

in the intervening periods, other MFIs also started their operations, both in treatment and comparison areas. We will show below that there is still a significant difference between MFI borrowing in treatment and comparison groups.

A comprehensive census of each area was undertaken in early 2007 to establish a sampling frame for the follow-up study, and to determine MFI takeup (to estimate the required sample size at endline). The endline survey began in August 2007 and ended in April 2008. The endline survey in each area was conducted at least 12 months after Spandana began disbursing loans, and generally 15 to 18 months after. The census revealed low rates of MFI borrowing even in treatment areas, so the endline sample consisted of households whose characteristics suggested high propensity to borrow: households who had resided in the area for at least 3 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. In general, baseline households were not purposely resurveyed in the follow-up.[5]

Table 1, Panel A shows that treatment and comparison areas did not differ in their baseline levels of population, household indebtedness, businesses per capita, expenditure per capita, or literacy levels. 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.

Table 1, Panel B shows that households in the follow-up survey do not systematically differ between treatment and comparison in terms of literacy, the likelihood that the wife of the household head works for a wage, the adult-equivalent size of the household,[6] the number of "prime-aged" women (aged 18 - 45), in the presence of teenagers (aged 13-18) in the household, the percentage who operate a business opened a year or more ago, or the likelihood of owning

[5] Baseline households were not deliberately resurveyed, since they were not a random sample to start with. Furthermore, the baseline sample was too small to detect plausible treatment effects, given the low takeup of MFI loans. These problems were both corrected in the followup survey, at the cost of not having a panel. The exception to the non-resurveying of baseline households is a small sample of households (about 500 households) who indicated they had loans at the baseline, who were surveyed with the goal of understanding the impact of an increase in credit availability for those households who were already borrowing (though not from MFIs). This analysis is ongoing.

[6] 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).

land, either in Hyderabad or in the family's native village. Again, this is unsurprising since treatment assignment was random within a stratum and hence orthogonal to fixed or baseline-level household characteristics. We will use these characteristics, which are not themselves outcomes of microcredit access, when we predict which households are likely to become new entrepreneurs.

2.3 The context: Findings from the Baseline

The average baseline household is a family of 5, with monthly expenditure of Rs. 5,000, or $540 at PPP-adjusted exchange rates. A majority of households (70%) lived in a house they owned, and the remaining 30% in a house they rented. Almost all of the 7 to 11 year olds (98%), and 84% of the 12 to 15 year olds, were in school.

There was almost no MFI borrowing in the sample areas at baseline. However, 69% of the households had at least one outstanding loan. The average loan was Rs. 20,000 (median Rs. 10,000), and the average interest rate was 3.85% per month. Most loans were taken from moneylenders (49%), friends or neighbors (28%), and family members (13%). Commercial bank loans were very rare.

Although business investment was not commonly named as a motive for borrowing, 31% of households ran at least one small business at the baseline, compared to an OECD-country average of 12%. However, these businesses were *very* small: only 10% had any employees, and typical assets employed were sewing machines, tables and chairs, balances and pushcarts; 20% of businesses had no assets whatsoever. Average profits were Rs. 3,040 ($335 in PPP terms) per month on average.

Baseline data revealed limited use of consumption smoothing strategies other than borrowing: 34% of the households had a savings account, and only 26% had a life insurance policy. Almost none had any health insurance. Forty percent of households reported spending Rs. 500 ($54) or more on a health shock in the last year; 60% of households who had a sick member had to borrow.

2.4 Did the intervention increase MFI borrowing?

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 just Spandana branches. In order to interpret differences between treatment and comparison areas as due to microcredit, it must be the case that MFI borrowing is higher in treatment than in comparison. Table 2 shows that this is the case. Households in treatment areas are 13.3 percentage points more likely to report being Spandana borrowers–18.6% vs. 5.3% (table 2, column 1). The difference in the percentage of households saying that they borrow from any MFI is 8.3 percentage points (table 2, column 2), so some households 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 almost 50% higher in treatment than in comparison areas–27% vs. 18.7%. Columns 4 and 5 show that treatment households also report significantly more borrowing from MFIs than comparison households. Averaged over borrowers and non-borrowers, treatment households report Rs. 1,408 more borrowing from Spandana than do control households, and Rs. 1,257 more from all MFIs. (The smaller first stage for all MFIs, relative for Spandana only, is because more control than treatment households borrow from MFIs other than Spandana.)

3 The Impacts of Microfinance: Conceptual Framework

3.1 Why would microcredit do anything?

What effects should we expect to see in response to the increase in MFI borrowing engendered by living in a treated area relative to comparison areas? The possible effects of microcredit can be grouped into three broad categories: relaxing credit constraints; shifting bargaining power within the household; and affecting the choice between "temptation expenditure" and "efficient expenditure."

The most direct effect of microcredit is to relax credit constraints, by lowering interest rates, or by allowing households who were previously completely rationed out of credit markets to borrow, or both. There is a growing body of direct evidence that (at least some) small- and medium-sized firms in developing countries are credit-constrained, e.g. de Mel, McKenzie and

Woodruff (2009); McKenzie and Woodruff (2008); and Banerjee and Duflo (2008). Relaxing credit constraints should allow households to expand old businesses, set up new ones, and efficiently time the purchase of business assets and household goods. In general, mitigation of credit constraints should move households and firms closer to the benchmark of the "separation theorem": when credit markets are efficient, investment (in enterprises, education, health, etc.) should be governed by rates of return, not the level or timing of the household's income or the timing of other expenditure. Thus, microcredit access may lead to increased (or more efficient) investment in business and household assets, health and education spending, if households were constrained from investing in these assets efficiently in the absence of microcredit. Additionally, relaxation of credit constraints may have effects beyond immediate borrowing. If households expect that they will be able to borrow from MFIs in the future, should the need arise, they may reduce their holding of buffer stocks of savings or assets (Deaton 1991, Rosenzweig and Wolpin 1993), their investment in (formal or informal) insurance, and their investment in keeping other credit lines (e.g., the ability to buy on credit) open (Deaton 1991), (Fulford 2009).

The second area in which microcredit might have an effect stems from the fact that Spandana (and many, but not all, other MFIs), lends almost exclusively to women. If this new source of credit is valuable to households and only women can access it, this may give women better outside options and raise their bargaining power within the household. Women's bargaining power may also increase if microcredit allows women to make investments that increase the share of household income that is under their control. More bargaining power or more income may give women more influence on family outcomes. This might be reflected in women reporting that they are more involved in making important household decisions such as what durable assets to purchase, how children should be educated, etc. Furthermore, given evidence that income under women's control is more likely than male-controlled income to be spent on children and on health (e.g., Lundberg et al. 1997, Duflo 2003), increased bargaining power/control over income for women may lead to greater school enrollment, more expenditure on educational goods such as private school tuition, and more investments in children's health.

Finally, many households in developing countries mention the difficulty they face in turning small savings into large sums which can be invested in durable goods, education, etc. (Collins, Morduch, Rutherford, and Ruthven 2009). Microcredit can act like "savings in reverse": the

household obtains the loan principal in a large sum, which can be invested, and then group and lender pressure to make regular loan repayments every week provides discipline that may make resisting temptation (tea, cigarettes, etc.) or requests for money from other family members or friends easier. If, due to time-inconsistency, households get a greater stream of utility from large expenditures (such as durable assets or education) than small ones (tea, cigarettes), consumption may become more efficient (Banerjee and Mullainathan 2010). Moreover, if the household knows that it will also have access to this commitment mechanism in the future, when investment returns are realized, this increases the rate of return on future investment/consumption, and makes savings or investing now more attractive, relative to consumption. Therefore, access to microcredit may have "knock-on" effects whereby today's income is spent more efficiently both because of the ability to resist temptation today, and the knowledge that the future self will be able to avoid temptation, too.

Whichever of these three channels is most important, it is important to note that microcredit's effect on savings vs. consumption in the short term is ambiguous. If households are constrained in consuming today (i.e. they would like to borrow against future income but cannot), or households invest microloans into technologies that generate a return right away, microcredit access may lead to an immediate increase in consumption. On the other hand, if microcredit gives more control to more patient members of the household[7], or allows the household to shift expenditure from immediate consumption toward investments whose returns are not realized for some time (e.g., education and some business investments), consumption may fall in the short term. Moreover, either an increase or decrease in short-term consumption could be consistent with an increase or decrease in the household members' long-term welfare. If households are unitary, time-consistent, and have rational expectations, revealed preference suggests that their decision to take a microloan must make them better off in the long run, whether short-term consumption increases or decreases. Yet the individuals within these households may have problems of self-control or intra-household inefficiency, or they may overestimate the returns to the investment they make with their microloan. In such cases, taking a microloan could lead to lower long-term welfare, while short-term consumption may increase or decrease. In short,

[7] There is some evidence that women, especially women with children, are more patient than men (Bauer and Chitylová 2008).

the intertemporal dimension of the decision to take a microloan, combined with the potential presence of fixed costs and time inconsistency mean that the impacts of microcredit on long-term welfare cannot be directly assessed by looking only at effects on short-term consumption or investment.

The preceding discussion leads us to test for the following impacts from microcredit access, with possibly different effects for different types of households: For households with high returns to entrepreneurship, but who could not or did not invest before, we should see more new businesses. Households who already had a business should invest in more assets. If households were constrained in investing in education and health, we should see more spending on these goods. If microfinance leads to more bargaining power for women, we should see women reporting greater participation in household decisions. We are agnostic about impacts on overall levels of consumption and investment, because they will depend on the relative importance of the channels identified above, and the proportions of the various types of households (likely vs. unlikely entrepreneurs, patient vs. impatient).

3.2 Why do borrowers borrow?

The purpose that the borrower reports for borrowing from Spandana is instructive about the kinds of effects of microcredit access that we might expect. Recall that Spandana does not insist that the loan be used for business purposes; nevertheless, these responses come from the survey, not what was reported to Spandana. In the case of 30% of Spandana loans the reported purpose was starting a new business; 22% were supposed to be used to buy stock for existing business, 30% to repay an existing loan, 15% to buy a durable for household use, and 15% to smooth household consumption. (Respondents could list more than one purpose, so purposes add up to more than 100%.) In other words, while some households plan to use their loans to start a business and others use a loan to expand a business they already have, many others use the loan for a non-business purpose, such as repaying another loan, buying a television or meeting day-to-day household expenses.

A feature of starting a business is that there are some costs that must be paid before any revenue is earned. While a small business like those operated by households in our sample may have few durable assets (machinery, property, etc.), they typically need working capital, such

as stock for a store, fabric to make saris, etc. And since there is always a fixed minimum time commitment in any of these businesses (someone has to sit in the shop, go out to hawk the saris, etc.), it makes no sense to operate them below a certain scale and hence it is hard to imagine operating even these businesses without a minimum commitment of working capital. Many businesses also have some assets, such as a pushcart, dosa tawa, sewing machine, stove, etc. The need to purchase assets and working capital constitutes a fixed cost of starting a business, and one impact of microfinance may be that it enables households who would not or could not pay this fixed cost without borrowing, to become entrepreneurs.

3.3 A simple model of occupational choice

3.3.1 No MFI

As a simple model of the decision to become an entrepreneur, consider households who live for two periods ($t = 1, 2$) and have endowment income y_1^i, y_2^i. Households[8] maximize the utility function:

$$U(c_1^i) + \delta_i U(c_2^i) \tag{1}$$

They can simply consume their endowment in each period ($c_1^i = y_1^i, c_2^i = y_2^i$), or they can make several intertemporal decisions. In the first period they can invest in a business with a constant-returns production function that generates second period income:

$$y = A_i(K - \underline{K})$$

Households differ in their return to entrepreneurship: some households are high-return: $A_i = A_H$. Other households have a low return to entrepreneurship: $A_i = A_L < A_H$. Households also differ in their patience (that is, in their relative preference for consumption in period 1 versus period 2). Patient households have $\delta_i = \delta_H$, while impatient households have $\delta_i = \delta_L < \delta_H$.

In addition to the option of starting a business, households can also borrow and save. Prior to the entry of the MFI, they can borrow up to an amount M from a money-lender at interest

[8] For clarity, we abstract for intra-household issues and model households as unitary. Introducing intra-household bargaining weights which depend on microcredit access would complicate notation (we would have to keep track of the overall rates of return and time preference at pre- and post-microcredit distributions of bargaining power) but not fundamentally change the predictions of the model.

rate $R(m) > A_H$. Alternatively, they can lend at net interest rate $R(I) < A_L < A_H < R(m)$. (Therefore, in the absence of the fixed cost, households with a sufficiently strong desire to shift consumption from period 1 to period 2 would invest in a business, rather than lend, since entrepreneurship has a higher rate of return. However, households who do not want to shift consumption from period 1 to period 2 will not borrow to start a business since $A_H < R(m)$.)

Households make decisions regarding first-period saving/borrowing s_1^i, and whether to become entrepreneurs, in the first period. Let $\mathbf{1}_E$ be an indicator for a household entering entrepreneurship; $\mathbf{1}_S$ be an indicator for being a period-1 saver ($s_1^i > 0$), and $\mathbf{1}_B$ be an indicator for being a period-1 borrower ($s_1^i < 0$). Households maximize utility (1) subject to the constraints that first-period consumption plus any net savings or investment not exceed first-period endowment income, and that second-period consumption not exceed second-period endowment income, plus the net return from any borrowing/saving or investment .

$$\begin{aligned} c_1^i + s_1^i + K_i &\leq y_1^i \\ c_2^i &\leq y_2^i + \mathbf{1}_E A_i(K - \underline{K}) + \mathbf{1}_S R(I) s_1^i - \mathbf{1}_B R(m) s_1^i \end{aligned} \tag{2}$$

where $s_1^i \equiv y_i^i - c_i^1 - \mathbf{1}_E K$.

Figure 1a shows the intertemporal choice problem of a household with a relatively low discount factor ($\delta_i = \delta_L$) and/or low return to entrepreneurship ($A_i = A_L$). The indifference curve (solid curve) is the locus of points that give equal utility, and the budget line (dashed line) is the locus of points satisfying (2). This household will not choose to start a business in the absence of an MFI. To do so would require borrowing at rate $R(m)$ and/or choosing very low first-period consumption, which is too painful for an impatient household or a household that realizes that its period 2 returns from entrepreneurship will be low. Due to the wedge between borrowing and lending rates ($R(I) < R(m)$), the household optimally consumes its endowment (y_1^i, y_2^i).

Figure 1b shows a the indifference curve and budget line of a household with high discount factor ($\delta_i = \delta_H$) and high return to entrepreneurship ($A_i = A_H$), who will choose to start a business, borrowing from the moneylender to do so, because for this household cutting first-period consumption is not too painful relative to the second-period returns.

Therefore, even when borrowing is expensive, the households with the highest incentives to

move consumption into the future will choose to become entrepreneurs, by borrowing or cutting consumption. Other households will not start businesses in the high-interest regime, although some of these households may opt to do so when they get access to a cheaper source of credit.

3.3.2 MFI enters

Now, an MFI enters. Households can now borrow at rate $R(I) < R(s) < R(m)$ up to an amount L. We assume that $A_L < R(s) < A_H$; the MFI lends at rates that are lower than the high return to entrepreneurship, but lower than the low return to entrepreneurship. For simplicity, we assume $L \leq \underline{K}$: the MFI will lend up to the amount needed to finance the fixed cost of entrepreneurship. Now, for some households, it may pay to borrow to go into business. Figure 2 shows two households, both of whom are relatively impatient ($\delta_i = \delta_L$). Because they are impatient, neither household had started a business before the MFI entered. However, household 1 has high return to entrepreneurship ($A_i = A_H$), while household 2 has low return to entrepreneurship ($A_i = A_L$).

The higher-return household, Household 1, now decides to start a business, borrowing from the MFI at rate $R(s)$ to finance the fixed cost. Due to the nonconvexity in the budget set, Household 1's current consumption may actually fall when they get access to microfinance, because they pay for part of the fixed cost with borrowing, and part by cutting consumption, rather than borrowing the full amount.[9] Because of the fixed cost, households who did not have a business before they gained access to microfinance, but are have a high return to starting a business, may see their consumption *decrease* due to treatment.

The other indifference curve in Figure 2 shows the case of a household with low return to entrepreneurship, Household 2. This household does not choose to start a business even when MFI loans are available. However, because the household is impatient ($\delta_i = \delta_L$), the household takes advantage of less-expensive credit to borrow against future income, and sees an immediate increase in consumption when MFI credit becomes available.

Note that it is not necessary that $A_L << A_H$ in order to see households with high and low returns behaving differently. Because of the nonconvexity due to the fixed cost of entrepreneur-

[9] Alternatively, the household may borrow the full amount, but use part of the loan principal to make the initial repayments, since MFI loans typically require that the borrower begin to make repayments just 1 week after the loan is disbursed.

ship, even quite similar households may make very different decisions.

A third group of households is those that already had a business when they gained access to microfinance. Unlike new entrepreneurs, these households have already paid the cost of starting a business, before the MFI entered. For such households, microfinance can allow them to scale up their business. Because they do not need to pay a fixed cost at the time they start to borrow from the MFI, their consumption should not decrease. Figure 3 shows that for a household that expands an existing business with an MFI loan, investment in the business increases when they get access to microfinance since $R(s) < A_H$; current consumption may or may not increase significantly, but will not fall as it may for households who are starting new businesses.

The final group of households is those who have $A_i = A_L$ and $\delta_i = \delta_H$: they have low returns to entrepreneurship, and they are patient. For these households, since $A_L < R(s)$, it does not pay to borrow to become an entrepreneur, and since they are patient, they do not want to borrow to increase their current consumption. These households do not borrow from the MFI and, since $R(I) < R(s)$, the may continue to consume their endowment. Figure 4 shows such a household.

3.4 Summary of predictions

The presence of a fixed cost that must be paid to start a business suggests that we should see the following when credit access increases:

Of those without an existing business, households with high returns to becoming an entrepreneur will pay the fixed cost and become entrepreneurs: investment will rise, and consumption may fall. On the other hand, impatient households with low returns to becoming an entrepreneur will borrow to increase consumption. Existing business owners, who do not face a nonconvexity, should borrow to increase investment (and perhaps consumption). Finally, patient households with low returns to becoming an entrepreneur will not borrow.

Before testing these predictions, we will summarize the overall treatment-comparison differences in business outcomes and in household spending, averaged over existing business owners, those with low propensity to become business owners, and those with high propensity to become business owners.

4 Results: Entire Sample

4.1 New businesses and business outcomes

To estimate the impact of microfinance becoming available in an area, we examine intent to treat (ITT) estimates; that is, simple comparisons of averages in treatment and comparison areas, averaged over borrowers and non-borrowers. Table 3 shows 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 the Data appendix.) Each column reports the results of a regression of the form

$$y_i = \alpha + \beta \times Treat_i + \varepsilon_i$$

where $Treat_i$ is an indicator for living in a treated area; β is the intent to treat effect. Standard errors are adjusted for clustering at the area level and all results are weighted to correct for oversampling of Spandana borrowers.

Column 1 of table 3a indicates that households in treated areas are 1.7 percentage points more likely to report operating a business opened in the past year. In comparison areas, 5.3% of households opened a business in the year prior to the survey, compared to 7% in treated areas, so this represents 32% more new businesses in treatment than in comparison. Another way to think about the economic significance of this figure is that approximately 1 in 5 of the additional MFI loans in treatment areas is associated with the opening of a new business: 1.7pp more new businesses due to 8.3pp more MFI loans.[10]

We also examine the impact of microcredit access on the profits of existing business (i.e., those not started in the year since the intervention). While the point estimate in column 2 indicates that average profits in treated areas are higher than in nontreated areas, this effect is not significant. The difficulty in measuring business profits means that we cannot rule out either a large positive or a negative treatment effect on business profits. The effects on monthly

[10] If we were confident that there were no spillovers of microfinance that affected the outcomes of nonborrowers in treated areas, this would be the local average treatment effect (LATE) of borrowing on those induced to borrow because of treatment. Although we are unable to conclusively estimate the extent of spillovers, this is nevertheless the per-loan impact of microcredit access.

business revenues and monthly spending on business inputs are both positive, but not significant (Table 3, columns 3 and 4).[11] Business owners in treatment areas do not report having more employees (column 5).

Intent-to-treat impacts on businesses created before the intervention have a causal, treatment effect interpretation because there is no selection effect for these businesses. We also examine the combined treatment and selection effects on new businesses (i.e., those created in the year after the intervention). These are reported in Table 3b. Because this is a small sample (356 households report starting at least one new business in the year after the intervention) and because these outcomes are difficult to measure with accuracy (**?**), many of the treatment-control differences are not significant, but they all point to selection of those households with lower propensity to become entrepreneurs in treatment areas: new businesses in treatment areas have lower spending on inputs (column 2) and even lower revenues (column 3), hence lower profits (column 1). They employ .2 fewer employees on average (compared to an average for control-area new businesses of .29 employees), significantly lower at the 10% level (column 4). Their wage bills are no lower (column 5), but this variable appears to be especially noisy. Treatment-area businesses also employ a lower value of assets (column 6), although again this is not significant.

Table 3c shows a comparison of the industries of old businesses and new businesses, across treatment and comparison areas. (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.") 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 industries of existing businesses do not differ between treatment and control (columns 3), unsurprisingly since these businesses were started before microcredit became available in the treatment areas. However, the industry composition of new businesses do differ. In particular, the fraction of food businesses (tea/coffee stands, food vendors, kirana stores, and agriculture) among new businesses in treatment areas is 8.5pp higher than among new businesses in comparison areas (against 21.4pp in comparison areas), and the fraction of rickshaw/driving businesses among new businesses in treatment areas is 5.4pp lower (against 11.0pp in compar-

[11] A second survey of the households is planned for late 2009-early 2010; we hope that when panel data on households with businesses is available, we may be able to estimate the effect of microcredit access on business outcomes with more precision.

ison areas). Both these differences are significant at the 10% level. Food businesses are likely to be among the smallest scale and least capital-intensive businesses in these areas, while rickshaw/driving businesses, which require renting or owning a vehicle, are likely to be among the most capital-intensive businesses.

Since the treatment effect of microcredit on business scale/capital usage is likely to be positive, as suggested by the effect on existing businesses, Tables 3b and 3c provide evidence of a negative selection effect, that is, microcredit drawing individuals into new entrepreneurship who are more marginal with respect to the entrepreneurship decision than existing entrepreneurs. In order to investigate the causal effects on households who are starting these new businesses, we need to find variables, not themselves influenced by microcredit access, that predict a household's propensity to start a new business. We turn to this question in Section 5.

4.2 Expenditure

Table 4 gives intent to treat estimates of the effect of microfinance on household spending. (The construction of the expenditure variables is described in the Data appendix.) Column 1 shows that, averaged over old business owners, new entrepreneurs, and non-entrepreneurs, there is no significant difference in total household expenditure per adult equivalent between treatment and comparison households. The average household in a comparison area has expenditure of Rs. 1,420 per adult equivalent per month; in treatment areas the number is 1,453, not statistically different. About Rs. 1,300 of this is nondurable expenditure, in both treatment and comparison areas (column 2). However, there are shifts in the composition of expenditure: column 3 shows that households in treatment areas spend a statistically significant Rs. 22 more per capita per month on durables than do households in comparison areas–Rs. 138 vs. Rs. 116. Further, when focusing on spending on durable goods used in a household business (column 4), the difference is even more striking: households in treatment areas on average spend more than twice as much on durables used in a household business, Rs. 12 per capita per month in treatment vs. Rs. 5 in comparison.

Column 5 shows that the increase in durables spending by treatment households was partially offset by reduced spending on "temptation goods": alcohol, tobacco, betel leaves, gambling, and food consumed outside the home. Spending on temptation goods is reduced by Rs. 9 per capita

per month.

The absolute magnitude of these changes is relatively small: for instance, the Rs. 22 of increased durables spending is approximately $2.50 at PPP exchange rates. However, this represents an increase of almost 20% relative to total spending on durable goods in comparison areas (Rs. 116). Furthermore, this figure averages over nonborrowers and borrowers. *If* all of this additional spending were coming from those who do borrow (that is, if there were no spillover effects to nonborrowers), the implied increase per new borrower would be Rs. 265, more than twice the level of durable goods spending in comparison areas. However, since it is entirely possible that there are spillover effects and affects that operate through the *expectation* of borrowing (such as reductions in precautionary savings, as documented in Thailand by Kaboski and Townsend (2009) and in India by Fulford (2009)), or through general-equilibrium effects on prices or wages (Gine and Townsend 2004), we will focus here on reduced-form/intent to treat estimates.

4.3 Does microfinance affect education, health, or women's empowerment?

The evidence so far suggest that, on average, after 15 to 18 months, microcredit allowed some households to start a new business. While we see no impact on overall expenditures, there is a significant impact on durable expenditures, and a significant decrease in goods that individuals had reported most frequently in the baseline as being "temptation goods".

The increase in durable expenditure, and the decrease with spending on temptation goods fits with the claims often made regarding microcredit, that microcredit changes lives. According to these claims, microcredit can also empower women or allow families to keep children in school (e.g. CGAP 2009). To examine these questions, Table 5 examines ITT effects on measure of women's decision-making, children's health, and education spending. 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 5 shows that, among households with non-MFI 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.[12]

A finding of many studies of women's vs. men's decisions is that women spend more on health (e.g. Lundberg et al. (1997), Duflo (2003)). 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, either. Column 3 shows that households in treatment areas spend no more on medical and sanitation items (e.g. medicines, soap) than do comparison households, and column 6 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.

Because there are many possible proxies for womens' empowerment, and many "social" outcomes we could examine, examining one at a time will create a multiple inference problem– out of 20 outcomes, we expect that 1 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 (Kling, Liebman, and Katz 2007). 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 enrolment; and counts of female children under 1 year and 1-2 years old. We selected these outcomes because they would likely be affected by changes in women's bargaining power within the household. Column 4 shows that there is no effect on the index of social outcomes (point estimate .008 standard deviations) and we can rule out an increase of more than one twentieth of a standard deviation with 95% confidence.

This suggests that, at least in the relatively short run, there is no prima facie evidence that microcredit changes the way the household functions.

[12] We exclude loans from MFIs because the selection of which households become MFI borrowers is different in treatment vs. control areas.

4.4 Coping with shocks

Another potential impact of microfinance is helping households deal with shocks with they occur. These shocks could include an illness, loss of property, loss of a job, or a death in the household. Table 6a reports the incidence of these shocks. Almost 2/3 of households (64%) experienced a health shock costing Rs. 500 or more in the past year. Property loss costing Rs. 500 or more in the past year was reported by 11% of households. Job loss was experienced by 2.4% of households in the past year (a low number, perhaps because many households do not have a member with a steady job), and 4.8% of households experienced a death in their household the past year. Table 6b investigates, for all households, the likelihood that the household borrowed to deal with a shock in the past year. Columns 1 and 2 show that the likelihood that a household borrowed to deal with a shock does not differ across treatment and comparison areas. However, column 3 shows that treatment-area households were almost twice as likely to have borrowed from an MFI to deal with a shock (2.2% of treatment-area households vs. 1.2% of comparison-area households), and column 4 shows that the amount borrowed from MFIs (including zeros for non-borrowers) is twice as high: Rs. 210 vs. Rs. 91. This is consistent with the idea that microcredit offers a way to deal with shocks that may substitute for holding buffer stocks of assets.

If microcredit was allowing households to spend more on health shocks, or in more property that could then be lost, we might see a treatment effect on the incidence of shocks costing the household more than Rs. 500, but Table 6a showed that this is not the case: the incidence is balanced between treatment and comparison. This lack of a selection effect allows us to examine the treatment effect of microcredit on response to shocks, which is conditional on a shock having occurred. Table 6c investigates how households who experiences a health shock or property loss costing Rs. 500 or more dealt with the shock. Treatment households are significantly more likely to have borrowed from Spandana (1.2% of treatment households experiencing a shock report that they dealt with it with a Spandana loan; the figure in comparison is .3%). They are not less likely to respond by borrowing from relatives/friends or from moneylenders, or by receiving gifts from relatives/friends, but they are significantly less likely to borrow from other sources (which includes borrowing on credit and delaying the payment of bills). Where we see no effect, it is quite precise: for instance, with 95% confidence we can rule out reductions in moneylender

borrowing due to shocks of more than three percentage points, against a comparison–area mean of 22.5% of households with shocks borrowing from moneylenders.

Finally, to examine whether microfinance helps households avoid "borrowing from leisure" in response to shocks by, for example, working during an illness instead of staying at home, we examine whether treatment-area households are less likely to miss work in response to a shock. However, we see no difference either in the proportion missing work or school, or in the number of days missed (including zeros).

In short, we see some evidence that microcredit helps households avoid dealing with shocks using nonpayment of bills and purchasing goods on credit, which may be especially costly responses. However microcredit does not appear to significantly reduce reliance on moneylenders or relatives and friends.

5 Testing the model: Impact Heterogeneity

As discussed above, the fact that starting a new business requires a fixed, up-front expenditure on assets and working capital, while expanding an existing business does not require such a fixed cost, means that we predict different impacts of MFI access for 3 groups of households:

1. those who had a business one year before the survey
2. among who did not have a business one year before the survey, those who **are not** likely to become entrepreneurs
3. among who did not have a business one year before the survey, those who **are** likely to become entrepreneurs.

This section investigates those predictions.

5.1 Predicting who is a likely entrepreneur

Because starting a new business is an outcome that is itself affected by the presence of microcredit (as shown in Table 3a, column 1, and Tables 3b and 3c) we cannot simply compare those who become new entrepreneurs in treatment areas to those who become in comparison areas. We

need to identify characteristics that are not themselves affected by treatment, and which make some households more likely to become entrepreneurs, so that we can compare their outcomes with those in comparison areas who would have stated businesses if they had gotten access to microcredit. It also allows us to compare the impact of microcredit on those likely to use microcredit to become entrepreneurs, to those who are unlikely to use microcredit for this purpose.

Among those who did not already own a business a year ago, the following characteristics predict the decision to become an entrepreneur: whether the wife of the household head is literate, whether the wife of the household head works for a wage, the number of prime-aged women in the household, and whether the household owns land in Hyderabad or in their native village. In the context of the model in Section 5, education and number of women may proxy for time preference (δ), since Indian women have been found to be more patient than Indian men, and more educated individuals have been found to be more patient than less educated individuals (Bauer and Chytilová 2008). If the wife of the household head works for a wage, this will reduce the return to opening a business (A).

Data on treatment-area households who do not own an old business is used to identify the relationship between these predictors and entrepreneurship: the "first stage" is shown in Table 10. Fitted values, "Biz hat" are generated for all households, treatment and comparison, who do not own an old business.[13] Literacy of the women in the family, the presence of women who do not work for a wage in the family, and the number of prime-aged women and the presence of teenagers in the household all positively predict the family starting a new business. This is as it should be: They all predict mean that the family has a larger pool of labor who have the ability to run a business, labor whose outside wage is likely quite low. These households correspond to "A_H households" in the model. Land ownership, a proxy for wealth that is unlikely to be affected by treatment (and is balanced across treatment and control, as shown in Table 1b columns 7 and 8) also positively predicts starting a business. Household wealth also raises the return to entrepreneurship because it can be used as collateral, lowering effective interest rates (Ahgion

[13] The number of observations in these regressions is lower because 10% of the sample is missing information for at least one predictor. Adding dummies for missing values and including these households does not substantially change the results (available on request).

and Bolton 1997).[14]

5.2 Relative consumption of old vs. likely vs. unlikely entrepreneurs

To interpret the findings below, which demonstrate significantly different treatment effects on the families of current business owners, compared to non-business owners who we predict to be likely to start a business as well as non-business owners who we predict to be unlikely to start a business, it may be helpful to have in mind what these groups look like in terms of average per capita expenditure in the absence of treatment. Due to randomization, the comparison group constitutes a reliable source of this information. Table 7 shows, for households in comparison areas only, the total per capita monthly consumption of old entrepreneurs (group 1 above), and, among those without a business 1 year prior to the survey, those with below-median predicted probability of starting a business (group 2 above), and those with median or above predicted probability of starting a business (group 3 above). Approximately one third, 31%, of comparison households are old business owners (Table 1b, column 5). Because all of the predictors of business propensity are binary, a significant number of households are exactly at the median level of business propensity, so group 2 includes 1,525 households and group 3 includes 2,571 households. Both those who own a business and those with median-or-above propensity of starting a business have nondurable monthly per capita expenditure approximately Rs. 100 greater than low-propensity household: Rs. 1,336 for old owners, Rs. 1,337 for high-propensity households, and Rs. 1,237 for low-propensity households. When durables purchases are included, the gap between old business owners and low-propensity households widens to Rs. 132 (Rs. 1,480 vs. Rs. 1,348) and the gap between high- and low-propensity households narrows slightly to Rs. 82 (Rs. 1,430 vs. Rs. 1,348). All 3 groups are quite poor in absolute terms: average nondurable consumption of old business owners and high-propensity households, the better-off groups, is less than $5 per person per day at PPP exchange rates: hardly prosperous. So, the impacts of microfinance discussed below are impacts for poor households, although old business owners and likely new entrepreneurs are slightly better off than those unlikely to become new entrepreneurs.

[14] Results dropping land ownership as a predictor are very similar and are available on request.

5.3 Measuring impacts for different groups

Table 8 presents the results of ITT regressions of the following form:

$$\begin{aligned} y_i &= \alpha_0 + \alpha_1 Old\_biz_i + \alpha_2 Biz\_hat_i + \\ &\quad \beta_1 Treat_i \times Old\_biz_i + \beta_2 Treat_i \times No\_old\_biz_i + \beta_3 Treat_i \times Biz\_hat_i + \varepsilon_i \end{aligned}$$

The β's are the intent to treat effects for the different groups for whom we expect different effects. β_1 measures the treatment effect for households who have an old business, and therefore did not have to pay a fixed cost, but could expand their business with an MFI loan. β_2 measures the treatment effect for households who do not own an old business, and have the lowest propensity to become new entrepreneurs. β_3 measures the *additional* treatment effect for households who do not own an old business, and are at the 75th percentile of propensity to become new entrepreneurs.[15]

Column 1, where the outcome variable is an indicator for being an MFI borrower, shows that all 3 groups take out MFI loans at very similar rates: households who have an old business increase their rate of MFI borrowing by 8.5 percentage points in treatment vs. comparison, and households who do not have an old business increase their rate of MFI borrowing by 9.6 percentage points; a higher propensity to become a new entrepreneur does not imply a higher chance of borrowing from an MFI. Therefore the results in columns 2 - 5 in Table 6 reflect different *uses* of MFI credit among these groups, not different rates of takeup.

Column 2 of Table 8 shows that, indeed, it is those with high business propensity who start more businesses in treatment than in comparison. Households with an old business are neither more nor less likely to start new businesses in treatment areas than comparison areas.

5.4 Differing patterns of changes in spending

In column 3 of Table 8, the outcome variable is monthly per capita spending on durable goods. Households who have an old business significantly increase durables spending, by 55 Rs. in treatment vs. comparison areas, averaged over borrowers and nonborrowers. Households who

[15] The business propensity variable is scaled to have a minimum of zero and to be equal to 1 at the 75th percentile. Because this is a generated regressor, all regressions with the business propensity variable are reported with bootstrapped standard errors. The regressions are weighted to correct for oversampling of Spandana borrowers.

do not have an old business, and have the lowest propensity to start a business, do not increase durables spending at all. However, moving from the lowest propensity to become a new entrepreneur to the 75th percentile of propensity is associated with an 54.9 Rs. per capita per month increase in the effect on durables spending. Therefore, consistent with the predictions above, those households who already own a business, or who are likely to start a new business, show a significant positive treatment effect on durables spending, while those who are least likely to start a new business do not use MFI credit for durable goods.

In column 4 of Table 8, the outcome variable is monthly per capita spending on nondurables (food, entertainment, transportation, etc.). Households who have an old business show no significant treatment effect on nondurable spending. Households who do not have an old business, and have the lowest propensity to start a business, on the other hand, show a large and significant increase in nondurable spending: 212 Rs. per capita per month. Moving from the lowest propensity to become a new entrepreneur, to the 75th percentile of propensity is associated with 258 Rs. per capita per month decrease in the effect on nondurable spending so that, at the 75th percentile, households are *reducing* spending by 46 Rs. per capita per month. So, again consistent with the predictions above, those households who are least likely to start a new business show a significant positive treatment effect on nondurable spending (they do not pay the fixed cost to start a business, and instead use the loan to pay off more expensive debt or borrow against future income), while those who are highly likely to start a new business decrease spending on nondurables, in order to finance the fixed cost of becoming entrepreneurs.

The increase in consumption for low business propensity households could, in principle, be an income effect from paying down high-interest loans. However, the implied TOT (treatment on the treated) effects on low business propensity households are much too large for this to be the case. In the data, the average interest rate for moneylender loans is 60% per year, while Spandana charges 12% per year (both on a non-declining balance basis). Therefore, replacing Rs. 10,000 of borrowing from a moneylender with a Spandana loan would save Rs. 4800 in interest per year—Rs. 400 per month, or Rs. 80 per capita per month for a family of 5. This is an upper bound on the possible income effect, if the marginal propensity to consume nondurables out of income were 1. (Of course, some households have debt bearing interest rates much higher than 60%, and for these households the income effect could be larger.)

Using the first stage on Spandana borrowing (13.3pp), the TOT effect of Spandana borrowing on expenditure for low business propensity households is 210/.133 = Rs. 1580 per month per capita.[16] Not only is this 20 times the implied income effect from paying down a moneylender loan, it is more than 100% of the Rs. 1,348 monthly per capita average expenditure of low business propensity households in comparison areas. Clearly, this effect is not coming entirely from those who actually borrow. That is, the exclusion restriction does not hold. Why might low business propensity households in treatment areas increase their consumption, even if they do not borrow? One possibility mentioned above is that these households are liquidating some of their buffer stocks of savings because they anticipate being able to borrow in the future. Unfortunately, we do not have measures of households' stock of savings, so we cannot directly test this possibility. Another possibility is consumption spillovers: low business propensity borrowers spend more, and non borrowers feel compelled to keep up by spending more as well. The magnitude of this effect, for a group that does not appear to be increasing investment, raises the possibility of unsustainable borrowing or running down of assets. We are currently collecting follow-up data that will allow us to examine how these households are faring three to 3.5 years after the intervention began.

In column 5 of Table 8, the outcome variable is monthly per capita spending on "temptation goods" (alcohol, tobacco, betel leaves, gambling, and food and tea outside the home). Microfinance clients sometimes report, and MFIs sometimes claim, that access to MFI credit can act as a "disciplining device" to help households reduce spending that they would like to reduce, but find difficult to reduce in practice. The pattern of effects for temptation goods is similar to the pattern for overall nondurable spending, but the effect for those with a high propensity to become entrepreneurs is much larger relative to spending on this category (temptation goods spending accounts for 6.5% of nondurables spending by comparison households). Households who do not have an old business, and have the lowest propensity to start a business, increase spending on temptation goods, roughly proportionally with the increase in other nondurables spending. However, moving from the lowest propensity to become a new entrepreneur, to the 75th percentile of propensity is associated with Rs. 40 per capita per month decrease in the

[16] Using the first stage on any MFI borrowing (8.3pp) yields an even larger implied TOT effect of Rs. 2530 per month per capita.

effect on temptation goods spending so that, at the 75th percentile, households are *reducing* spending on temptation goods by Rs. 14 per capita per month. In other words, those with high entrepreneurship propensity households are cutting back temptation goods by 17%. If all of this effect were concentrated on those who become borrowers due to treatment, it would suggest a decrease of Rs. 168 per capita per month, for high entrepreneurship propensity households who become MFI borrowers due to treatment, but as we discuss above, the magnitude of effects for low business propensity households, as well as the theoretically-motivated possibilities of anticipatory saving or dissaving, suggests that effects are not concentrated only among borrowers .

5.5 Business outcomes for existing businesses

Because new entrepreneurs (those who open businesses as a result of treatment) are a selected sample, we analyze business profits separately for businesses that existed before the start of the program. Table 9 shows treatment effects on business profits for these existing entrepreneurs. Because month-to-month profits for small businesses are extremely variable, and we are concerned that profits results may be driven by businesses who accidentally report no inputs or no income, we report results for all existing entrepreneurs and results dropping businesses reporting no inputs or no income.

Using both measures, we find impacts on business profits that, while uniformly positive, are not significant. Column 1 looks at business profits for all existing entrepreneurs. Existing business owners see an insignificant increase in business profits of Rs. 785 per month. Dropping businesses reporting no inputs or no income reduces this estimate to Rs. 143, also insignificant (column 2). Column 3 shows that the estimated effect on the 95th percentile of business profits is large in magnitude (Rs. 2095), but insignificant, while column 4 shows that the estimated effect on median (50th percentile) business profits is an insignificant Rs. 80.

In short, profits data for small businesses are extremely noisy, due in part to some businesses with very high or very low profits, and unfortunately we cannot rule out either a large positive or negative average impact on business profits. However, for the median business, we can rule out a positive impact of more than roughly Rs. 500 per month (one third of median profits in the control group), or a negative effect of more than roughly Rs. 300 per month, one sixth of

median profits in the control group. A second survey of our sample is planned for late 2009-early 2010; we hope that when panel data on households with businesses is available, we may be able to estimate the effect of microcredit access on outcomes for existing businesses with more precision.

6 Conclusion

These findings suggest that microcredit does have important effects on business outcomes and the composition of household expenditure. Moreover, these effects differ for different households, in a way consistent with the fact that a household wishing to start a new business must pay a fixed cost to do so. Existing business owners appear to use microcredit to expand their businesses: durables spending (i.e. investment) increases. Among households who did not own a business when the program began, those households with low predicted propensity to start a business do not increase durables spending, but do increase nondurable (e.g. food) consumption, consistent with using microcredit to pay down more expensive debt or borrow against future income. Those households with high predicted propensity to start a business, on the other hand, reduce nondurable spending, and in particular appear to cut back on "temptation goods," such as alcohol, tobacco, lottery tickets and snacks eaten outside the home, presumably in order to finance an even bigger initial investment than could be paid for with just the loan.

This makes it somewhat hard to assess the long run impact of the program. For example, it is possible that in the longer run these people who are currently cutting back consumption to enable greater investment will become significantly richer and increase their consumption. On the other hand, the segment of the population that increased its consumption when it got the loan without starting a business may eventually become poorer because it is borrowing against is future, though it is also possible that they are just enjoying the "income effect" of having paid down their debt to the money-lender (in which case they are richer now and perhaps will continue to be richer in the future).

While microcredit "succeeds" in affecting household expenditure and creating and expanding businesses, it appears to have no discernible effect on education, health, or womens' empowerment. Of course, after a longer time, when the investment impacts (may) have translated into

higher total expenditure for more households, it is possible that impacts on education, health, or womens' empowerment would emerge. However, at least in the short-term (within 15-18 months), microcredit does not appear to be a recipe for changing education, health, or womens' decision-making. Microcredit therefore may not be the "miracle" that is sometimes claimed on its behalf, but it does allow households to borrow, invest, and create and expand businesses.

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Appendix 1: Tables

Table 1: Treatment-Control balance

Panel A: Slum-level characteristics (baseline sample)

	(1) Population (census)	(2) Avg debt outstanding (Rs)	(3) Avg debt outstanding (Rs), no outliers	(4) Businesses per capita	(5) Per capita expenditure (Rs/mo)	(6) Literacy
Treatment	-16.258	-4815.3	-2109.2	-0.014	24.78	0.002
	[31.091]	[4812.7]	[2551.4]	[0.035]	[35.69]	[0.018]
Control Mean	316.564	36567.56	28820.718	0.299	981.315	0.68
Control Std Dev	162.89	35319.929	12639.611	0.152	163.19	0.094
N	104	104	104	104	104	104

Note: Cluster-robust standard errors in brackets. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .1, ** means statistically significant at .05, *** means statistically significant at .01.

Table 1: Treatment-Control balance

Panel B: Household-level characteristics (followup sample)

	(1) Spouse is literate	(2) Spouse works for a wage	(3) Adult equivalents	(4) Prime-aged women (18-45)	(5) Any teen (13-18) in HH	(6) Old businesses owned	(7) Own land in Hyderabad	(8) Own land in village
Treatment	-0.001	-0.013	-0.01	-0.021	0.018	0.002	-0.002	0.005
	[0.027]	[0.026]	[0.066]	[0.028]	[0.016]	[0.022]	[0.007]	[0.028]
Control Mean	0.544	0.226	4.686	1.456	0.495	0.306	0.061	0.195
Control Std Dev	0.498	0.418	1.781	0.82	0.5	0.461	0.239	0.396
N	6133	6223	6821	6856	6856	6733	6824	6813

Note: 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. An old business is a business started at least 1 year before the survey. * means statistically significant at .1, ** means statistically significant at .05, *** means statistically significant at .01.

Table 2: First stage

	(1) Borrows from Spandana	(2) Borrows from any MFI	(3) Borrows on credit	(4) Spandana borrowing (Rs.)	(5) MFI borrowing (Rs.)	(6) Borrowing on credit (Rs.)
Treatment	0.133***	0.083***	-0.093***	1406.814***	1250.504**	-390.956
	[0.023]	[0.030]	[0.034]	[261.568]	[477.956]	[1168.656]
Control Mean	0.052	0.186	.441	592.47	2404.7	8757.9
Control Std Dev	0.222	0.389	.497	2826.855	6698.2	32786.0
N	6651	6651	6638	6651	6651	6638

Note: Cluster-robust standard errors in brackets. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .1, ** means statistically significant at .05, *** means statistically significant at .01.

Table 3a: Impacts on business creation and business outcomes

	All households		Existing business owners					
	(1) New business	(2) Stopped a business	(3) Profit	(4) Inputs	(5) Revenues	(6) Employees	(7) Wages (Rs per month)	(8) Value of assets used in businesses
Treatment	0.016**	-0.003	475.15	2391.534	2866.683	-0.028	-100.937	857.876
	[0.008]	[0.004]	[2326.340]	[4441.696]	[3187.618]	[0.084]	[136.518]	[979.533]
Control Mean	0.054	0.031	550.494	13193.81	13744.304	0.384	411.477	6675.911
Control Std Dev	0.252	0.173	46604.8	59769.3	47025.5	1.656	2977.457	16935.123
N	6735	6650	2362	2362	2362	2365	2365	2360

Note: Cluster-robust standard errors in brackets. Profits, inputs and revenues are monthly, measured in Rs. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 3b: Treatment + selection effect on new business outcomes

	(1) Profit	(2) Inputs	(3) Revenues	(4) Employees	(5) Wages (Rs per month)	(6) Value of assests used in businesses
Treatment	-1323.722	-4520.369	-6224.31	-0.196*	-1.12	-812.082
	[3060.846]	[3968.584]	[6965.888]	[0.113]	[263.181]	[2205.374]
Control Mean	4365.146	12804.624	17398.949	0.289	269.901	8410.855
Control Std Dev	39388.216	52758.962	90565.553	1.325	1891.621	24129.786
N	349	356	349	356	356	356

Note: Cluster-robust standard errors in brackets. Profits, inputs and revenues are monthly, measured in Rs. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 3c: Industries of businesses

	(1) Old businesses Treatment	(2) Old businesses Control	(3) Treatment-Control Difference	(4) New businesses Treatment	(5) New businesses Control	(6) Treatment-Control Difference
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	-0.05
			[0.020]			[0.033]
Rickshaw/ driving	0.103	0.103	0.00	0.056	0.110	-0.054*
			[0.021]			[0.028]
Repair/ construction	0.0421	0.0523	-0.01	0.016	0.035	-0.019
			[0.010]			[0.015]
Crafts vendor	0.0197	0.0293	-0.01	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]
N	1424	1261		251	173	

Note: Old (new) businesses are those started more (less) than 1 year before the survey. Cluster-robust standard errors in brackets. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 4: Impacts on monthly household expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rs per capita per month								
	Total PCE	Nondurable PCE	Food PCE	Durable PCE	Durables used in a business	"Temptation goods"	Festivals (not weddings)	Any home repair>Rs 500 last year	75th percentile of home repair value (Rs)
Treatment	9.863	-6.689	-12.674	19.575*	6.832*	-8.859*	-22.217**	0.03	-1000
	[37.231]	[31.857]	[11.618]	[11.308]	[3.519]	[4.885]	[10.620]	[0.020]	[1320.07]
Control Mean	6821	6775	6821	6775	6817	6857	6857	0.495	75th percentile in control is
Control Std Dev	1419.229	1304.786	520.51	116.174	5.335	83.88	119.489	0.501	8000
N	978.299	852.4	263.099	332.563	89.524	130.213	161.522	2189	2189

Note: Cluster-robust standard errors in brackets. "Temptation goods" include alcohol, tobacco, gambling, and food and tea outside the home. Durables include assets for household or business use. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 5: Treatment effects on empowerment, health, education

	Women's empowerment: All households				HHs with loans	Health: HHs w/ kids 0-18
	(1) Woman primary decision-maker	(2) Woman primary decision-maker (non-food spending)	(3) Health expenditure (Rs per capita/mo)	(4) Index of social outcomes	(5) Woman primary decision-maker on loans	(6) Child's major illness
Treatment	0.014	0.024	-2.608	0.008	0.009	0.017
	[0.035]	[0.032]	[12.431]	[0.023]	[0.017]	[0.032]
Control Mean	0.662	0.516	140.253	-0.002	0.281	0.420
Control Std Dev	0.473	0.500	455.740	0.457	0.396	0.659
N	6849	6849	6821	6856	6028	5871

Notes: Cluster-robust standard errors in brackets. Decisions in columns 1 and 2 include household spending, investment, savings, and education. Health expenditure (col 3) includes medical and cleaning products spending. Index of social outcomes (col 4) is an equally-weighted average of z-scores for outcomes including: indicators for women making decisions on food, clothing, health, home purchase and repair, education, durable goods, gold and silver, investment; levels of spending on tuition, fees, and other education expenses; medical expenditure; teenage girls' and teenage boys' school enrolment; and counts of female children under 1 and 1-2 years old. Decisions in cols 5 and 6 indicate women being the primary decision-maker in taking out household loans. Child's major illness in col 7 is a child's lillness in the past year on which the household spent more than Rs. 500. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 6a: Incidence of shocks

	(1) Health shock > Rs 500	(2) Property loss > Rs 500	(3) Job loss	(4) Death
Treatment	0.0071	-0.0107	-0.0008	-0.0008
	[.0177]	[.0108]	[.0045]	[.00575]
Control mean	0.6351	0.1144	0.0228	0.0479
Control sd	0.4815	0.3183	0.1494	0.2135
N	6857	6812	6800	6836

Notes: Cluster-robust standard errors in brackets. Shocks include health events and property losses costing Rs. 500 or more, job loss by a household member, and death of a a household member. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 6b: Borrowing to deal with shocks (unconditional)

	(1) Borrowed for shock	(2) Amount borrowed	(3) Borrowed from MFI	(4) Amount from MFI	(5) Borrowed from Spandana
Treatment	-0.021	-498.857	0.010**	119.020**	0.009***
	[0.026]	[404.178]	[0.005]	[46.483]	[0.003]
Control mean	0.185	2434.628	0.012	90.938	0.003
Control sd	0.565	12470.508	0.115	1012.973	0.053
N	6702	6702	6702	6702	6702

Notes: Cluster-robust standard errors in brackets. Shocks include health events and property losses costing Rs 500 or more, job loss by a household member, and death of a a household member. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 6c: Dealing with health shocks (conditional on shock)

	(1) Borrowed from Spandana	(2) Borrowed from relatives or friends	(3) Borrowed from moneylender	(4) Borrowed from other source	(5) Received gifts	(6) Other financing	(7) Missed any work	(8) Days missed
Treatment	0.009***	-0.009	0.009	-0.025*	-0.002	-0.004	0.001	-2.825
	[0.003]	[0.020]	[0.020]	[0.013]	[0.005]	[0.006]	[0.021]	[3.859]
Control mean	0.003	0.236	0.225	0.097	0.027	0.02	0.68	24.757
Control sd	0.058	0.425	0.418	0.296	0.161	0.141	0.467	75.695
N	4384	4384	4384	4384	4384	4384	4384	4384

Notes: Cluster-robust standard errors in brackets. Shocks include health events and property losses costing Rs. 500 or more, job loss by a household member, and death of a a household member. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 7: Expenditure for control households, by business status

		Did not have a business 1 yr ago			
	Old business owners (1)	High-business propensity (2)	Low-business propensity (3)	P value: (1)=(3)	P value: (2)=(3)
Total PCE (Rs/mo)	1,479.56	1,430.31	1,347.56	0.014	0.011
Nondurable PCE) (Rs/mo)	1,335.57	1,336.81	1,237.32	0.006	0.051
Number of control households	979	2,571	1,525		

Note: P-values computed using cluster-robust standard errors. Old business owners are those who own a business started at least 1 year before the survey. High-business propensity households are those (who did not have a business 1 year before the survey) with median or above predicted propensity to start a new business; low-business propensity households are those with below-median propensity who did not have a business 1 year before the survey. New business propensity estimated using spouse's literacy, spouse working for a wage, number of prime-aged women, presence of any teens in household, and land ownership. PCE is per capital expenditure (Rs per month). Nondurable PCE excludes purchases of home and business durable assets.

Table 8: Effects by business status: borrowing and expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Borrowing		Monthly PCE				Business outcomes		Social index
	Borrows from any MFI	Non-MFI loan age (years)	Durable expenditure	Business durables	Nondurable expenditure	"Temptation goods"	Started new business	Stopped business	
Main effects									
New biz propensity	0.00	-.281**	4.49	-7.58	201.94***	-25.03***	.046**	-0.08	.127***
(no old biz)	(0.03)	(0.13)	(19.68)	(7.62)	(57.56)	(8.10)	(0.02)	(0.11)	(0.039)
Any old biz	.125***	-.309**	50.13**	1.74	202.42***	-10.58	.0395**	-0.15	.158***
	(0.03)	(0.14)	(22.08)	(9.20)	(51.13)	(7.97)	(0.02)	(0.09)	(0.038)
Interaction w treatment									
No old biz	.095**	-0.31	-46.72**	-5.10	213.30**	19.90*	-0.02	0.02	0.065
	(0.05)	(0.20)	(23.10)	(9.33)	(99.12)	(12.06)	(0.02)	(0.16)	(0.057)
New biz propensity	-0.02	0.24	67.40**	7.45	-260.24**	-32.87***	.0424*	0.04	-0.064
	(0.04)	(0.20)	(29.17)	(8.63)	(102.29)	(12.35)	(0.02)	(0.18)	(0.053)
Any old biz	.085*	-0.09	55.42**	18.90**	65.12	-14.71*	0.01	0.00	0.001
	(0.05)	(0.12)	(24.53)	(8.86)	(56.03)	(8.86)	(0.01)	(0.01)	(0.028)
Control mean of LHS var	0.19	0.85	116.17	5.34	1,304.79	83.88	0.05	0.04	-0.001
Control Std Dev	0.39	1.41	332.56	89.52	852.40	130.21	0.25	0.19	0.456
N	5996	6037	6141	6179	6141	6183	6183	2299	6183

Note: New business propensity estimated in treatment using spouse's literacy, spouse working for a wage, number of prime-aged women, indicator for any teens in household, and land ownership (HHs with missing predictors dropped). New business propensity scaled to equal one at 75th percentile. Loan age in column 2 is the average age of a household's loans (i.e., the time since the loans were taken), weighted by the size of the loan principal. "Temptation goods" include alcohol, tobacco, paan, gambling, and food and tea outside the home. Durables include assets for household or business use. Index of social outcomes is an equally-weighted average of z-scores for outcomes including: indicators for women making decisions on food, clothing, health, home purchase and repair, education, durable goods, gold and silver, investment; levels of spending on tuition, fees, and other education expenses; medical expenditure; teenage girls' and teenage boys' school enrolment; and counts of female children under 1 and 1-2 years old. Cluster-robust standard errors in parentheses bootstrapped (200 repetitions) to account for generated regressor; regressions are weighed to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 9: Business effects on existing business owners

	OLS		95th quantile regression	Median regression
	(1)	(2)	(3)	(4)
	Profits	Drop businesses with zero inputs or zero income	Drop businesses with zero inputs or zero income	Drop businesses with zero inputs or zero income
Treatment effect	784.967	143.27	2095	80
	[2,561.379]	[2,516.557]	[2,120.626]	[221.443]
Control mean for existing businesses	35.829	1,432.80	95th percentile in treatment is Rs. 14,473	Median in treatment is Rs. 1,768
Control Std Dev	47055.357	27,446.82		
N	2084	1968	1968	1968

Note: Existing businesses are those started at least 1 year prior to the survey. Cluster-robust standard errors in brackets; regressions weighted to account for oversampling of Spandana borrowers. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Table 10: Predicting business propensity

RHS variable: Household opened new business	
Spouse is literate	0.017
	0.014
Spouse works for wage	-0.048***
	0.016
Number prime-aged women	0.009
	0.009
Own land in Hyderabad	0.019
	0.032
Own land in village	-0.018
	0.017
Any teenagers in household	0.025*
	0.014
Constant	0.049***
	0.018
N	2134

Note: Regression estimated using treatment-area households who did not own a business one year prior to the survey. "Spouse" is the wife of the household head, if the head is male, or the household head if female. Teenagers are household members aged 13-18. * means statistically significant at .10, ** means statistically significant at .05, *** means statistically significant at .01.

Appendix 2: Figures

Figure 1a: No MFI, non-entrepreneur
(A_L or δ_L)

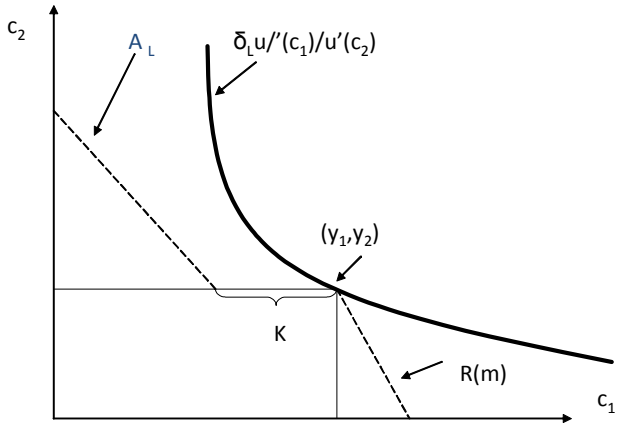


Figure 1b: No MFI, entrepreneur
(A_H and δ_H)

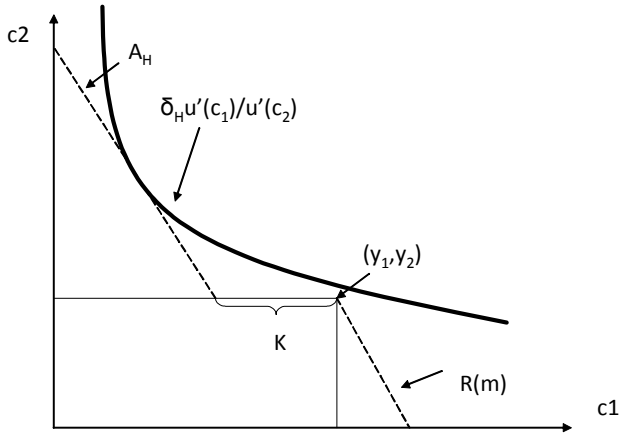


Figure 2: MFI enters:
2 impatient households (no existing business)

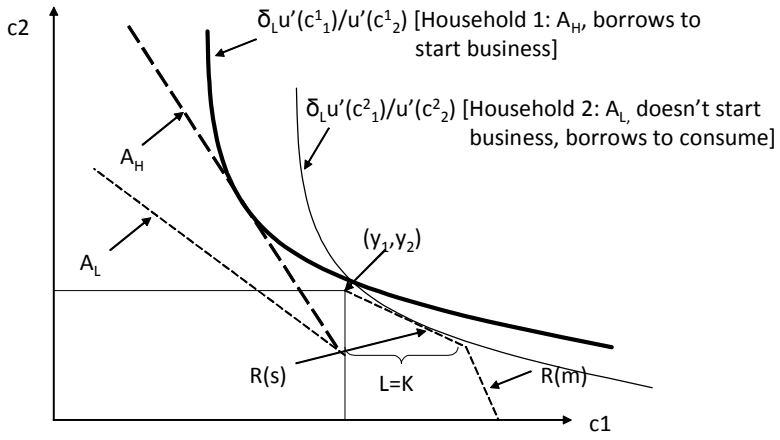


Figure 3: MFI enters:
household w/ existing business
patient, high business propensity (A_H and δ_H)

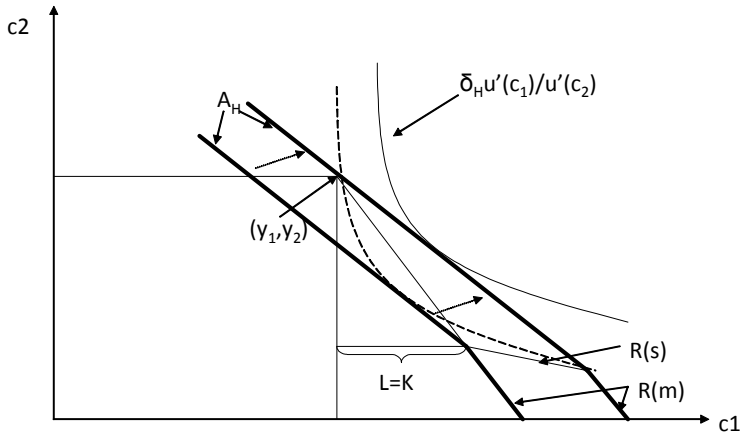
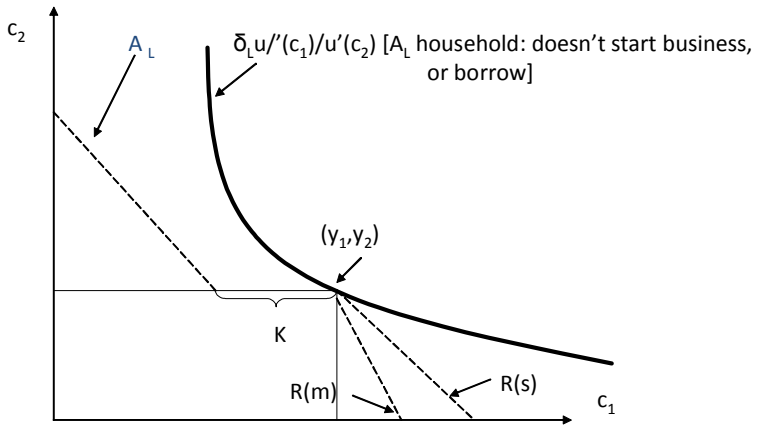


Figure 4: MFI enters:
patient, low business propensity
(A_L and δ_H)



Appendix 3: Variable definitions

Go to http://www.povertyactionlab.org/projects/project.php?pid=44 to download the survey instruments (English and 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, they 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 5 saris this months but sold only 4, then we need to record the purchase price of 4 saris, not 5." 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 misc. goods & 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.

Nondurable 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.