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

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Abstract

Microcredit has spread extremely rapidly since its beginnings in the late 1970s, but whether and how much is 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. 15 to 18 months after the program, there was no effect of access to microcredit on average monthly expenditure per capita, but durable expenditure did increase. The effect are heterogenous: Households with an existing business at the time of the program invest in durable goods, and their profits increase. Households with high propensity to become business owners 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 see nondurable spending increase. We find no impact on measures of health, education, or women's decision-making.

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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 over-borrowing and therefore even greater long term poverty. For instance, microfinance skeptic Milford Bateman states in a 2008 letter to the *Financial Times*, "in nearly 25 years of academic and consulting work in local economic development, my experience is that microfinance programmes most often spell the death of the local economy."

The problem is that microfinance clients are self-selected and therefore not comparable to non-clients. Microfinance organizations also purposively chose some villages and not others. 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 if identifying variation in a structural model of the impact of microcredit, and find

large positive effects, especially for women. However, 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, Jonathan 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 de Aghion and Morduch reiterated the same uncertainty, 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.

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.

Yet, surprisingly, while 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)), to date, to best of our knowledge, there have not been any large-scale randomized trials with the potential to examine what happens when microcredit becomes available in a new market.[2]

In this paper we report on the first randomized evaluation of the effect of the canonical group-lending micro-credit 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

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[1]Kaboski and Townsend (2005) use a natural experiment (the introduction of a village fund whose size is fixed by village) to estimate the impact of the amount borrowed and find impacts on consumption, but not investment.

[2]Karlan and Zinman (2008) 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 down the road.

in an average of 65 households in each slum, a total of 6,850 households. In the mean time, 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 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 like education, health and women's empowerment.

On balance our results show significant and not insubstantial impact on both how many new businesses get started and the profitability of pre-existing businesses. We also do see significant impacts on the purchase of durables, and especially business durables. However there is no impact on average consumption, although the effects are heterogenous, and 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.

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 loan of their group, and of the center. The first loan is Rs. 10,000 (about $200 at market exchange rates, or $1,000 at PPP-adjusted exchange rates). It takes 50 weeks to reimburse principal and interest rate; the interest rate is 12% (non-declining balance; equivalent to a 20% APR). If they all reimburse they are eligible for second loans of

Rs. 10,000-12,000; loans 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: (a) female,[3] (b) aged 18 to 59, (c) residing in the same area for at least one year, (d) has valid identification and residential proof (ration card, voter card, or electricity bill), (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, Spandana does not insist on "transformation" in the household (unlike Grameen). 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.)

2.2 Experimental Design

Spandana selected 120 areas (identifiable neighborhood, 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.

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[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.

In each area, a baseline survey was conducted in 2005. Households were selected, 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, sixteen areas were dropped from the study prior to randomization. These areas were dropped because they were found to contain large numbers of migrant-worker households. Spandana (and other microfinance agencies) has a rule that lending should only be made to households who have lived in the same community for at least three years because dynamic incentives (the promise of more credit in the future) are more effective in motivating repayment for these households. The remaining 104 were assigned to pairs 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 assigned to the treatment group. Spandana then progressively began operating in the 52 treatment areas, between 2006 and 2007. Note that in the intervening periods, other MFIs also started their operations, both in treatment and comparison areas. 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 followup 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

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[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.

resurveyed in the followup.[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 followup 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] number of "prime-aged" women (aged 18 - 45), the percentage who operate a business opened a year or more ago, or the likelihood of owning land, either in Hyderabad or in the family's native village.

2.3 The context: Findings from the Baseline

The average baseline household is a family of 5, with monthly expenditure of Rs 5,000, $540 at PPP-adjusted exchange rates (World Bank 2006).[7] A majority of households (70%) lived in a house they owned, and 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. Loans were taken from moneylenders (49%), family members (13%), friends or neighbors (28%). Commercial bank loans were very rare.

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[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).

[7]PPP exchange rate: $1=Rs. 9.2. All following references to dollar amounts are in PPP terms unless noted otherwise.

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 ($340) 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 3 and 4 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, and Rs. 1,257 more from all MFIs.

3   The Impacts of Microfinance: Conceptual Framework

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 purpose. 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 can 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 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 not have a lot of 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), 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.

3.1   A simple model of occupational choice

3.1.1   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. 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:

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

They 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 rate $R(m) < A$. Alternatively, they can lend at net interest rate $R(I) < R(m)$. (Therefore, in the absence of the fixed cost, all households wanting 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.)

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 from consumption:

$$U(c_1^i) + \delta_i U(c_2^i)$$

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 .

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\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(K - \underline{K}) + \mathbf{1}_S R(I)s_1^i - \mathbf{1}_B R(m)s_1^i
\end{aligned}
$$

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 (δ_i) and/or low wealth ($y_1^i + y_2^i$). 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 with cost equal to $y_1^i + y_2^i$. 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 or low-current-wealth household. Due to the wedge between

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borrowing and lending rates, 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 and high first-period wealth, who will choose to start a business, 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.

3.1.2 MFI enters

Now, an MFI enters. Households can now borrow at rate $R(s) < R(m)$ up to an amount L; for simplicity let $L = \underline{K}$. Now it may pay to borrow to go into business. Figure 2 shows two households, neither of whom had started a business before the MFI entered. The households are identical except that household 1 has a very slightly higher discount factor than household 2; that is, household 1 gives the future slightly more weight than does household 2. (We could also have shown two households who are identical except for a small difference in period 1 wealth, or who are identical except for a small difference in returns to becoming an entrepreneur: the idea is the same.)

The slightly-more-patient household, Household 1, now decides to start a business, borrowing 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. Because of the fixed cost, households who did not have a business before they gained access to microfinance, but are likely to start a business, may see their consumption decrease due to treatment.

The other indifference curve in Figure 2, shows the case of a slightly-less-patient household, Household 2, who does not choose to start a business even when MFI loans are available. Such a household takes advantage of less-expensive credit to borrow against future income, and sees an immediate increase in consumption when MFI credit becomes available, because the household's effective income has increased. It is because of the nonconvexity due to the fixed cost that 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

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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, they are expected to see increased profits as a result of the additional investment in their business. Their consumption should not decrease. Figure 3 shows that for a household that expands an existing business with an MFI loan, current consumption increases when they get access to microfinance, because their investment translates immediately into higher profits.

3.2   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 propensity to start a business (due to a high discount factor, high wealth, or high returns to becoming an entrepreneur) will pay the fixed cost and become entrepreneurs: investment will rise, and consumption may fall.

  - Households with low propensity to start a business will borrow to increase consumption.

- Existing business owners do not face a nonconvexity: they can borrow to increase investment; business profits will increase.

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 profits

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 3 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.[8]

Furthermore, business owners in treatment areas report more monthly business profits than business owners in comparison areas: an average of Rs. 4,800. (Table 3, column 2). The effects on monthly business revenues and monthly spending on business inputs are both positive, but not significant (Table 3, columns 3 and 4). Business owners in treatment areas do not report having more employees (column 5).

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[8]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.

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, 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 8 examines ITT effects on measure of women's decision-making, children's health, and education spending. Columns 1-3 show that women in treatment areas were no more likely to be make decisions about household spending, investment, savings, or education. Column 2 shows that even focusing on non-food decisions, which might be more sensitive to changes in empowerment, does not change the finding.

A finding of many studies of women's vs. men's decisions is that women spend more on child health and education (e.g. Lundberg et al. 1997). These are interesting outcomes in their own right, and increased spending in these areas might also demonstrate greater decision-making or bargaining power for women. However, there is no effect on health or education outcomes, either. Column 3 shows that households in treatment areas spend no more on medical and sanitation (e.g. soap) than do comparison households, and column 4 shows that, among households with children, households in treatment areas were no less likely to report that a child had a major illness in the past year. Columns 5-7 examine educational outcomes. Among households with school-aged children, households in treatment areas are not more likely to have children in school. Looking just at girls' school enrollment gives the same conclusion (column 6). While the enrollment results are unsurprising since the majority of children are enrolled in school even in treatment areas, schooling expenditures vary widely from household to households, and treatment households do not spend more on schooling, either: spending on tuition, school fees and uniforms is the same in treatment and comparison areas. For decision-making, health, and education, the standard errors of the treatment effects are reasonably small: with 95% confidence we can rule out an effect on any of these outcomes of more than about 10% of the standard deviation in comparison areas.

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

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 3, column 1) we cannot just 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 the amount of land owned by the household. In the context of the

model in Section 6, education and number of women may proxy for time preference, since Indian women have been found to be more patient than Indian men, and more educated individuals have been found to be more patient (Bauer and Chytilová 2008). If the wife of the household head works for a wage, this will reduce the return to opening a business; land ownership is a proxy for initial wealth.

Data on comparison 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 9. Fitted values, "Biz hat" are generated for all households, treatment and comparison, who do not own an old business.[9] 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 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 women who have the ability to run a business. Land ownership, a proxy for wealth (one that is unlikely to be affected by treatment) also positively predicts starting a business.[10]

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 5 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, col 5). Because all of the

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[9]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).

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

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.

5.3   Measuring impacts for different groups

Table 6 presents the results of ITT regressions of the following form:

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

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.[11]

Column 1, where the outcome variable is an indicator for being an MFI borrower, shows

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[11]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.

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 6 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 6, 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 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 6, 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.

In column 5 of Table 6, 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 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.

5.5 Business outcomes for existing businesses

Because new entrepreneurs (those who open businesses as a result of treatment) are a selected sample, in analyzing business profits we restrict attention to the effect on businesses that existed before the start of the program. Table 7 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, no income, or erroneous inputs or income, we report results for all existing en-

trepreneurs; results dropping businesses reporting no inputs or no income; and results dropping businesses reporting inputs more than ten times greater than income, or less than one tenth of reported income.

Column 1 looks at business profits for all existing entrepreneurs. Existing business owners see a large and significant increase in business profits of more than Rs. 5,300 per month (significant at 5% level). Dropping businesses reporting no inputs or no income reduces this estimate to Rs. 3,060, but does not change the level of significance (column 2). Dropping businesses reporting inputs more than ten times greater than income, or less than one tenth of reported income leads to an estimated effect of Rs. 2,783 (column 3; again, significant at 5% level). These large effects are coming for the most and least successful business. Column 4 shows that the estimated effect on the 95th percentile of business profits is Rs. 6,248, while column 5 shows that the estimated effect on median (50th percentile) business profits is essentially zero.

Because the point estimate on profits for small businesses varies depending to the sample used, these point estimates should be interpreted with caution, if at all. However, given our data, with 95% confidence we can rule out a negative effect on average profits for existing businesses, and we can rule out a negative effect larger than -365 Rs per month for the median existing business. Not only does this suggest that at least some of these businesses have very high rates of return, it also suggests that the new businesses being created in treatment areas do not harm existing business owners, on average. However, this average masks enormous variation in the effect on business profits.

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) and business profits increase. 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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7   Data Appendix

The survey instruments (English and Telugu) can be downloaded here: http://www.povertyactionlab.org/projects/project.php?pid=44

7.1   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)."

7.2 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 & other educational articles (including uniforms); hospital, nursing home (institutional); clothing (include festival clothes, winter clothes, etc.) and gifts; 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 asked for, and 1/12 of the sum of annual spending on all goods where annual spending was asked for.

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/intoxicants; lottery tickets/gambling.

7.3 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, divided by 12.

Table 1: Treatment-Control balance

Panel A: Slum-level characteristics (baseline)

	(1) Population (census)	(2) Avg debt outstanding (Rs)	(3) Businesses per capita	(4) Per capita expenditure (Rs/mo)	(5) Literacy
Treatment	-16.258 [31.091]	-4891.596 [6048.984]	-0.014 [0.035]	24.777 [35.694]	0.002 [0.018]
Control Mean	316.564	50430.009	0.299	981.315	0.68
Control Std Dev	162.89	41760.501	0.152	163.19	0.094
N	104	104	104	104	104

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) Old businesses owned	(6) Own land in Hyderabad	(7) Own land in village
Treatment	-0.001 [0.027]	-0.013 [0.026]	-0.01 [0.066]	-0.021 [0.028]	0.002 [0.022]	-0.002 [0.007]	0.005 [0.028]
Control Mean	0.544	0.226	4.686	1.456	0.306	0.061	0.195
Control Std Dev	0.498	0.418	1.781	0.82	0.461	0.239	0.396
N	6133	6223	6821	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 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

Table 2: First stage

	(1) Spandana	(2) Any MFI	(3) Spandana borrowing (Rs.)	(4) MFI borrowing (Rs.)
	b/se	b/se	b/se	b/se
Treatment	0.133***	0.083***	1408.018***	1257.368***
	[0.023]	[0.030]	[260.544]	[473.802]
Control Mean	0.053	0.187	603.377	2421.505
Control Std Dev	0.224	0.39	2865.088	6709.473
N	6651	6651	6651	6651

Note: Cluster-robust standard errors in brackets. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

Table 3: Impacts on business creation and business outcomes

	All households	Business owners			
	(1)	(2)	(3)	(4)	(5)
	New businesses	Profit	Inputs	Revenues	Employees
Treatment	0.017**	4809.835**	2089.988	6899.823	-0.028
	[0.008]	[2032.781]	[4641.245]	[4925.634]	[0.084]
Control Mean	0.053	1703.821	13006.159	14709.98	0.384
Control Std Dev	0.25	55195.7	59056.7	55860.0	1.656
N	6756	2365	2365	2365	2365

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 5%, *** means statistically significant at 1%.

Table 4: Impacts on monthly household expenditure (Rs per capita)

	(1)	(2)	(3)	(4)	(5)
	Total PCE	Nondurable PCE	Durable PCE	Durables used in a business	"Temptation goods"
Treatment	37.375	17.723	22.300*	6.790*	-8.999*
	[46.221]	[40.686]	[11.680]	[3.488]	[5.169]
Control Mean	1419.229	1304.786	116.174	5.335	83.88
Control Std Dev	978.299	852.4	332.563	89.524	130.213
N	6821	6775	6775	6817	6857

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 5%, *** means statistically significant at 1%.

Table 5: Expenditure for control households, by business status

	Old business owners	Did not have a business 1 yr ago		P value: (1)=(3)	P value: (2)=(3)
		High-business propensity	Low-business propensity		
	(1)	(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 HHs	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, and land ownership. PCE is per capital expenditure (Rs per month). Nondurable PCE excludes purchases of home and business durable assets.

Table 6: Effects by business status: borrowing and expenditure

	(1)	(2)	(3)	(4)	(5)
				Monthly PCE	
	Borrows from any MFI	Started new business	Durable expenditure	Nondurable expenditure	"Temptation goods"
Main effects					
New biz propensity (no old biz)	-0.0053004	0.039	20.71	282.37***	-15.83**
	[0.0338]	[.0189]	[18.68]	[61.54]	[7.73]
Any old biz	0.121***	0.034	63.52	269.33***	-3.22
	[0.0377]	[.0147]**	[17.77]***	[57.12]	[8.26]
Interaction with treatment					
Any old biz	0.085*	0.011	55.42**	65.12	-13.4
	[0.0464]	[.012]	[26.18]	[49.09]	[8.75]
No old biz	0.0959**	-0.027	-36.32	212.41**	25.56**
	[0.0465]	[.020]	[23.25]	[100.52]	[11.39]
New biz propensity	-0.0176	0.048**	54.93**	-258.49**	-39.85***
	[0.0473]	[.024]	[29.50]	[102.22]	[12.98]
Control mean of LHS var	0.187	0.053	116.174	1,304.79	85.079
Control Std Dev	0.39	0.25	332.563	852.40	130.751
N	5991	6733	6136	6136	6100

Note: New business propensity estimated using spouse's literacy, spouse working for a wage, number of prime-aged women, and land ownership (HHs with missing predictors dropped). New business propensity scaled to equal one at 75th percentile. "Temptation goods" include alcohol, tobacco, pan, gambling, and food and tea outside the home. Durables include assets for household or business use. Cluster-robust standard errors in brackets bootstrapped to account for generated regressor; regressions are weigted to account for oversampling of Spandana borrowers. * means statistically significant at 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

Table 7: Business effects on existing business owners

	OLS			95th quantile regression	Median regression
	(1)	(2)	(3)	(4)	(4)
	Profits	Drop businesses with zero inputs or zero income	Drop businesses with inputs>10x biz income, or inputs<.10x biz income	Drop businesses with inputs>10x biz income, or inputs<.10x biz income	Drop businesses with inputs>10x biz income, or inputs<.10x biz income
Treatment effect	5,386.906** [2,248.648]	3,059.243** [1,501.998]	2,783.215** [1,401.219]	6,190*** [2,359]	114 [244]
Control mean for existing businesses	776.161	1,947.90	1,660.74	95th percentile in treatment is Rs. 13,250	Median in treatment is Rs. 1,893
Control Std Dev	56960.961	26,426.04	27,476.15		
N	2014	1821	1568	1568	1568

Note: Existing businesses are those started at least 1 year prior to the survey. Cluster-robust standard errors in brackets bootstrapped to account for generated regressor; regressions weigted to account for oversampling of Spandana borrowers. * means statistically significant at 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

Table 8: Treatment effects on empowerment, health, eduction

	Women's empowerment: All households			Health: HHs w/ kids 0-18	Education: Households with children 5-18		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Woman makes spending decisions	Woman makes nonfood spending decisions	Health expenditure (Rs per capita/mo)	Child's major illness	Kids in school	Girls in school (HHs w/ girls 5-18)	Educ. Expenditure (Rs per capita/mo)
Treatment	0.000	-0.001	-2.608	-0.001	-0.028	-0.043	5.017
	[0.011]	[0.014]	[12.431]	[0.024]	[0.036]	[0.035]	[12.300]
Control Mean	0.930	0.901	140.253	0.241	1.42	0.72	145.945
Control Std Dev	0.255	0.299	455.74	0.539	1.251	0.882	240.594
N	6849	6849	6821	5123	5439	4058	5409

Note: Cluster-robust standard errors in brackets. Decisions include household spending, investment, savings, and education. Health expenditure includes medical and cleaning products spending. Educational expenditure includes tuition, school fees and uniforms. Results are weighted to account for oversampling of Spandana borrowers. * means statistically significant at 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

	Household opened new business
Head's spouse is literate	0.013
	(0.014)
Spouse works for wage	-0.046***
	(0.016)
Number prime-aged women	0.012
	(0.009)
Own land in Hyderabad	0.021
	(0.032)
Own land in village	-0.017
	(0.017)
Constant	0.059***
	(0.017)
N	2134
r2	0.006

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. * means statistically significant at 10%, ** means statistically significant at 5%, *** means statistically significant at 1%.

Figure 1a: No MFI, non-entrepreneur
## (low y_1 or low δ)

c_2

A

$\delta_{NE}u/'(c_1)/u'(c_2)$

(y_1,y_2)

$\underline{K}$

$R(m)$

c_1
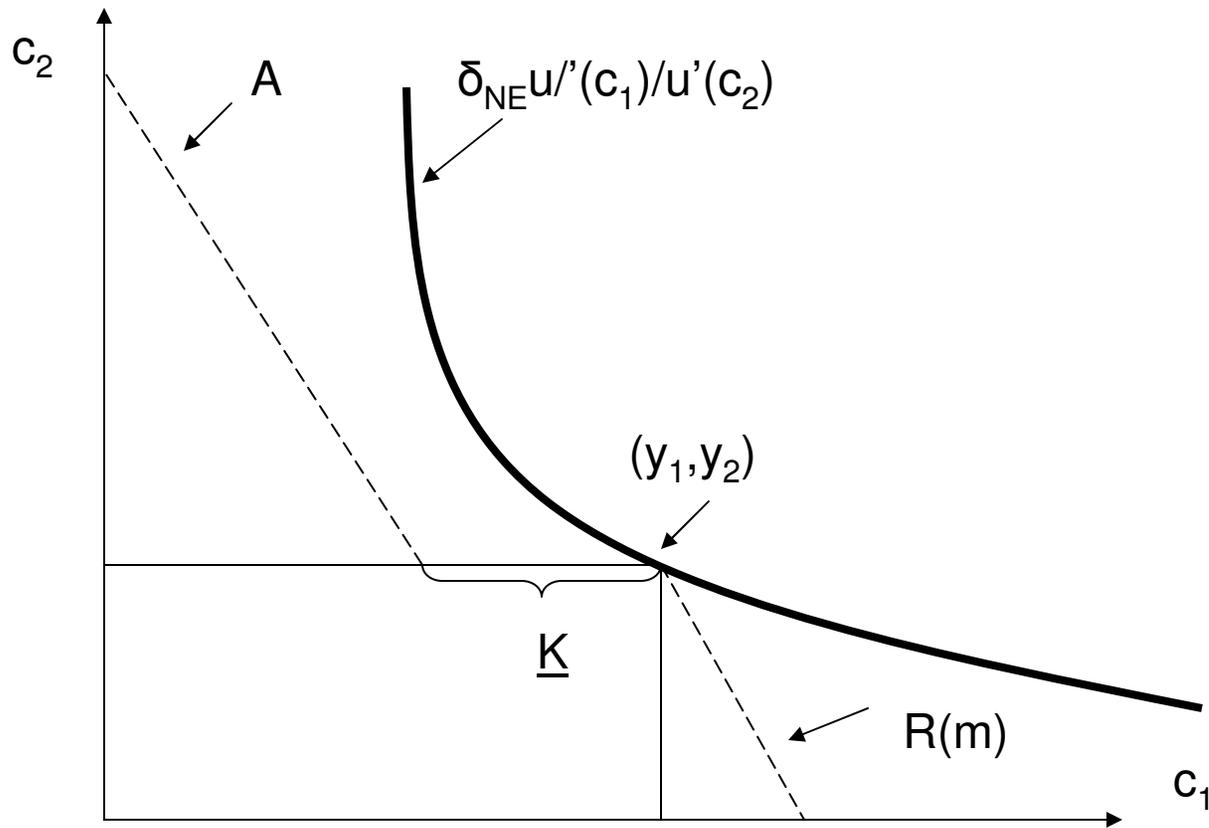
Figure 1b: No MFI, entrepreneur
(high y_1 or high δ)
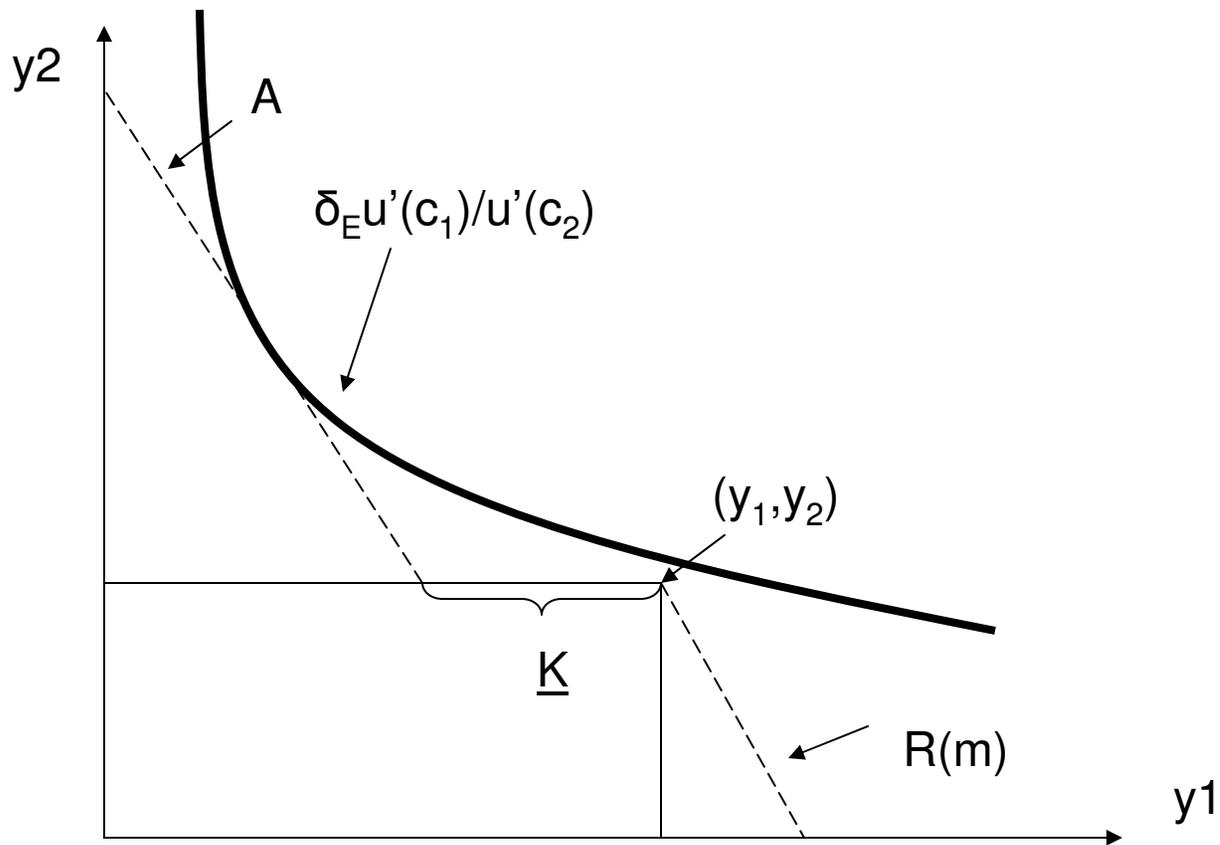
Figure 2: MFI enters:
2 households w/o existing business

$\delta_1 u'(c^1{}_1)/u'(c^1{}_2)$ [Household 1, starts business]

$\delta_2 u'(c^2{}_1)/u'(c^2{}_2)$ [Household 2, doesn't start business]

A

y2

R(s)   L=$\underline{K}$ R(m)

y1
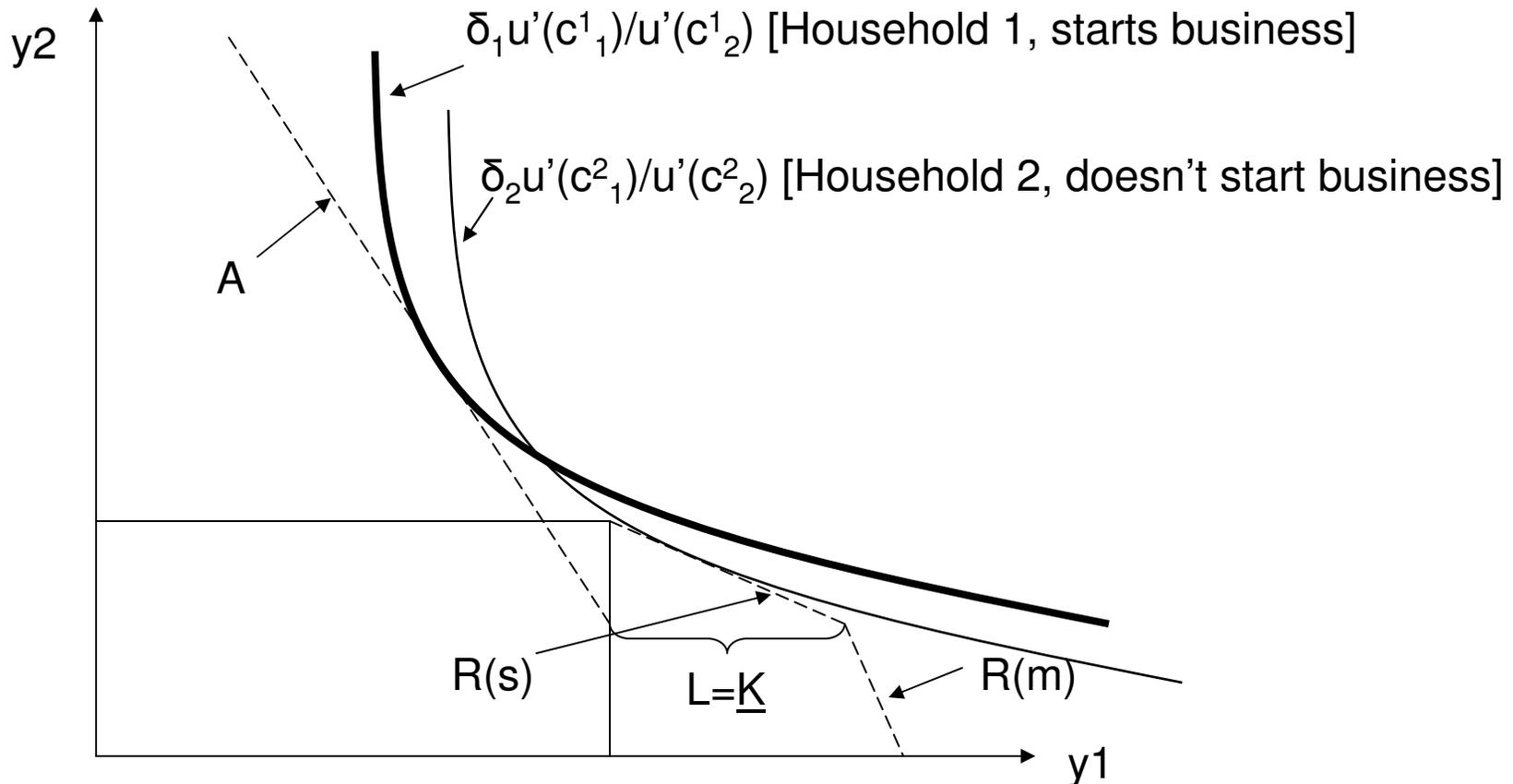
Because of the nonconvexity (fixed cost) associated with starting a new business, 2 households who differ only slightly in their discount factor could make very different Use of an MFI loan.

Figure 3: MFI enters:
household w/ existing business
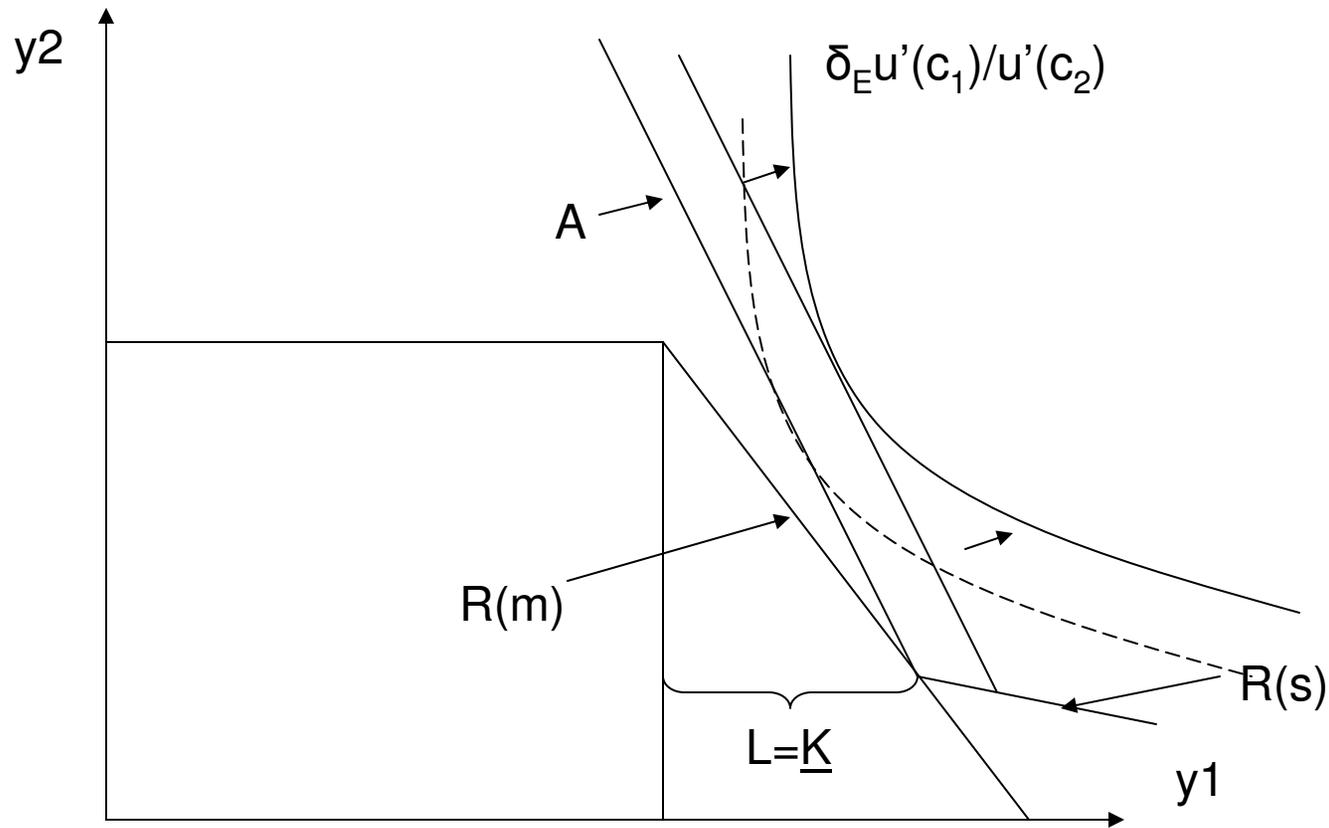
A household that has already paid the fixed cost of starting a business will see both investment and consumption increase when MFI loans become available.