RETURNS TO CAPITAL IN MICROENTERPRISES: EVIDENCE FROM A FIELD EXPERIMENT

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Abstract

Small and informal firms account for a large share of employment in developing countries. The rapid expansion of microfinance services is based on the belief that these firms have productive investment opportunities and can enjoy high returns to capital if given the opportunity. However, measuring the return to capital is complicated by unobserved factors such as entrepreneurial ability and demand shocks, which are likely to be correlated with capital stock. We use a randomized experiment to overcome this problem, and to measure the return to capital for the average microenterprise in our sample, regardless of whether or not they apply for credit. We accomplish this by providing cash and equipment grants to small firms in Sri Lanka, and measuring the increase in profits arising from this exogenous (positive) shock to capital stock. We find the average real return to capital to be around 4 percent per month, substantially higher than the market interest rate. We then use the heterogeneity of treatment effects to explore whether missing credit markets or missing insurance markets are the most likely cause of the high returns. Returns are found to vary with entrepreneurial ability and with measures of other sources of cash within the household, but not to vary with risk aversion or uncertainty. We therefore conclude that credit constraints are the main reason for the high returns.

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1. Introduction

Small and informal firms are the source of employment for large sectors of the labor force in many developing countries. A key question of interest is whether these firms hold the potential for income growth for their owners, or whether they merely represent subsistence sources of incomes for low-productivity individuals unable to find alternative sources of work. Evidence that *some* firms have high marginal returns is seen in the very high interest rates paid by some individuals to moneylenders, and by literature which identifies the effect of credit shocks on those who apply for credit (see Banerjee and Duflo, 2005 for an excellent recent summary). However, the sample of firms who apply for credit or who belong to microfinance organizations may not represent the full universe of firms for any number of reasons.[1] In this paper we use a randomized experiment to identify the marginal return to capital for all firms, irrespective of whether or not they choose to apply for credit at market interest rates. We then examine the heterogeneity of returns in order to test which theories can explain why firms may have marginal returns well above the market interest rate.

We accomplish this by surveying microenterprises in Sri Lanka and providing small grants to a randomly selected subset of the sampled firms. The grants made were for either 10,000 Sri Lankan Rupees (about $100), or for 20,000 SLR (about $200). Half the grants were given in the form of cash, and the other half in the form of equipment or inventories selected by the entrepreneurs. We purposely restricted our survey to small firms with less than 100,000 SLR (about $1000) in capital other than land and buildings. The median level of capital investment among firms in the sample is about 27,000 SLR. The capital shocks provided were therefore large relative to the size of the firms, with the larger shock equal to about 75% of the median level of invested capital.

There is an increasing number of estimates of the returns to capital in small scale productive activities in developing countries (see Banerjee and Duflo, 2005). Some of the estimates come from broad cross-sections of producers, and others from the subset of firms applying for or receiving credit. Among those considering the full distribution of firms, McKenzie and Woodruff (2006) estimate returns to capital among the smallest urban microenterprises in Mexico, those with less than $US200 invested, of around 15% per month. Returns in the Mexican data fall to around 3-5% above the $500 range. The latter equates to annual returns in the 40-80% range.

Udry and Anagol (2006) estimate returns to capital among small scale agricultural producers in Ghana to be 50% per year among those producing traditional crops on a

[1] These reasons include both selection among entrepreneurs as to whether or not to apply for credit, determined by factors such as their attitudes to risk, access to alternative sources of finance, perceptions of the returns on investment, and expectations of getting a loan; as well as selection on the part of the lender as to which firms to accept as clients.

median-sized plot and 250% per year among those producing non-traditional crops on median sized plots. Udry and Anagol creatively calculate effective discount rates from the market for used taxi parts. Using data on prices and useful lives of used taxi parts, they estimate the discount rate among taxi drivers to be 60% per year. Banerjee and Duflo (2004) find returns of a similar magnitude among somewhat larger firms in India. They use changes in laws forcing banks to make preferential loans to certain groups of firms to identify changes in access to finance among the firms. Banerjee and Duflo conclude that returns to capital are "at least" 74% per year.

In all of the estimates derived from firm level accounting data, we should worry about the conflation of returns on entrepreneurial ability and returns to capital investment. In the case of McKenzie and Woodruff and Udry and Anagol's production function estimates, the data are cross sectional. If capital investments and entrepreneurial ability are positively (negatively) correlated, then the estimated returns to capital will be upwardly (downwardly) biased.[2] Banerjee and Duflo's estimates come from shock to capital stock, but only among firms applying for credit. So while they are less subject to ability bias among this subsample of firms, self-selection of the subsample suggests the returns likely overstate those for the full spectrum of firms. Udry and Anagol's estimate derived from the prices and lives of used auto parts does not suffer from these biases, but is subject to others (which they recognize). In particular, they ignore labor costs associated with installing the parts and the costs of not being able to use the taxi when a part is broken. As a result, this estimate should be seen as a lower bound on the discount rate.

The difficulty of obtaining an unbiased estimate of returns to capital across all firms in a sector is the motivation for the field experiment on which the data used in this paper are based. We use random grants of either cash or equipment to generate changes in capital against which changes in revenues and profits can be measured. The random allocation of the grants ensures that the changes in capital stock are uncorrelated with entrepreneurial ability, demand shocks, and other factors associated with the differences in the profitability of investments across firms.

We first use the data to estimate the impact of the random capital shocks on the revenues and profits of the firms, estimating the marginal return on capital for the average firm in our sample. Several theories of poverty traps suggest returns may be low if production technology is non-convex and firms need to make lumpy investments. We use the two different sizes of treatment to test whether returns are linear, increasing, or decreasing in the size of the treatment amount. We also look at the structure of investment, examining whether firms choose divisible or indivisible assets when they win the equipment treatment, and comparing the returns to investments in divisible assets such as inventories and raw materials to those in lumpy investments such as machinery.

We estimate the average real return to capital to be around 4 percent per month, much higher than the market interest rate. We then set out a model consistent with our data which can be used to investigate the proximate causes of such high returns to capital. The

[2] McKenzie and Woodruff control for entrepreneurial ability with several measures. Though the controls are clearly imperfect., they suggest the extent of ability bias is not large.

two main theories we consider are imperfect credit markets and imperfect insurance markets. Examination of the heterogeneity of treatment effects leads us to find that returns to capital are higher for entrepreneurs with higher ability, and with fewer other workers in the household. We do not find significant interaction effects with risk aversion or uncertainty. This suggests that the reason for high returns to capital is missing credit markets rather than missing insurance markets, and that the household internal capital market is a binding constraint.

We begin by describing the experiment. We follow in Section 3 with a description of the data. Section 4 compares the treated and untreated samples and section 5 presents the basic regression results. In Section 6, we develop a simple model of household investment which incorporates both the riskiness of investment and factors affecting the shadow value of capital. The model provides several testable implications, which we confront with the data. Section 7 concludes.

2. Description of Experiment

Our data come from a survey of microeneterprises designed and written by the authors. The baseline survey was conducted just over three months after the devastating December 26, 2004 tsunami which struck eastern and southern Sri Lanka. We surveyed in three districts, Kalutara, Galle and Matara, each of which was affected by the tsunami. Firms were re-surveyed every three months after the baseline survey. We use data from the five surveys conducted between April 2005 and April 2006.

We set out to draw a sample of firms with invested capital of 100,000 Rupees (about US$1000) or less, excluding investments in land and buildings. We began by selecting 25 Grama Niladhari divisions (GNs) in three districts in the southern and southwestern Sri Lanka. A GN is an administrative unit containing on average around 400 households. We conducted a door-to-door screening survey among households in each of the selected GNs. The screening survey identified self employed workers outside of agriculture, transportation, fishing, and professional services who were between the ages of 20 and 65 and had no paid employees. The full survey was given to 659 enterprises meeting these criteria. After reviewing the baseline survey data, we eliminated 41 enterprises because either because they exceeded the 100,000 rupee maximum size or because a follow-up visit could not verify the existence of an enterprise. The remaining 618 firms constitute the baseline sample. After five waves of the survey, the sample had fallen to 573 firms. This represents an attrition rate of only about 7% after one year.

The 25 GNs were selected after consulting available census data on employment and education. We selected GNs with a high percentage of own-account workers and modest education levels. These were thought to be most likely to yield enterprises with invested capital below the maximum threshold. Some of the selected GNs were located on the coast and others further inland. The resulting sample has roughly one-third firms which suffered some direct impact from the tsunami in the form of lost assets, one-third which suffered no physical damage but were proximate enough to damaged areas to suffer losses in demand, and one-third which suffered no direct or indirect effects from the tsunami. For the purposes of this paper, we exclude the firms which were directly

affected by the tsunami because the recovery of assets damaged by the tsunami might affect returns to capital. The baseline survey gathered data for 405 firms which were not directly affected by the tsunami in 20 GNs. After attrition, we use a sample of 383 firms. The remaining description of the data is limited to the group of firms not directly affected by the tsunami.

After the first round of the survey, 126 firms were selected randomly from among those surveyed and provided with one of four grants: 10,000 Sri Lankan Rupees (~$100) in equipment for their enterprises, 20,000 Rupees in equipment, 10,000 Rupees in cash, or 20,000 rupees in cash. In the case of the equipment grants, the equipment was selected by the enterprise owner, and purchased by research assistants working for the project. This treatment process was repeated after the third round of the survey with an additional 104 firms selected at random from among those who did not receive treatments following round 1. Three firms treated following round 1 exited from the sample. Thus, 227 of 383 firms (59%) of the firms were treated sometime during the five waves of the survey.[3]

The randomization was carried out within zone/district cells. We selected 42 firms in each district after round one, and an additional 36 firms in each district after round 3.[4] The probability of treatment after round one was somewhat higher in the zone close to the coast and the probability of treatment after round 3 higher in inland areas. In the zone closer to the coast, 72 firms were selected for treatment after round 1 and 45 after round 3. This pattern was reversed in the inland area, where 54 were selected for treatment after round 1 and 63 after round 3, so that the probability of being treated was the same in each zone. In the final sample after attrition, the number of treated firms in Kalutara, Galle and Matara is 76, 76, and 75, respectively. The number of treated firms in the near-inland and inland areas is 112, and 115, respectively.

The 10,000 rupee treatment was equivalent to about three months of median profits reported by the firms in the sample, and the larger treatment equivalent to six months of median profits. The median initial level of invested capital, excluding land and buildings, was about 27,000 rupees, implying the small and large treatments were just over one-third or two-thirds of the initial invested capital. By either measure, the treatment amounts were large relative to the size of the firms.

In order to purchase the equipment for these entrepreneurs receiving equipment treatments, research assistants visited several firms in the evening, and asked them what they wanted to buy with the money, and where they would purchase it. They then arranged to meet them at the market where the goods were to be purchased at a specified time the next day. Thus, the goods purchased and the place/market where they were purchased were chosen by the entrepreneurs with no input from the research assistants.

[3] Firms were told before the initial survey that the possibility of winning either a cash or equipment award was the only compensation for participating in the survey. In fact, the remaining 41% of firms were given 2500 rupees after wave 5. They were not told in advance that this payment was to be made.

[4] Four firms selected for treatment after round 3 had exited the sample by that round. These firms were not replaced.

Though we provided the firms either 10,000 or 20,000 rupees, the amount they spent on inventories and equipment sometimes differed from this amount. Among those receiving equipment, only a handful of firms spent less than the amount we offered. Only four of the 116 firms receiving equipment treatments spent as much as 50 rupees ($0.50) less than the amount we offered. One of those spent 1200 less than we offered, one about 2500 less and the other two about 100 less than we offered. More commonly, the entrepreneurs contributed funds of their own to purchase a larger item. This occurred in 65 of the 116 equipment treatments. However, in most cases, the amount contributed by the entrepreneurs was trivial. In two-thirds of these cases (44 out of 65), the extra spending was less than 500 rupees, or $5. In 11% of the equipment treatments (13), the entrepreneurs contributed 2000 or more rupees from other sources. In three of those cases, their contribution was more than 10,000 rupees. We have both receipts and pictures of all of the goods purchased with the equipment grants. Approximately 57% of the goods purchased were inventories or raw materials, 39% machinery or equipment, and 4% construction materials for buildings.

Cash treatments were given without restrictions. Those receiving cash were told that they could purchase anything they wanted, whether for their business or for other purposes. In reality, the grant was destined to be unrestricted because we lacked the ability to monitor what they did with the funds, and because cash is fungible. We felt that being explicit about the lack of restriction was likely to lead to more honest reporting. In the survey subsequent to the treatment, we asked what they had done with the treatment.[5] Approximately 58% of the cash treatments were invested in the business between the time of the treatment and the subsequent survey. An additional 12% was saved, 6% was used to repay loans, 5% on expenditures for the household, 4% on repairs to the house, 3% on equipment or inventories for other businesses, and the remaining 12% on "other items." Of the amount invested in the enterprise, about two-thirds was invested in inventories and one-third in equipment.

In all of the regressions, we take the amount of our offer as the variable of interest, measuring an impact of the intention to treat.

3. Data/Survey

The baseline survey asked firms the replacement cost of assets used in the enterprise. Firms were also asked to identify whether the assets were owned by the enterprise or rented. We focus on assets owned by the enterprise, since much of the return on rented assets presumably is captured by the rental fee. In any case, 90% of all assets and 99% of assets excluding land and buildings are owned by the enterprises. None of the results or discussion is affected by the exclusion of rented assets.

In each subsequent round of the survey, we ask firms to report on the purchase of new assets, the disposition of assets by sale or damage, and the repair and return to service of assets. These are used to calculate a change in assets over the quarter. Combined with the

[5] Our question noted that some entrepreneurs had told us they had spent the money on furniture or other items for the household, some had spent it on food and clothing, and some had invested in their business. In fact, they had told us this during piloting of the round 2 survey.

data from each previous quarter, this allows us to estimate updated levels of land, building, machinery and equipment for each quarter of the survey. Note that the data are not adjusted for depreciation of machinery and equipment. Given the relatively short period over which the data are gathered and the high percentage of assets invested in inventories, we do not see this as a major concern. The survey also asks the current value of inventories of raw material, work in progress and final goods each quarter.

The majority of assets owned by the enterprises are land and buildings. In the baseline sample, these average 121,000 rupees ($1200), though about a sixth (15%) of firms report they own no assets in this category. The firms also reported an average of 14,400 ($145) rupees worth of machinery and equipment and 13,000 ($130) in inventories. The median firm had 54,000 rupees in land and buildings, 7900 in equipment and 5000 in inventories.

The survey also asks about the expenses, revenues and profits of the enterprise. Baseline mean and median sales levels are 12,300 and 7,000 rupees, respectively. Reported mean and median profits are 3900 and 3000, respectively. Profits calculated as reported revenues minus reported expenses are lower, around 2500 at the mean and 1350 at the median. Profits calculated in this manner are positively correlated with reported profits, with a correlation coefficient of 0.32. This is about the same level as one finds in other microenterprise surveys. In de Mel, McKenzie and Woodruff (2006), we discuss measurement issues in some detail. The biggest reason reported and calculated profits differ is a mismatch of the timing of purchases and the sales associated with those purchases. Some of the expenses in one month are associated with sales the following month. We conclude from the more detailed analysis of measurement issues that the reported profit is the best measure of the firm's profitability, and we use those data for the remainder of this paper.

In terms of activities, about half (51%) of the enterprises in the sample are retail shops. The other half are in the manufacturing or repair services sectors. Among the manufacturers, the largest number, almost one-fifth (18%), produce clothing. Lace, bamboo, and food products are each produced by about 10% of the firms. Among services, the largest number—about 6% of the manufacturing/services firms--repair bicycles. The remainder are scattered across a wide range of products and services.

Firms in the retail sector have lower levels of assets in land and buildings (106,000 vs. 138,000 rupees), but much higher levels of inventories (19,000 vs. 7000), compared with firms in the manufacturing and services sectors. The two groups have nearly identical investments in machinery and equipment, averaging 14,200 for retail firms and 14,500 for manufacturing/service firms.

Measured by size of capital stock, the firms in the near coastal areas are very similar to those in more inland areas. The former average 27,100 SLR and the latter 26,900 SLR. Sales in the baseline period were higher in the inland areas, however, averaging 15,000 SLR vs. 9600 in the areas nearer the coast. This likely reflects a drop in demand following the tsunami, but the inland firms reported somewhat higher pre-tsunami profits in the baseline survey (4700 vs. 4200) and higher pre-tsunami revenue as well (14,700 vs.

12,900). We note that the randomization was carried out within zones, and our main results hold when the sample is limited to the inland areas.

Purchase of equipment with treatments
The baseline survey asked a series of questions related to investment in the enterprise. We asked firms what they would purchase if they had 5000 rupees to invest in the business. We asked the same question with regard to 10,000 and 15,000 investments.[6] Finally, we asked firms what the single "tool, piece of equipment or other asset" would increase profitability the most, regardless of cost.

Inventories and raw materials are more likely to be purchased at smaller investment levels. Over two thirds (68%) of 5000 rupee investments would be used to purchase inventories and raw materials, compared with 59% of 10,000 rupee investments and 49% of 15,000 rupee investments. Only 17% of the most profitable investments reported by firms are inventories and raw materials.

In the full sample, the median cost of the most profitable investment is 25,000 rupees, and two-thirds of the firms say the most profitable item would cost 30,000 rupees or less. Among the one-third saying the most profitable investment would cost more than 30,000 rupees, 12% say they would invest in land or building and 16% would invest in inventories or raw materials. The remaining 72% would invest in equipment, most commonly refrigerators (14%) and sewing machines (10%). When these same firms were asked how they would invest 15,000 rupees, they reported that 52% of their spending would be on inventories and raw materials, 42% would be on equipment and 6% on land. With only 10,000 rupees to invest, the firms report they would spend 65% on inventories, 31% on equipment and 3% on land. These shifts indicate that investment constraints cause firms to shift their investments from more profitable to less profitable categories, though we don't have any information about the relative profitability of the various investments.

But while some of the firms change investments as the size of the investment increases, almost a third of the firms (30%) do not. These firms say the most profitable investment they could make is also the item they would invest in if they had only 5000 rupees to invest. About 45% of firms would make their most profitable investment with 15,000 rupees to invest. One quarter of the firms said their most profitable investment would cost less than 10,000 rupees. Among these firms, the surprising thing is that inventories and raw materials make up only a small part of the most profitable investments. Equipment, like showcases, scales, and sewing equipment, are high in the profitability lists of these firms.

The 10,000 and 20,000 rupee treatments we provided are sufficient for some firms to make their most profitable investment. Among those firms actually given 10,000 rupees, 22% said their most profitable investment would cost 10,000 rupees or less. The 20,000 rupee treatment was sufficient for 43% of the firms to make their most profitable

[6] In this version of the paper, the data in this section refer to a sample including firms which were directly affected by the tsunami.

investment. On the other hand, half (one-third) of the firms receiving 10,000 (20,000) rupees fell short of being able to purchase their most optimal input by at least 10,000 rupees. In the regressions, we will test whether the impact of the treatments differs for these three groups of firms.

4. Impact of capital shocks on the enterprises:

Table 1 shows summary statistics for the enterprises from the baseline survey. For this table and the subsequent analysis, we use all firms with at least three rounds of data on profits and revenues. This results in a sample of 383 firms. Table 1 shows data for the full 383 firms, and for the sub samples of treated and untreated firms. The table also shows the p-values for the t-test for equivalence of the means of the treated and untreated samples.

There are no significant differences in the baseline operating statistics for the treated and untreated firms. Revenues, profits, total capital stock and capital stock aside from land and buildings are all slightly larger for the treated sample, but none of the differences are close to being significant. Untreated entrepreneurs worked about .40 hours longer than treated entrepreneurs in the baseline, but again the difference is not close to significant. We show the comparison for revenue and profit in levels, but the differences between the treated and untreated samples are also small and insignificant in logs.

None of the personal characteristics of the entrepreneurs—age, years of schooling, gender, and so forth, differ significantly between the two sub-samples. The same is true for firm-level characteristics like age, registration, sector, and pre-tsunami profits. However, treated firms do report a lower level of household assets, significant at the .05 level.

The impact of the treatments is evident from the data on Table 2, which reports the post-treatment differences in operating characteristics of the treated and untreated samples. In the top half of Table 2, we split the sample into treated and untreated firms, and use data from the fourth and fifth waves of the survey, after the second round of treatments. We find that revenues and capital stock are both significantly higher in the treated sample. Profits are higher for treated firms, but the difference is not significant. Interestingly, we also find that treated entrepreneurs work more than five hours longer, on average, than untreated entrepreneurs, an effect significant at the .08 level. In the bottom half of the table, we use data from all five waves, putting the treated firms in the untreated samples for the periods before they are treated. The results are similar, though the levels of significance are higher. Profits in the post-treatment periods are now significantly different from those of untreated firms and treated firms prior to treatment.

Tables 1 and 2 suggest that the treatments were randomly allocated, and that they had a significant impact on the operations of the enterprises. We next use regressions to explore the impact further, controlling for firm fixed effects and other characteristics.

5. Regression results:

We begin by pooling the data from all five rounds of the survey, and running fixed effects regressions on log profits and log revenues. Using logs gives us results which reflect the real returns to capital. Since real output is equal to nominal output divided by a price index, then log real output is equal to log nominal output minus the price index. The price index will be absorbed in wave fixed effects, which are included in all of the regressions. Since measurement of inflation is a subject of some dispute in Sri Lanka, this eliminates the need to choose between competing price indices.[7] Using logs also has the effect of reducing the weight of the outliers in the regressions.

We use both revenues and profits as dependent variables because we are interested in the impact of the capital shocks on both outcomes. Revenues are arguably measured and reported more accurately by the firms, and profits are arguably a better indication of the welfare of the entrepreneurs. The results are presented on Table 3. The first column of the table shows the results of a firm fixed effects regression measuring the impact of the treatments on log revenues. The amount of the treatment is measured in ten-thousands of rupees so that the coefficients are easier to read. That is, the 10,000 rupee treatment takes a value of 1 and a 20,000 rupee treatment a value of 2.

The coefficient on treatment in the first revenue regression indicates that a 10,000 rupee treatment is associated with a 18 log point increase in revenues. For the median firm, this represents an increase in revenue of 1250 rupees, or 12.5% of the treatment amount. The coefficient on the first profit regression (column 6) is .13, indicating that a 10,000 rupee treatment increases profits by 13 log points. For firms at the median profit level (3000 rupees), this represents additional profits of 420 rupees, or 4.2% of the treatment amount.

The second specification (columns 2 and 7) controls for hours worked. As we noted above, the reported hours increase after the treatments. Some part of the additional revenues and profits may be attributable to the extra hours worked rather than the additional capital stock. In fact, hours worked is not significant in the regression, and the coefficient on the treatment amount falls only slightly. Columns 3 and 8 show results from random effects regressions, controlling for several characteristics of the entrepreneur and firm. The results indicate that firms owned by female entrepreneurs have a third lower revenues and profits and firms in the inland areas have revenues and profits 35-50% higher. We also find that firms reporting higher pre-tsunami profits have higher revenues and have higher profits, and older entrepreneurs earn higher profits. Hours worked is positively associated with both revenues and profits, significantly so for profits. The effect is fairly small: an additional five hours per week is associated with a 1% increase profits.[8]

In columns 4 and 9 we replace log revenues and log profits with the levels of revenues and profits. The effect of the treatments remain significant, and are somewhat larger for the median firm. A 10,000 rupee treatment results in a 3058 rupee increase in revenues

[7] Both the Central Bank and the Department of Census and Statistics maintain price indices. They differ, sometimes markedly, in their measure of inflation.

[8] Hausman tests indicate that fixed rather than random effects is the proper specification. We therefore use fixed effects for most of the reported results.

(column 4) and a 531 rupee increase in profits (column 9). The latter equates to a marginal profit rate of 5.3% rather than the 4.2% found in the log specification. Last, in columns 5 and 10 we use log revenues and profits, but trim the sample at the 5th and 95th percentiles. The trimming has a modest effect in the revenue regressions, with the coefficient on treatment dropping from .177 to .141, but no effect in the profit regression, where the coefficient increases from .126 to .128.[9]

Cash vs. Equipment Treatments

The analysis thus far has pooled together the treatments provided as cash with those provided as equipment. Table 4 considers how the impact of the treatment varies according to the form in which the treatment was given. Column 1 repeats the overall treatment effect when the two forms of treatment are pooled. Column 2 then compares those treated with equipment to the control firms while Column 3 compares those receiving cash treatments to the control firms. The coefficient on the equipment treatment is 0.145, almost 50 percent higher than the 0.099 coefficient on the cash treatment. Recall that not all of the cash was invested in the business. Columns 4 and 5 therefore give the effect on log profits of the cash actually invested in the business, using the amount of cash offered as an instrument for the amount invested. Column 4 uses the amount that the owner reports as having spent on inventories and equipment as the measure of cash actually invested, while Column 5 also includes amounts which were saved within one round of the treatment. This measured effect in Column 5 is similar to the effect of the equipment treatment in Column 2. It therefore appears that when the cash is invested in the business it has similar returns to the equipment treatment: which is not surprising since firm owners were the ones deciding which equipment was purchased with the equipment treatment, and that the cash invested is also going to inventories and equipment.

Finally in Column 6 of Table 4 we enter the amount of the cash treatment and the amount of the equipment treatment as separate regressors in our fixed effects treatment regression, and test for equality of coefficients. While we again find higher coefficients on the equipment treatment, one can not reject equality of the coefficients, and so for the rest of our analysis we continue to pool the cash and equipment treatments together.

Heterogeneity of treatment effects

We next explore the possibility the treatments have heterogeneous impacts on firms. One question of interest is whether returns are increasing or decreasing with the level of the capital stock. McKenzie and Woodruff (2006) use local linear regressions to allow returns to vary continuously with capital stock. They find returns are generally higher at lower levels of capital stock. We have a much smaller sample of firms here, too small for local linear regression techniques. Instead, we focus on discontinuities in the level of returns. We first test whether the impact of the larger treatment was greater or less than twice the impact of the smaller treatment. We include 2 variables. The first takes a value of 1 for firms which have received a treatment of 10,000 rupees previous to the wave, and

[9] The effect of trimming the sample is somewhat larger in the profits regression when we use levels rather than logs. In this case, the coefficient drops to 484. The 4.8% return is closer to the 4% return in the trimmed log profits regression.

is zero otherwise. The second takes a value of 1 for firms which received a treatment of 20,000, and is zero otherwise. Untreated firms have zeros in all waves for both variables.

Table 5 shows the results by treatment level for both revenues and profits. In both cases, the coefficient on the larger treatment is slightly less than twice the coefficient on the smaller treatment. For profits, we cannot reject the null hypothesis that the coefficient on the larger treatment is equal to twice the coefficient on the smaller treatment. That is, we cannot reject linearity in the impact of the two treatment levels. However, for revenues we can reject the null at the .10 level. The coefficients indicate declining impact of treatment on revenues.

Next, we interact the treatment with the level of capital stock other than land an buildings reported in the baseline survey. When we use a continuous measure of capital stock, the interaction term is negative but not statistically significant. Table 5 shows the results using the level of capital stock, but the results are similar if we use logs instead of levels. However, if we divide the sample into firms above and below the median baseline capital stock, we do find that lower-capital firms experience larger increases in log revenues after the treatment. The effect is significant at the .01 level. For profits, the interaction is also negative, but significant only at the .12 level.

We also test the importance of the lumpiness of investment using the firms' response to the question "How much money would you need to purchase the asset which increase profitability the most?." We create a variable which measures the gap between a treated firm's response to this question and the amount of the treatment. We then use this variable to divide the sample into firms with a gap exceeding 10,000 SLR and those with smaller or no gaps. The interaction of this gap with the treatment amount is negative in both the revenues and profits equation, but not significant in either.

Together, these results suggest that returns are either linear or decreasing in the size of the firms. We find no evidence consistent with increasing returns at the range of capital stock represented by our firms.

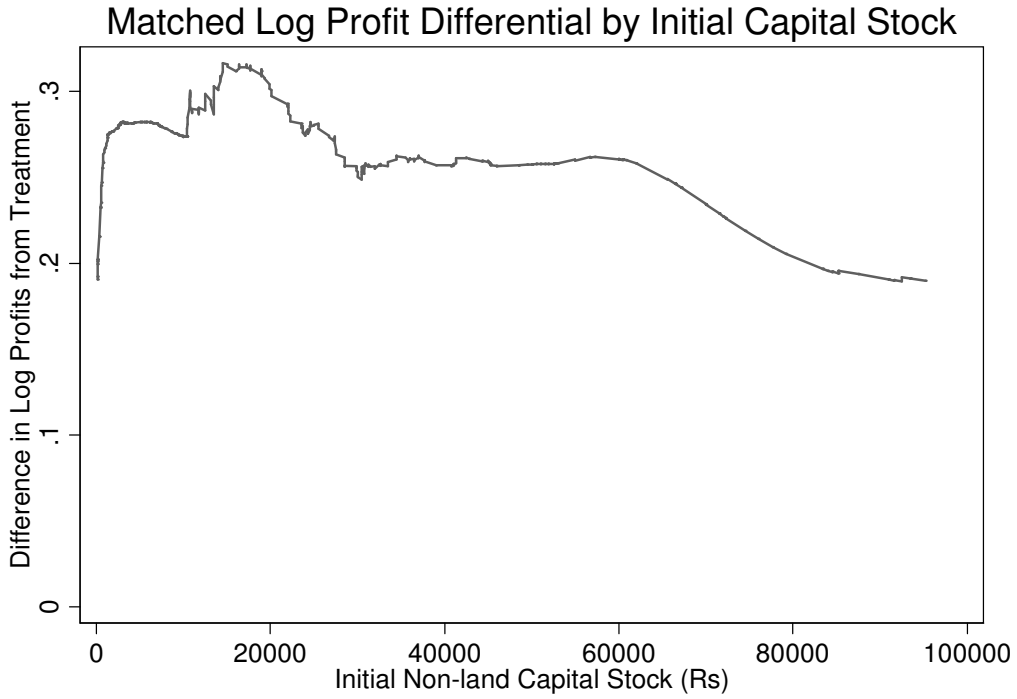
Using matching to investigate non-linearities in returns

As a further check as to whether the treatment effect varies with firm size, we use propensity score matching to match each treated firm to its four closest non-treated firms based on baseline characteristics.[10] For each treated firm we can then calculate the difference between its log profits and those of its four closest matches in each round after treatment. We group together the 10,000 and 20,000 Rupee treatments as a single treatment effect here. Figure 1 then plots these differences against the initial capital stock of the firm, using lowess for smoothing. The figure shows an overall slight decline in the change in log profits as firm size grows, replicating the negative but insignificant interaction in Table 5. Visual inspection shows the gain in log profits is highest for initial

[10] Firms were matched using on the basis of the entrepreneur's age, sex, education, ability, religion, risk aversion, uncertainty, household size, number of workers in the household, household assets, and the firm's industry, November 2004 profits, round 1 profits, legal registration status, location, and round 1 capital stock.

capital stock between 10,000 and 25,000 Rupees. If we interact the treatment amount with an indicator for initial capital stock in this range in our fixed effects regression, we find the coefficient on the interaction to be positive as the figure shows, but insignificant (p=0.55). The insignificant negative slope also acts to counteract the tendency of the level of profits to increase with firm capital stock, and as a result, we again find that the treatment results in a relatively constant increase in the level of profits across firm sizes.

Figure 1



IV results

The regressions on Tables 3 and 5 use the treatment amount as the independent variable. The actual amount invested in the enterprise as a result of the treatment may differ from the treatment, either because the entrepreneur added funds of his or her own, or because he/she invested less than the full amount in the enterprise. The actual change in capital stock may differ from the amount of the treatment because untreated firms may also make investments between waves. We next use the treatment amounts as an instrument for the changes in actual investment and the change in actual capital stock. These results are reported on Table 6.

The coefficient on the IV regressions are slightly larger in both the fixed effects and random effects specifications. However, the coefficients are close enough in size that we can't reject at any conventional level the hypothesis that they are the same. For log revenues, the coefficient on treatment increased from .18 in the fixed effects regression

shown on Table 3 to .22 in the IV regression with fixed effects. The increase is similar using random effects, when the coefficient increases from .17 to .23. When we use the treatments to instrument for the actual amount spent in a fixed effects regression, we obtain a coefficient of .18. Since we know the actual amount spent only for the equipment treatments, this coefficient comes from a regression using a sample excluding those receiving cash. In the standard fixed effects regression using the same sample, the coefficient on the treatment variable is .20 (result not shown).

For log profits, the coefficient in the IV regression is the same as that in the fixed effects regression, .13. The magnitude of the treatment effect falls slightly to .11 when we instrument for the amount spent rather than the change in capital stock.

6. Explaining the high returns to Capital

We find that the treatment has a real monthly return in the 4-5 percent range. Even if all these additional profits are consumed by the household and not compounded by reinvestment in the business, this would still give a real annual return of at least 48 percent. This greatly exceeds the market interest rate on loans being charged by banks and microfinance institutions. Typical *nominal* market interest rates are 16-24 percent per annum for two year loans on a declining balance basis. Assuming a conservative 6 percent inflation rate, this equates to an effective annualized real rate of 3-7.5 percent per annum, or only one-sixth of the return on our treatments. The presence of these high marginal returns well in excess of the market interest rate therefore raises the question of why firms are underinvesting and not taking advantage of these high returns, an issue we address in this section.

6.1. Firm Perceptions

We begin by asking whether firm owners perceive themselves as constrained, and what they view as the major constraints on their ability to grow their firms to their desired size. In the baseline survey, 78 percent of firm owners reported that their business was smaller than the size they would like. Table 7 presents the constraints on the growth of firms as perceived by their owners. The most prevalent constraint is lack of finance, which 93 percent of firms say is a constraint. The second most prevalent constraint, lack of inputs, which 53 percent of firms list as constraint, is also likely to reflect in part liquidity constraints, as firms said that they couldn't afford to buy all the inputs they would need. After finance, the second most common set of constraints can be broadly interpreted as reflecting uncertainty among firms about realizing the gains from investment. The possibility of lack of demand for products, lack of market information, and economic policy uncertainty all suggest that the riskiness of returns could be important. Relatively few firms view the legal and regulatory framework as constraints to growth: 16 percent say lack of clear ownership of land is a constraint, 6 percent say legal regulations, and only 1 percent say high tax rates. Few firms view infrastructure as a constraint.

Given that finance is seen as such a constraint, it is worth considering how entrepreneurs financed the initial start-up capital of their businesses, and how ongoing equipment

purchases are financed. Table 8 reports this information, based on questions which asked firms to report the percentage of funds coming from different sources. Only 3.1 percent of our firms have a bank account for business use, and 89 percent of firms got *no* start-up financing from a bank or microfinance organization. Formal credit is scarcely used at all for financing additional equipment purchases. Instead the major source of both start-up and ongoing funds is personal savings of the entrepreneur and loans from family. On average 69 percent of start-up funds came from this source, and 71 percent of firms relied entirely on own savings and family for start-up funds. Looking at new equipment purchases made between survey waves, we see that 83 to 100 percent of firms making new equipment purchases used only own savings and family to finance this. This data supports the view that firms are constrained in accessing credit from the formal credit market, and suggests that the internal capital market of a household will be a major source of funds.

6.2. A Model of Heterogeneous Returns

These perceptions suggest that missing markets for credit or for insurance against risk could be important factors in explaining the high marginal returns to capital. These are two of the most common explanations considered in the literature.[11] We now provide a simple model of microenterprise production to illustrate how these missing markets can give rise to marginal returns in excess of the market interest rate, and which can be used along with evidence of the heterogeneity of returns from our treatment to test whether missing credit or insurance markets is the more important factor driving high returns.

Consider a simple one-period model in which the enterprise owner supplies labor inelastically to the business.[12] The household has an endowment of assets A, and allocates the number of other working age adults in the household, n, to the labor market, where they are paid a fixed wage w. The household can finance capital stock, K through the formal credit market by borrowing B, and through its internal household capital market, by allocating A_K of household assets and I_K of household labor income to financing capital stock.

The household's problem is then to choose the amount of capital stock, K, to invest in the business, subject to its budget and borrowing constraints:

$$\underset{\{K,\, B,\, A_k,\, I_k\}}{\text{Max}} \quad EU(c)$$

Subject to

[11] See Banerjee and Duflo (2005) for an excellent recent review of different explanations. Missing credit and insurance markets appear the most important for our setting among the different theories they summarize.

[12] This simple model is an adaptation of the agricultural household model set out in Bardhan and Udry (1999).

$$c = \varepsilon f(K,\theta) - rK + r(A - A_K) + (nw - I_K) \quad (1)$$

$$K \le A_K + I_K + B \quad (2)$$

$$B \le \overline{B} \quad (3)$$

$$A_K \le A \quad (4)$$

$$I_K \le nw \quad (5)$$

Where ε is a random variable with positive support and mean one, reflecting the fact that production is risky, and *r* is the market interest rate. The production function of the firm, f(.) depends on the level of capital stock, and on θ, the ability of the entrepreneur.

With well-functioning credit and insurance markets, households will choose *K* to maximize expected profits and as a result, households choose *K* such that:

$$E[\varepsilon f'(K,\theta)] = r \quad (6)$$

Since E(ε)=1, this yields

$$f'(K,\theta) = r \quad (7)$$

That is, households will choose capital stock so that the marginal return to capital equals the market interest rate. In this case, the marginal return to capital will be the same for all firms, and will not depend on the characteristics of the owner or household.

The more general solution to the household's first-order condition for *K* is:

$$f'(K,\theta) = \frac{1}{1 + \dfrac{Cov(U'(c),\varepsilon)}{EU'(c)}}\left[r + \frac{\lambda}{EU'(c)}\right] \quad (8)$$

where λ is the lagrange-multiplier on condition (2), and is a measure of how tightly overall credit constraints bind. We can consider two sub-cases:

a): *perfect insurance markets, missing credit market*. With perfect insurance, risk and uncertainty do not matter, and (5) reduces to $f'(K,\theta) = r + \lambda$. That is, the marginal return will exceed the market interest rate by the shadow cost of capital. Solving the first-order conditions for the optimal choices of *B,* I_K and A_K yields:

$$\lambda = \mu_B = \mu_A + r = \mu_I + 1 \quad (9)$$

where μ_B, μ_A, and μ_I are the lagrange-multipliers on constraints (3), (4) and (5) respectively. Credit constraints will therefore be binding if and only if both the external (formal) and internal (household) credit markets are binding. Given the lack of access to bank finance seen in our firms, it therefore appears that the critical determinant of whether or not credit constraints bind will be the shadow cost of capital within the household.

In our model λ will then depend on the amount of internal capital available, which is increasing in household assets *A* and in the number of workers *n*. However, it will also depend on what the firms' unconstrained level of capital will be. If ability θ and capital

are substitutes, then higher ability individuals will desire more capital, and so will be more likely to be constrained for a given level of assets and workers.

As a result, if credit constraints are the reason for high returns, we predict that the marginal return to capital will be higher for firms with greater ability, lower for households with more workers, and lower for households with more liquid household assets. We will test for this by examining whether the effect of our treatments varies with these factors.

b): *perfect credit markets, missing insurance market.*
An alternative explanation for the high marginal returns could be that credit markets function well, but that households are risk averse and insurance markets are missing, In this case equation (8) simplifies to:

$$f'(K,\theta)Cov(U'(c),\varepsilon) = [r - f'(K,\theta)]EU'(c) \quad (10)$$

Since consumption increases with ε, Cov(U'(c), ε)<0. Since U'(c) <0 this implies that $r < f'(K,\theta)$. The size of the gap between the market interest rate and the marginal return to capital will be increasing in the level of risk in business profits, and in the level of risk aversion displayed by the household. We test this by interacting the treatment effect with measures of the risk aversion of the entrepreneur, and the perceived uncertainty they have in their profits.

6.3. Estimation of Heterogeneous Treatment Effects and Measurement of Factors Determining Heterogeneity.

The above theory shows that the pattern of heterogeneity of treatment effects can inform us about the reasons why returns are so high and exceed market interest rates. We allow for heterogeneity in treatment effects through estimation of variants of the following fixed effects regression:

$$\ln(\pi)_{i,t} = \beta Amount_{i,t} + \sum_{s=1}^{S} \gamma_s Amount_{i,t} * X_{s,i,t} + \rho hours_{i,t}$$
$$+ \sum_{t=2}^{5} \phi_t \delta_t + \sum_{s=1}^{S} \left(\sum_{t=2}^{5} \phi_{s,t} \delta_t * X_{s,i,t} \right) + \alpha_i + \varepsilon_{i,t} \quad (11)$$

The parameter γ_s then shows how the effect of the treatment amount varies with characteristic *s*. Since the evolution of profits over time may vary with $X_{s,i,t}$ even in the absence of treatment, we allow the wave effects δ_t to also differ with individual characteristics.

The theoretical model suggests that the heterogeneity of returns could vary with the number of workers in the household, household wealth, entrepreneurial ability, risk aversion, and uncertainty. We measure each of these factors as follows:

i) The *number of workers in the household* is the number of paid workers in the household apart from the entrepreneur, as measured in the baseline survey. This will therefore be predetermined at the time of treatment.

ii) *Household wealth* is difficult to measure accurately, especially since liquid wealth should be more important for funding the household budget than illiquid forms of wealth such as building quality. Following Filmer and Pritchett (2001) we proxy household wealth with the first principal component of a set of indicators of ownership of durable assets (such as fans, radios, cameras, televisions, bicycles, refrigerators and motorcycles). We again take this from the baseline survey, so that it is predetermined at the time of treatment.

iii) *Entrepreneurial ability* is a more nebulous concept, and so we explore several proxy measures. The first, and most standard in the literature (e.g. Paulson and Townsend 2004), is to use the number of years of education of the enterprise owner. Secondly, we follow (Djankov et al, 2004) and use the score of the entrepreneur on a digit span recall test. Thirdly, we use the first principal component of years of education, digit span recall, time taken to solve a maze, and self-assessed efficacy in ability to carry out business tasks such as keeping accounts, making a sale to a new customer, and identifying market opportunities. This latter measure is a broad measure of entrepreneurial ability, and has a correlation of 0.64 with digit span and 0.79 with education.

iv) *Risk aversion* is measured from lottery experiments played with real money with each firm owner. Firm owners were given the choice between 40 Rupees for certain, or a gamble with X% chance of 10 Rs and 100-X% chance of 100 Rs. A 10-sided dice was used to vary the odds of the higher payment from 10% up to 90%. The probability threshold at which an individual switches from the safe payment to the risky gamble then provides a measure of risk aversion, and can be used to derive the coefficient of relative risk aversion for a CRRA money utility function, which we take as our measure of risk aversion.

v) *Uncertainty* is measured by eliciting from firm owners their subjective distribution of firm profits (Manski, 2004; Lybbert et al, 2005). In the October 2005 survey, firm owners were given a sheet with different ranges of profits, such as <500 Rs, 500-1000 Rs, 1000-1500 Rs, etc. They were then asked to place 20 marks in cells, representing how many firms just like theirs they think would have profits in each range in December 2005. We use these subjective distributions to estimate the coefficient of variation of expected profits, which we take as our measure of the riskiness of firm profits as perceived by the firm owner. Finally, we note that the effect of risk aversion will depend on the level of uncertainty faced by the business, so also interact our risk aversion measure with the uncertainty measure.

6.4. Results on Treatment Effect Heterogeneity

Table 9 presents the results from estimating equation (11) allowing for different forms of heterogeneity in the treatment effects. Column 1 presents the overall treatment effect, repeating column 6 of Table 3. Column 2 shows that the treatment effect is greater for

households with fewer other paid workers, as predicted by our model with credit constraints. At the overall median level of profits, estimated returns are 7.1% per month for the 27 percent of firms with no other paid workers, 4.3% per month for the 44 percent of firms with only one other paid worker (including the median firm), 1.4% per month for the 19 percent of firms with two paid workers, and negative returns for the 10 percent of firms with 3 or more workers.

Column 3 shows a small and insignificant effect of the household durable asset index. This is consistent with the results of Table 8, which show that households rely on own savings rather than selling household assets when financing the business. Unfortunately we are not able to measure liquid savings of the household, preventing us from testing whether households with more liquid assets have lower returns.

Columns 4, 5 and 6 show that the interaction of the treatment amount with each of our measures of entrepreneurial ability is positive and significant: the treatment has a larger effect on more able entrepreneurs. This is again consistent with credit constraints, if capital is a complement to ability in production, so that more able entrepreneurs require more capital to operate at their optimal size. At the median profit level, the interaction predicts zero return for the 20 percent of firm owners with 6 or fewer years of schooling, 2.7 percent monthly returns at the 25^{th} percentile of 8 years schooling, 4.8 percent monthly returns at the median education of 10 years schooling, and 5.9 percent monthly returns at the 75^{th} percentile of 11 years schooling. The other measures of ability also give zero or slightly negative returns for the bottom of the ability distribution, and higher returns for the more able. For example, 15 percent of firm owners could only recall 4 digits or less: they have slightly negative estimated returns. At the top of the distribution, 11 percent of firm owners could recall 8 or more digits, resulting in predicted returns of almost 10 percent per month.

Columns 7 and 8 find that there is no significant interaction of the treatment amount with either risk aversion or the uncertainty of firm profits. Moreover, the signs of both coefficients are negative, suggesting that, if anything, firms that are more risk averse or who face more uncertainty have lower marginal returns. This is evidence against the high marginal returns being caused by risk averse entrepreneurs operating with missing insurance markets, as this would predict that both coefficients would be significantly positive.

Columns 9, 10 and 11 of Table 9 consider all the interactions together. The results confirm the findings from entering each interaction into the model separately. We find strong positive effects of owner ability and strong negative effects of the number of other paid workers in the household. The interaction between risk aversion and uncertainty is positive, as the missing insurance market theory would suggest, but the coefficient is small and insignificant.

Taken together, the heterogeneity of returns supports the view that the high marginal returns from our treatments reflect credit constraints rather than missing insurance markets. Credit constraints are more binding, and thus marginal returns are higher, for

more able entrepreneurs and for entrepreneurs with a high shadow cost of capital within the household, due to few other paid workers.

7. Conclusions:

We find returns to capital for the average microenterprise firm in our sample to be very high, around 4 percent per month. Returns appear to be flat or decreasing – we do not find evidence of increasing returns over our sample range. Marginal returns are highest for entrepreneurs with more ability and with fewer other workers in the household. These are the individuals who, all else equal, we would expect to be most credit constrained. In contrast, returns are not found to differ with risk aversion of the entrepreneur, or with the perceived uncertainty of the entrepreneur about his or her profits. This suggests that missing credit markets rather than missing insurance markets is the main constraint on enterprise growth.

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Table 1: Means of treated and untreated samples

		All Firms	Untreated	Treated	p-value treated vs. untreated
	Firm operational data, Baseline Survey				
Revenue March 2005	383	12302	12776	11976	0.61
		(15228)	(16551)	(14278)	
Profit March 2005	367	3856	3735	3939	0.56
		(3302)	(2917)	(3548)	
Invested Capital, March 2005	383	149669	136327	158838	0.35
		(230577)	(161122)	(268053)	
Invested Capital excl land/buildings, March 2005	383	26873	27732	26282	0.58
		(25243)	(25577)	(25051)	
Hours worked March 2005	383	52.50	53.40	51.88	0.52
		(22.52)	(22.75)	(22.39)	
	Other variables				
Age of entrepreneur	383	42.13	42.35	41.98	0.75
		(11.27)	(11.52)	(11.11)	
Years of schooling of entrepreneur	383	9.02	9.11	8.96	0.64
		(3.14)	(3.26)	(3.06)	
Entrepreneur is female	383	0.47	0.52	0.44	0.13
		(0.50)	(0.50)	(0.50)	
Age of firm in years	381	9.34	8.67	9.80	0.30
		(10.49)	(10.23)	(10.66)	
November 2004 profits	383	4421	4230	4552	0.40
		(3686)	(3554)	(3777)	
Father was entrepreneur	383	1.90	1.89	1.90	0.81
		(0.31)	(0.31)	(0.30)	

Table 1 (Continued)

Firm is registered	383	0.23	0.21	0.26	0.25
		(0.42)	(0.41)	(0.44)	
# of digits repeated in digit span test	374	5.80	5.76	5.82	0.74
		(1.29)	(1.38)	(1.22)	
Number of people living in household	383	5.02	4.99	5.04	0.75
		(1.73)	(1.59)	(1.82)	
Index of household assets	383	0.29	0.51	0.15	**0.03**
		(1.59)	(1.56)	(1.60)	
Muslim	383	0.14	0.11	0.15	0.21
		(0.34)	(0.31)	(0.36)	

Table 2: Post treatment differences in operating data

		Treated vs. untreated firms, Post-treatment (Waves 4 and 5)			p-value treated vs. untreated
		All Firms	Untreated	Treated	
Revenue, Dec 2005 and Mar 2006	734	23694	20311	26063	**0.00**
		(26964)	(24608)	(28266)	
Profit, Dec 2005 and Mar 2006	732	6414	6076	6659	0.21
		(6191)	(6509)	(5961)	
Invested Capital, Dec 2005 and Mar 2006	711	162756	136220	181144	**0.01**
		(237689)	(152353)	(280075)	
Invested Capital excl land/buildings, Dec 2005 and Mar 2006	711	38474	33527	41920	**0.01**
		(39302)	(39364)	(38944)	
Hours worked, Dec 2005 and Mar 2006	697	56.90	53.58	59.23	**0.08**
		(42.25)	(23.28)	(51.33)	
		Pre-treated and untreated vs. post-treatment, all waves			
Revenue, pre- vs. post-treatment	2828		16883	25028	**0.00**
			(22033)	(27150)	
Profit, pre- vs. post-treatment	2798		4828	6125	**0.00**
			(5373)	(5539)	
Invested Capital, pre- vs. post-treatment	2730		146946	179087	**0.00**
			(201475)	(283791)	
Invested Capital excl land/buildings, pre- vs. post-treatment	2730		30232	40204	**0.00**
			(33373)	(37501)	
Hours worked, pre- vs. post-treatment	2735		53.62	58.38	**0.00**
			(22.70)	(43.19)	

Table 3: Effect of Treatment on Revenues and Profits

	Revenues					Profits				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log revenues FE	Log revenues FE	Log revenues RE	Revenues FE	Log revenues FE 5/95 trim	Log profits FE	Log profits FE	Log profits RE	Profits FE	Profits FE 5/95 trim
Treatment amount (0, 1, 2)	0.183	0.177	0.174	3058.4	0.141	0.129	0.126	0.099	531.4	0.128
	(0.037)**	(0.037)**	(0.035)**	(762.373)**	(0.036)**	(0.037)**	(0.037)**	(0.032)**	(243.206)*	(0.035)**
June 2005	0.222	0.232	0.237	5197.6	0.225	0.045	0.06	0.07	584.4	0.06
	(0.049)**	(0.049)**	(0.050)**	(993.787)**	(0.045)**	(0.05)	(0.05)	(0.05)	-319.3	(0.05)
September 2005	0.249	0.261	0.261	749.4	0.297	0.094	0.106	0.113	1236.3	0.139
	(0.049)**	(0.049)**	(0.050)**	(997.107)**	(0.047)**	(0.049)+	(0.049)*	(0.049)*	(320.619)**	(0.046)**
December 2005	0.388	0.418	0.418	8330.6	0.415	0.264	0.278	0.296	1502.0	0.257
	(0.056)**	(0.056)**	(0.056)**	(1146.656)**	(0.053)**	(0.055)**	(0.056)**	(0.055)**	(368.119)**	(0.052)**
March 2006	0.457	0.482	0.487	9353.3	0.478	0.415	0.427	0.452	2893.7	0.371
	(0.056)**	(0.056)**	(0.056)**	(1139.426)**	(0.053)**	(0.055)**	(0.056)**	(0.054)**	(365.900)**	(0.052)**
Hours worked		-0.0003	0.001	12.7	0.005		0.001	0.002	3.3	0.005
		(0.0006)	(0.0006)	-12.3	(0.001)**		(0.0010)	(0.001)**	-3.9	(0.001)**
Female entrepreneur			-0.296					-0.257		
			(0.098)**					(0.070)**		
Years of schooling, entrepreneur			0.033					0.011		
			(0.015)*					(0.011)		
Age of entrepreneur			0.008					-0.0003		
			(0.004)+					(0.003)		
Age of firm in years			-0.015					-0.004		
			(0.005)**					(0.003)		
November 2004 profits			0.0001					0.0001		
			(0.00001)**					(0.00001)**		
Close inland zone			-0.507					-0.358		
			(0.094)**					(0.066)**		
Observations	1875	1812	1804	1812	1572	1857	1795	1788	1795	1572
Number of groups	383	383	381	383	376	383	383	381	383	376
R-squared	0.13	0.15	0.14	0.13	0.19	0.11	0.11	0.11	0.09	0.14

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4: Cash vs. Equipment Treatments
Dependent Variable: Log Profits

	(1) All firms	(2) Equipment	(3) Cash	(4) Cash	(5) Cash	(6) All firms
Treatment Amount	0.129	0.145	0.0987			
	(0.037)***	(0.048)***	(0.049)**			
Equipment Treatment Amount						0.150
						(0.047)***
Cash Treatment Amount						0.108
						(0.047)**
Cash invested (instrumented with amount offered)				0.184	0.154	
				(0.091)**	(0.076)**	
Constant	7.918	7.878	7.948	7.948	7.948	7.918
	(0.033)***	(0.039)***	(0.040)***	(0.040)***	(0.040)***	(0.033)***
Observations	1857	1320	1285	1285	1285	1857
Number of firms	383	272	265	265	265	383
R-squared	0.11	0.12	0.09			0.11
F-test of equality of treatment effects						0.53
p-value						0.467

All regressions also include firm and time fixed effects.
Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Tests for Linearity of Impact

	Log of Revenues			Log of Profits		
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	FE
Treated amount 10,000 Rps	0.272			0.143		
	(0.066)***			(0.066)**		
Treated amount 20,000 Rps	0.295			0.231		
	(0.080)***			(0.079)***		
Treatment amount (0, 1, 2)		0.263	0.199		0.173	0.136
		(0.049)***	(0.044)***		(0.049)***	(0.044)***
Treatment * Initial level of capital stock		-0.031			-0.017	
		(0.011)***			(0.011)	
Treatment * gap to best investment>10000			-0.056			-0.027
			(0.061)			(0.061)
Hours worked	-0.0003	-0.0004	-0.0003	0.0008	0.0008	0.0008
	(0.001)	(0.001)	(0.001)	(0.0006)	(0.0006)	(0.0006)
Observations	1813	1812	1812	1796	1795	1795
Number of firms	383	383	383	383	383	383
R-squared	0.15	0.15	0.15	0.11	0.11	0.11

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: IV Regressions

	Log of Revenues			Log of Profits		
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	RE	FE	FE	RE	FE
Invested capital,	0.222	0.227		0.127	0.129	
w/o land/buildings	(0.056)***	(0.052)***		(0.038)***	(0.046)***	
Actual amount			0.183			0.109
invested			(0.045)***			(0.046)***
Hours worked	-0.0003	0.001	0.006	0.0007	0.001	0.006
	(0.001)	(0.001)	(0.001)***	(0.001)	(0.0006)*	(0.001)***
R-Square	0.21	0.33	0.16	0.05	0.08	0.13
Observations	1762	1754	1493	1745	1738	1476
Number of firms	383	381	383	383	381	379

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: What do Firms Report as Constraints to Growth?
Baseline survey perceptions of constraints to firm growth

	% of firms reporting that this is a constraint
Lack of Finance	92.7
Lack of Inputs	53.8
Lack of Demand	34.5
Lack of Market Information	15.9
Lack of Clear Ownership of Land	15.7
Economic policy uncertainty	15.1
Costs of hiring new employees	11.2
Poor quality roads	8.1
Lack of trained employees	6.8
Legal regulations	6.3
Poor quality electricity and phone	3.7
High crime rates	1.6
High tax rates	1.0

Note: results are for the 383 firms in the panel for all 5 waves

Table 8: Where do Firms Get Start-up and Ongoing Finance from?

Mean percentage of funds used for start-up and ongoing equipment by source

		Investment in Equipment between Waves			
	Funds used for start-up	Wave 1&2	Wave 2&3	Wave 3&4	Wave 4&5
Own Savings	68.7	75.1	86.7	87.1	100
Loans from family	10.5	8.5	4.4	3.2	0
Loans from friends	3.1	2.0	4.4	3.2	0
Remittances from abroad	0.1	0.0	0.0	0.0	0
Bank loan	7.2	0.0	0.0	0.0	0
Loan from a microfinance organization	0.7	2.4	0.0	0.0	0
Private moneylenders	2.4	0.0	0.0	0.0	0
Sale of household assets	0.3	0.0	0.0	0.0	0
Credit from Customers	0.5	0.0	0.0	0.0	0
Credit from Suppliers	2.9	4.9	0.0	0.0	0
Sale of business assets	0.0	2.4	0.0	0.0	0
Other	3.6	4.6	4.4	6.5	0
Proportion of firms buying equipment between waves:		0.158	0.125	0.120	0.048
Proportion of firms using only own savings and loans from family:	71.2	82.9	91.1	90.3	100.0

Note: results for start-up funds are for the 373 firms using start-up capital (10 firms started with zero)
Results for ongoing equipment purchases are for the group of firms making an equipment purchase
between waves.

Table 9: Treatment Effect Heterogeneity
Dependent Variable: Log Profits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment Amount	0.126	0.238	0.131	-0.183	-0.436	0.118	0.125	0.201	0.0966	-0.0980	0.421
	(0.037)***	(0.058)***	(0.038)***	(0.11)*	(0.18)**	(0.037)***	(0.038)***	(0.097)*	(0.16)	(0.21)	(0.12)***
Hours Worked	0.000826	0.000791	0.000781	0.000778	0.000774	0.000606	0.000840	0.000698	0.000566	0.000548	0.000364
	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)	(0.00060)
Interaction of Treatment Amount with:											
Number of Workers		-0.0946							-0.101	-0.101	-0.090*
		(0.037)**							(0.039)***	(0.039)***	(0.040)**
Asset Index			-0.00428						-0.00602	0.0128	-0.00517
			(0.024)						(0.026)	(0.025)	(0.026)
Years of Education				0.0344					0.0327		
				(0.012)***					(0.013)***		
Digitspan Recall					0.0961					0.0950	
					(0.030)***					(0.032)***	
Broad Entrepreneurial Ability						0.0926					0.0919
						(0.032)***					(0.034)***
Risk Aversion							-0.00995		-0.0119	-0.0569	-0.0508
							(0.023)		(0.062)	(0.062)	(0.063)
Uncertainty								-0.136	-0.242	-0.368	-0.328
								(0.16)	(0.17)	(0.18)**	(0.18)*
Risk Aversion*Uncertainty									0.00160	0.0718	0.0590
									(0.100)	(0.10)	(0.10)
Constant	7.878	7.881	7.881	7.880	7.875	7.887	7.878	7.892	7.899	7.894	7.909
	(0.046)***	(0.046)***	(0.046)***	(0.045)***	(0.045)***	(0.046)***	(0.046)***	(0.046)***	(0.046)***	(0.046)***	(0.046)***
Firm*Time Observations	1795	1795	1795	1795	1766	1736	1795	1777	1777	1748	1721
Number of Firms	383	383	383	383	374	366	383	379	379	370	363

All regressions include firm fixed effects
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1