Are Women More Credit Constrained?
Experimental Evidence on Gender and Microenterprise Returns[#]

Suresh de Mel, University of Peradeniya
David McKenzie, World Bank
Christopher Woodruff, UCSD

January 11, 2009

Abstract

We report on a field experiment providing random grants to microenterprise owners. The grants generated large profit increases for male owners, but not for female owners. We show that the gender gap does not simply mask differences in ability, risk aversion, entrepreneurial attitudes, or differences in reporting behavior, but there is some evidence that the gender gap is larger in female-dominated industries. The data are not consistent with a unitary household model, and indeed, imply an inefficiency of resource allocation within households. We show evidence that this inefficiency is reduced in more cooperative households.

JEL codes: O12, O16, C93.
Keywords: Microenterprises; Gender; Microfinance; Randomized Experiment.

This paper examines differences in income generated by capital shocks provided to male and female microenterprise owners. The capital shocks were provided as part of a field experiment to randomly selected microenterprise owners in Sri Lanka. About half of the participating enterprise owners are men and half are women. Contrary to our initial expectations, the grants resulted in large, sustained increases in income for male owners, but no increase in income for female owners. Our expectation was that women would experience larger increases in income because women are generally seen as being more credit constrained than men in low-income countries (e.g. Shahidur R. Khandker, 1998; SEAGA, 2002).

Half of the shocks were provided as cash, and half as purchases of equipment or working capital selected by the enterprise owners. Fungibility effectively prevented us from specifying that the funds had to be used for the business, so we made the grants explicitly unconditional. In trying to understand differences between outcomes for females and males, we need to take into account not only credit constraints, but also competing demands from the household and intrahousehold bargaining. There is ample evidence against the unitary model of household behavior in favor of models of intrahousehold bargaining. However, bargaining does not imply inefficiency (Pierre-Andre Chiappori (1998); Martin Browning and Chiappori (1998)). Indeed, the nature of the repeated bargaining game among members of a household yields a strong expectation of efficient outcomes. The bargaining power of individual household members will affect the particular consumption, production, and other decisions that are made, but Pareto optimality should be attained. Most of the empirical results in the literature support the prediction of efficient outcomes.[1] The most widely cited exception to this finding of efficiency is Christopher Udry (1996). Using data from Burkina Faso, Udry finds inefficiency in the allocation of agricultural inputs across plots controlled by men and women residing in the same

---

[1] See Browning and Chiappori (1998, for Canada) and Francois Bourguignon et al (1993 for France), for instance.

1

household. Inputs are over-allocated to plots controlled by men, and under allocated to plots controlled by women.[2] In a more recent finding which also relates to our analysis here, Markus Goldstein and Udry (2008) find that similar gender differences in Ghanaian agriculture are explained by the efficiency of fallowing decisions, which in turn depend on the security of property rights over land. Women invest less in their plots because property rights over their plots are less secure.

We examine the efficiency of household asset allocation following the receipt of the capital shocks. Two thirds of the grants were $100 and the other third were for $200, representing about 50 and 100 percent of the baseline median capital stock. In previous work (Suresh de Mel, David McKenzie and Christopher Woodruff, 2008), we show that the mean real return to capital exceeds 5.0 percent per month, much higher than market interest rates. We also show that returns to capital are heterogeneous, varying with measures of ability, household liquidity, and the gender of the owner.

With respect to gender, we find that monthly profits increase by around 9 percent of the grant amount in enterprises owned by males, but do not increase at all in enterprises owned by females. In this paper, we show that women fail to invest any portion of the smaller grant, while they invest as much or more of the larger grant than men do, but still realize no return. We are unable to reconcile the set of results with a model of efficient household decision-making. While sample sizes become small once we go beyond the simple male/female division, we do find evidence consistent with more efficient outcomes where the enterprise owner has more decision-

---

[2] Whether Udry's results can be generalized has been questioned both empirically and theoretically. Richard Akresh (2005) uses nationally representative survey data from Burkino Faso and finds that the inefficient outcomes are limited to the particular region within Burkino Faso that Udry's data comes from. Marcos A Rangel and Duncan Thomas (2005) suggest that production decisions cannot be analyzed in isolation from consumption decisions. Using data on both production and consumption, they are unable to reject efficiency within households in Burkino Faso.

making power in the household, or where the spouse is more cooperative with regard to the management of the enterprise.

Limited data from studies of microfinance clients in several countries reaches mixed conclusions with regard to differences in the profitability and growth of enterprises run by females and males. Most studies suggest that female-owned enterprises grow more slowly and generate lower profit levels than male-owned enterprises.[3] The samples for studies of clients of microfinance programs, however, reflect selection decisions both on the part of enterprise owners as to whether or not to apply for a loan, and on the part of lenders as to whether or not to lend. The limited work on returns to capital in the broader population of microenterprises seldom differentiates returns by gender, and is still subject to the problem that capital stock is not exogenously determined. We are unaware of any convincing evidence on gender differences in the productivity of incremental investments across households.

After describing the sample, the experiment and the main results on investment and returns, we ask whether the gender differences are masking differences in household liquidity, ability or attitudes toward risk. We find they are not. We then examine whether division of labor or social constraints might explain the results even in the context of a unitary household. We find some evidence that both investment rates and returns to investment decrease as the proportion of female owners in the industry increases. Thus, owners of bicycle repair shops (all males) invest and earn more than owners of retail shops (mixed male and female), who invest and earn more than those who make lace products (all females). However, large gender differences remain even after we control for industry.

---

[3] Michael Kevane and Bruce Wydick (2001) provide a survey of several studies of investment behavior of microenterprise owners by gender, finding mixed results. In their own work, they find no significant difference between male and female borrowers in Guatemala in their ability to generate increases in sales. See Michael A. McPherson (1996), Donald C. Mead and Carl Liedhom (1998), and Sherri Grasmuck and Rosario Espinal (2000) for additional evidence on the size and growth of enterprises owned by men and women.

Next, we consider a collective household model, where women and men have different preferences with respect to consumption and investments. We find very limited evidence that women invest the grants in the schooling of their children, and no evidence that they spend more of the grant on health or household durable goods. Indeed, both household durable assets and financial assets increase more in the households of male owners than in the households of female owners. Finally, we develop a non-cooperative model of decision making, allowing for the possibility that the spouse may capture either a share of profits from the business or working capital held in the business. We find that women with more decision-making power and more cooperative husbands invest a larger share of the grant in working capital, and have positive returns from investments of the larger grant. The positive returns are consistent with household cooperation affecting the efficiency of the investments made by female owners.

As with any finding based on data from a single country, we should ask whether the findings are likely to hold in other regions or countries. Using non-experimental cross sectional data from Brazil and Mexico, we show that similar gender differences appear in urban households in these countries. Women earn a significantly lower return on marginal investments of capital and, in Brazil, the gap is larger in sectors in which females predominate.

I. Data and Experimental Design

We summarize here the sample of microenterprises and the experiment which randomly provided grants to some microenterprise owners. More details on the basic experimental design can be found in de Mel, McKenzie and Woodruff (2008).

A. Participants and Survey design

4

The goal of our experiment was to provide a positive shock (in the form of a grant) to the capital stock of firms, and measure the return to this shock. Our target population was low-capital microenterprise owners, those with less than 100,000 Sri Lankan rupees (LKR, about US$1000) in capital, excluding land and buildings. The upper threshold assured that the grants our budget allowed us to provide would result in measurable changes in capital stock. Additionally, previous research had suggested that returns to capital were particularly high for enterprises with very low capital stocks (McKenzie and Woodruff, 2006). In addition to the capital stock threshold, a microenterprise owner had to fulfill all of the following conditions to be included in our sample:

    (a) be self-employed full-time (at least 30 hours per week) outside of agriculture, transportation, fishing and professional services;

    (b) be aged between 20 and 65; and,

    (c) have no paid employees.

Using the 2001 Sri Lankan Census, we selected 25 Grama Niladhari divisions (GNs) in three Southern and South-Western districts of Sri Lanka: Kalutara, Galle and Matara. A GN is an administrative unit containing on average around 400 households. We used the GN-level data from the Census to select GNs with a high percentage of own-account workers and modest education levels, since these were most likely to yield enterprises with invested capital below the threshold we had set. GNs were also stratified according to the degree of exposure of firms to the December 26, 2004 Indian Ocean tsunami. A door-to-door screening survey of 3361 households in these GNs was then conducted to identify firms whose owners satisfied the criteria listed above. In April 2005, the first wave of the Sri Lanka Microenterprise Survey (SLMS) surveyed the 659 firm owners which the screen identified as meeting these criteria. After reviewing the

baseline data, 42 firms were dropped because they exceeded the capital stock threshold, or because a follow-up visit could not verify the existence of the enterprise. This gives a baseline sample of 617 microenterprises.

In this paper we exclude the firms which suffered damage to business assets as a result of the tsunami, since recovery of assets damaged by the tsunami might affect returns to capital. This leaves 405 firms to be used in this paper, of which 197 are run by males and 190 by females. In the remaining 18 firms both husband and wife claim themselves as owner. Given their small number, we drop these dual owner firms. The result is a sample of 387 firms almost evenly split by gender and also across two broad industry categories: retail sales, and manufacturing/services. Firms in retail trade are typically small grocery stores. The manufacturing/services firms cover a range of common occupations of microenterprises in Sri Lanka, including sewing clothing, making lace products, making bamboo products, repairing bicycles, and making food products such as hoppers and string hoppers.

The SLMS then re-interviewed the owners of these firms at quarterly intervals for two years, and semi-annually for a third year. We use 11 waves of data, with the eleventh wave gathered in April 2008. In each wave, firm owners were asked about profits, revenues and expenses, changes in physical capital stock, and levels of inventories on hand. Profits were obtained through direct elicitation, which we find to be more reliable than constructing profits from detailed questions on revenue and expenses (de Mel, McKenzie and Woodruff, 2009). Nominal profits were converted into real profits using the monthly Sri Lanka Consumers' Price Index.[4] Each round also attempted to collect additional information about the firm or owner, in

---

[4] Source: Sri Lanka Department of Census and Statistics, http://www.statistics.gov.lk/price/slcpi/slcpi_monthly.htm [accessed February 17, 2007]. Inflation was low over the first year of the survey, with a 4.0 percent annual rate. Inflation was higher in the second and third years of the survey, with an annual rates of 18.6 percent between March 2006 and March 2007, and 28.0 between March 2007 and March 2008. The Sri Lankan price indices were revamped

the form of special modules to measure owner ability, risk aversion, labor history, and other characteristics. We will discuss some of these measures in detail later in the paper. In addition, the first, fifth, and ninth and eleventh waves of the panel also included a household survey, measuring household expenditure, school attendance, and work participation of all household members.

Attrition in the SLMS is quite low. 370 of our 387 firms reported profits in the baseline survey. In the fifth wave (one year later), 348 firms reported profits, an attrition rate of only 5.9 percent. In the eleventh wave (three years after the baseline), we still have 319 firms with reported profits, for cumulative attrition of 13.8 percent. We concentrate our analysis on the unbalanced panel of 365 firms reporting at least three waves of profit data. There is no significant difference in attrition rates by gender: 63.5 percent of males are in all 11 waves, compared to 63.7 percent of females, 93.4 percent of males have at least 3 waves and are included in the sample we used after trimming large changes in profits, compared to 95.8 percent of females (p-value = 0.22).[5]

B. The Experiment

Firms were told before the initial survey that as compensation for participating in the survey, we would conduct a random prize drawing, with prizes of cash or inputs/equipment for the business. The prize consisted of one of four grants: 10,000 LKR (~$100) in materials for their business, 20,000 LKR in materials, 10,000 LKR in cash, or 20,000 LKR in cash. In the case of in-kind grants, the materials were selected by the enterprise owner, and purchased by research

---

in November 2007, and the all island index we use was discontinued. We estimate the March 2008 value of the index by applying the rate of increase in the Colombo area index between March 2007 and March 2008.
[5] There are no significant observable differences between attritors and non-attritors for either males or females: we cannot reject that attrition is unrelated to age, education and marital status of the owner, and to the baseline age of business and baseline profits.

assistants working for the project.[6] 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.

After the first round of the survey, 124 firms were randomly selected to receive a treatment, with 84 receiving a 10,000 LKR treatment and 40 receiving a 20,000 LKR treatment. The randomization was done within district (Kalutara, Galle, and Matara) and zone (unaffected and indirectly affected by the tsunami). After the third round of the survey treatments were given to an additional 104 firms selected at random from among those who didn't receive treatment after the first round: 62 receiving the 10,000 LKR treatment and 42 the 20,000 LKR treatment.[7] In each case half of the firms received the treatment in cash, and the other half in kind. Finally, a token cash payment of 2,500 LKR (~$25) was made after round 5 to firms which had not already received a treatment. This payment was not discussed in advance with firms, and was presented as a thank-you for their continued participation in the survey.[8]

The median initial level of invested capital, excluding land and buildings, was about 25,000 LKR for male-owned enterprises and 10,000 LKR for female-owned enterprises, implying the smaller treatment was equal to the median initial invested capital for women, and

---

[6] In order to purchase the goods for these entrepreneurs receiving in kind treatments, research assistants visited several firms in the evening to inform them they had won an in kind prize. The winning entrepreneurs were asked what they wanted to buy with the money, and where they would purchase it. The research assistants 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.

[7] Allocation to treatment was done *ex ante*, and as a result, there were an additional seven firms who were assigned to receive the treatment after round 3, but who had attrited from the survey by this time. See de Mel et al. (2008) for detailed discussion of how the randomization was done. The use of fixed effects in our analysis conditions on the strata used in randomization.

[8] The initial funding covered five waves of the survey. The 2,500 rupee payment was made to limit attrition after additional funding was obtained to extend the survey for an additional four waves. We count the 2,500 LKR payment as a treatment in the analysis because owners told us they invested a similar amount of each of the three cash amounts in the enterprise, but the main results are not affected if this payment is instead ignored.

40 percent of the median initial capital for men. For both men and women, the treatment amounts were thus large relative to the initial size of the firm.

C. Verifying Randomization

Note that allocation to treatment was not stratified by gender. Nevertheless, provided the sample sizes are large enough, randomization will still lead the treated women to be comparable in terms of pre-treatment characteristics to the untreated women, and similarly for men. We verify this for observable characteristics in Table 1, splitting the treatments into the 10,000 LKR and 20,000 LKR levels since much of our analysis will compare these treatments separately. Randomization does appear to have given comparable treatment and control groups for both men and women in terms of baseline observable variables.[9]

II. Mean Treatment Effects and Returns to Capital by Gender

We begin by following the specification in de Mel, McKenzie and Woodruff (2008), in which cash and in-kind treatments are pooled and assumed to be linear. To test whether the treatment has the same mean impact on business profits for female owners as it does for male owners we estimate the following equation for firm i in period t:

$$PROFITS_{i,t} = \alpha + \beta AMOUNT_{i,t} + \gamma AMOUNT_{i,t} * FEMALE_i$$
$$+ \sum_{s=2}^{11} \theta_s \delta_{s,t} + \sum_{s=2}^{11} \kappa_s \delta_{s,t} * FEMALE_i + \lambda_i + \varepsilon_{i,t} \qquad (1)$$

where $AMOUNT_{i,t}$ is a single variable indicating how much treatment firm i had received by time t, coded in terms of 100 LKR so that the coefficients can be read as monthly percentage returns. $AMOUNT$ therefore takes value 100 if by time t the firm had received the 10,000 LKR treatment,

---

[9] There are baseline differences at the 10% level in 4 out of 56 (or 7 percent) of the t-tests for difference in means conducted, about the level one would expect by chance. Our use of fixed effects will control for any baseline differences among treated and control firms.

200 if the firm received had the 20,000 LKR treatment, 25 if they had received the 2,500 LKR payment after round 5, and 0 if they were untreated as of time t. We include individual fixed effects to account for any time-invariant characteristics of owners that also influence profits. Since randomization appears to have held on the subsamples, including these effects is not necessary, but their inclusion can improve efficiency by accounting for more of the variation across owners in profits. The $\delta_{s,t}$ are period effects that are one when s=t and zero otherwise, which we also interact with the female dummy variable to allow for different time paths of profits for male and female enterprises. The coefficient β gives the mean treatment effect for males, and γ provides the differential treatment effect for females. We test

i) $\gamma \neq 0$ (female-owned businesses have a different increase in profits than male owned businesses from the treatment), and

ii) $\gamma + \beta = 0$ (there is no effect of the treatment on profits of female-owned businesses).

Equation (1) shows the impact on business profits of giving cash or materials to firm owners. Since some of the grant may not be invested in the business (even the in-kind grant may be partially decapitalized), this will not give the return to capital. Moreover, if male and female owners invest different amounts of the treatment in their business, we may find different treatment effects despite similar returns to capital. We therefore also estimate the returns to capital directly by using the treatment amount to instrument capital stock $K_{i,t}$ in the following regression:

$$PROFITS_{i,t} = \alpha_1 + \beta_1 K_{i,t} + \gamma_1 K_{i,t} * FEMALE_i$$
$$+ \sum_{s=2}^{11} \theta_{1s} \delta_{s,t} + \sum_{s=2}^{11} \kappa_{1s} \delta_{s,t} * FEMALE_i + \lambda_{1i} + \upsilon_{i,t} \qquad (2)$$

Capital stock is measured as the total value of capital stock and inventories, excluding land and buildings. We can then test whether the returns to capital differ by gender ($\gamma_1 \neq 0$) and whether the returns to capital are zero for female enterprises ($\gamma_1 + \beta_1 = 0$).

Profit data are noisy. Measurement error can cause extreme changes in profits from one period to the next, reducing our power to detect changes in profits resulting from the treatments. We verified with the survey firm all observations with very large changes in either direction from one period to the next. Many of these were keypunch errors, which we corrected. Others may be errors of enumerators made in the field, but we have no way to verify this. For several observations with a large fall in profits, the survey firm told us that the business was closed for a period because of illness of the owner, or because of a lack of demand. Because these occurrences represent real risks of operating a business, we choose to trim only the top 1% of the sample ranked by changes in profits (in both percentages and levels). In practice, this trims observations for which profits increase by more than 608 percent or 15,000 LKR from one quarter to the next.[10]

A. Gender differences in treatment effects and returns

We begin by using real profits as the dependent variable. However, since profits include the earnings of the firm owner, any increase in profit from the treatment will be a combination of the return to capital and of the return to the owner of any adjustment in labor hours worked. Recall that since we are including individual fixed effects, the average hours of work are already implicitly adjusted for, and it is only changes in hours that we need worry about. When we estimate equation (1) using own hours worked as the dependent variable, we find the mean

---

[10] Note that if the increase represents a permanent change in the operation of the business, then we will lose only one observation, since in subsequent quarters growth rates will be modest again. The observation-specific trimming thus eliminate coding errors without excluding firms which are growing rapidly.

treatment effect is an increase of 1.8 hours per week for males, and a 0.3 hours per week for females. We can not reject that the change in hours is the same for males and females, and neither effect is significant.[11]

To isolate the impact of capital, we subtract the implicit wage earned by the firm owner. We estimate the marginal return to own labor using the baseline data to regress profits on capital stock, owner characteristics, and hours of work. We allow the hours effect to vary by three education levels for both males and females. The value of an additional hour worked varies from zero to 9.2 rupees per hour.

Table 2 reports the results of estimating equations (1) and (2). Columns 1 and 2 show the mean treatment effect for real profits and real profits adjusted for hours worked by the owner. Columns 3 through 4 display the corresponding returns to capital regressions. Column 1 shows that a 10,000 LKR treatment increases real profits for treated males by 804 LKR per month, or 8.0 percent of the treatment amount. However, there is a large negative and significant gender interaction.[12] The overall female effect is the sum of the female interaction and overall effect, and is -20 rupees or negative 0.20 percent per month, which is not statistically different from zero. That is, we can not reject a zero effect of the treatment on mean profits for female-owned enterprises. Column 2 shows that the gender gap is not caused by adjustments in hours worked after the treatment. By either profit measure, we find large positive and significant treatment effects for males, and no significant treatment effects for females, with negative point estimates.

---

[11] There is a significant increase in hours worked in the periods immediately following treatment, but this dissipates with time. In the period immediately following treatment, hours worked increases by 4.4 hours per week for males and 4.6 hours per week for females, both significant at the .05 level. In the second or later rounds after treatment, however, the measured effect on male hours is very close to zero while the effect on female hours worked is always negative but insignificant. Also, the effect of treatment on hours worked differs somewhat by treatment level, but the effects are not statistically significant. The process we use to adjust profits for hours worked uses actual hours, and so incorporates differences by treatment level.

[12] Column 1 can be compared to the coefficients of 7.35 on treatment and -7.51 on the interaction with female in Table V, column 2, of de Mel, McKenzie and Woodruff (2008), which is estimated using two years of data rather than three.

In columns 3 and 4 we examine gender differences in returns to capital. Column 3 uses real profits as the dependent variable, ignoring the effect of the capital injection coming through hours worked, while column 4 adjusts profits for the value of the owner's time. In either case, the mean real returns to capital are estimated to be just over 11 percent per month for males, and slightly negative but not significantly different from zero for females. Note that the first-stage estimating the effect of treatment on capital stock levels shows a coefficient on the treatment amount of 0.73 for males and 0.70 for females, suggesting that on average 73 percent of the treatment given male owners ended up as capital stock for the business, while females invested almost as much. We explore this in more detail below.

The final two columns of Table 2 allow the treatment effect to vary with the number of quarters since the treatment was administered. If the initial shocks generate large profits, we might expect some part of those profits to be reinvested in the enterprise. On the other hand, shocks to household cash needs might lead to some disinvestment of the treatments over time. We find no significant trend for either males (Column 5) or females (Column 6). For both males and females, the standard errors increase with time after treatment, suggesting an increasing dispersion over time. Finding no significant time trend, we pool the data across all 11 rounds of the survey for the remainder of the paper.

B. Differential Effects by Treatment Level

The results in Table 2 assume that the effect of the 20,000 LKR treatment is twice that of the 10,000 LKR treatment. We can not reject this linearity for either capital stock or profits when the treatment effects are pooled across gender. In Table 3, we allow the effect of the treatment on the level of invested capital to vary by both gender and treatment amount. This implies estimating equation (1) with four separate variables indicating treatment of 10,000 LKR and

13

20,000 LKR separately for males and females. Once we divide the sample by gender and treatment level, the sample sizes within any subgroup are modest, and standard errors are correspondingly larger. This will often limit our ability to reach definitive conclusions.

Table 3 shows that the investment behavior did indeed differ by treatment level. The first row of column 1 indicates that, averaged over the eleven survey rounds, males invested 138 percent of the smaller treatment in their enterprises. Although we can not reject that 100 percent of the treatment was invested, the point estimate suggests the use of complementary resources or the reinvestment of generated profits by male owners. Females, on the other hand, invested none of the 10,000 LKR treatments. The female interaction term is -1.39, meaning that the measured investment level is -0.01 for females. But for the larger treatment amounts, females invested, if anything, more than males. While males invested just over 60 percent of the 20,000 LKR treatment, females invested 85 percent of the larger treatment (1.22 plus 0.48 divided by two to reflect the treatment amount). The second column of Table 3 limits the sample to the single quarter immediately following the treatment, in order to show the immediate investment effects. Females do appear to have initially invested some part of the 10,000 LKR treatment, though only 22 percent of the treatment finds its way into the enterprise three months following the grant. Males had invested just over 60 percent of the smaller treatment within the first three months.[13]

The sample sizes within group are even smaller if we allow the treatment effects to vary with gender, treatment level, and whether the treatment was cash or in-kind. Allowing treatment effects to vary with gender and treatment level, we can not reject the null hypothesis that the effect of cash and in-kind treatments are the same on both capital stock (p=0.48) and adjusted

---

[13] Owners receiving cash grants were asked in the survey following the treatment how they had spent the cash grant. Among those receiving the 10,000 LKR grants, females report spending significantly less on the business (4,900 vs. 7,700, p<.01) and more on household durable or nondurable consumption (2,700 vs. 1,600, p=.09).

profits (p=0.16).[14] Moreover, the point estimates do not suggest large differences in the investment by females of the cash and in-kind treatments. The point estimates for females are 0.11 for the 10,000 LKR cash treatment, -0.11 for the 10,000 in-kind treatment, 1.99 for the 20,000 LKR cash treatment and 1.16 for the 20,000 LKR in-kind treatment. So in both cases the smaller treatment is not invested in the business while the larger treatment is. We therefore continue to pool cash and in-kind treatments for the remainder of the paper.

Given these differences in the response of investment to the size of the treatment, we repeat the intent to treat regression allowing the returns to the treatment to vary by treatment level and gender. The results, shown in column 3 of Table 3, indicate that the pattern of returns generally reflects the pattern of investment. Males receiving the 10,000 LKR treatment have profit increases which are greater than those of males who received the larger treatment. This is consistent with the fact that males invested on average 138 percent of the smaller treatment and only 63 percent of the larger treatment. We find no increase in profits for females following the smaller treatment, consistent with the fact that women did not invest the treatment in the enterprise. However, even females receiving the larger treatment did not obtain higher profits, in spite of the fact that they invested 85 percent of the treatment amount.

The difference in returns to the larger treatment could be the results of females and males investing in different types of assets. For the half of the treatments given in kind, we have very detailed information on the purchases. For the half given as cash, we know from follow-up surveys whether the initial investments were made in inputs or equipment. Males invested a larger share of their grants in inventories and working capital (58 percent vs. 45 percent for

---

[14] This is the p-value for testing jointly four hypotheses: the 10,000 LKR treatment has the same male effect for cash and in-kind; the interaction of the 10,000 LKR treatment and female is the same for cash and in-kind; the 20,000 LKR treatment has the same male effect for cash and in-kind; and the interaction of the 20,000 LKR treatment and female is the same for cash and in-kind.

female, p=.03). Among the equipment purchases, women appear to have spent more on items which have uses both in the business and in the home—sewing machines, ovens, cookers, furniture, and the like. This largely reflects the fact that they are more likely to work in food processing and garments. But our profit data will not reflect the consumption value to the household of the purchases. For both males and females, we find weak evidence that the return to investments in equipment is lower than the return to investments in working capital, with the gap larger for females.[15] Columns 4 and 5 of Table 3 show the increase in profits as a function of the amount spent on working capital and the amount spend on capital equipment. For males, working capital investments have returns of 8.5 percent per month, while equipment investments return 5.3 percent per month. For females, the comparable estimates are 1.4 percent for working capital and -5.8 percent for equipment. Though none of these differences is statistically significant, the larger measured gap for females could reflect a greater value in home consumption of the equipment purchased by females, or a desire to invest in assets which are more difficult to decapitalize. We return to the latter possibility later in the paper.

In sum, we find that females invest little of the smaller treatment amount, but more of the larger treatment amount than do males. Females who do invest the grants in the enterprise show no increase in profits as a result. The remainder of the paper tries to understand why these stark gender differences occur.

III. Is gender masking heterogeneity in returns in other dimensions?

_____

[15] Given that the choice to invest in inventory compared to equipment is endogenous, we should be cautious in interpreting these results. If firm owners have heterogeneous returns, and select the type of capital which has the highest returns for their business, then both point estimates will be overestimates of the return to the average firm of investing in this subtype. However, as we will argue later, the threat of capture may lead the inventory versus capital stock decision to be made for reasons other than which will most maximize profits.

Given that the enterprises in our sample were all operating at the time of the baseline survey, the owners are a random sample of poor small business owners, not a random sample of all males and females in the population. The process by which women select themselves into self employment may differ from the process by which men select themselves into self employment. For example, more highly educated males may be more (or less) likely to select into self employment than more highly educated females. Moreover, males entering self employment may be more likely to grow beyond our upper limit of capital stock, and so be excluded from our sample. As a result, the characteristics of male and female owners in our sample may differ. If the treatment effects are also heterogeneous across these same characteristics, then the differences shown in Tables 2 and 3 may be related not to gender, but to differences in these other characteristics.

Table 4 shows the means of selected variables by gender, along with t-tests for differences in those means. We do find that female and male owners differ significantly in several respects. To investigate whether these differences can explain the observed gender difference in treatment effects, we allow the effect of the treatment to vary with other measured characteristics. We focus on three dimensions motivated by the simple model in de Mel, McKenzie and Woodruff (2008): differences in household wealth and liquidity, differences in entrepreneurial ability, and differences in attitudes toward risk. We estimate the following equation, for a given set of H potential explanators X_s'

$$
\begin{aligned}
PROFITS_{i,t} = &\ \alpha + \beta' AMOUNT_{i,t} + \gamma' AMOUNT_{i,t} * FEMALE_i \\
&+ \sum_{h=1}^{H} \pi_h' AMOUNT_{i,t} * X_{h,i} + \sum_{h=1}^{H} \rho_h' AMOUNT_{i,t} * X_{h,i} * FEMALE_i \\
&+ \sum_{s=2}^{11} \theta_s \delta_{s,t} + \sum_{s=2}^{11} \kappa_s \delta_{s,t} * FEMALE_i + \sum_{h=1}^{H} \left(\sum_{s=2}^{11} \varphi_{h,s} \delta_{s,t} * X_{h,i} \right) + \lambda_i + \varepsilon_{i,t}
\end{aligned}
\tag{3}
$$

17

As in Table 3, amount is defined as a vector consisting of separate variables indicating treatment of 10,000 LKR and 20,000 LKR for males and females. A given characteristic (e.g., years of schooling) is allowed to affect returns differently for each gender treatment-level combination.[16] We demean all the X's, so that β' will give the mean treatment effects for males, and γ' the differential effects for females, evaluated at the mean of the other potential explanatory variables. We then examine how sensitive γ' is to the inclusion of these other variables, to determine whether the gender interaction is really reflecting gender differences in access to capital. We use profits adjusted for the value of the owner's labor input, as described above.

A. Gender Differences in Liquidity Constraints

Table 5 shows the results allowing heterogeneity in both the investment (columns 1 through 4 and profits (columns 5 through 8) regressions.[17] In columns 1 and 5, we allow the treatment effects to vary according to two variables measuring household wealth and liquidity. The first is an index of ownership of household durable assets, measured in the baseline survey. The second is the number of wage workers in the household in the baseline. Wage workers are posited to provide a steady stream of income which might relax liquidity constraints. The interaction terms themselves are statistically significant in only a few cases. When they are significant, they have the expected negative sign, indicating that more liquidity is associated with lower investment of, and returns on, the treatment. Controlling for these interactions does not lead to a significant change in the size of the negative female interaction terms at both the 10,000

---

[16] Equation (3) allows the effect of liquidity constraints, ability, or risk aversion on the heterogeneity of the treatment to differ for men and women. The results are very similar if we restrict the ρ_h' coefficients in equation (3) to be zero, so that the heterogeneity effects are the same for men and women. We therefore present the more general specification results.

[17] In the interest of space, we do not show all of the interaction terms. These are available from the authors upon request.

LKR and 20,000 LKR treatment levels. We still find high returns for males, and can not reject the return being zero for females after these controls for differences in access to credit.

B. Differences in entrepreneurial ability and reasons for going into business

The demand for credit will depend on the optimal size of the enterprise. If capital and ability are complements in production, more able owners will have higher optimal sizes. Hence, for a given supply of credit, more able owners will be further away from their optimal size and have higher marginal returns to capital.

Entrepreneurial ability is a multifaceted and nebulous concept, which is unlikely to be captured fully by general measures of ability such as years of education. The SLMS has an extremely rich set of measures of ability, allowing us to consider an array of possible measures for entrepreneurial ability. In Table 5 we use a standard measure, years of education, and the score from a Digit-span recall test. The Digit-span test is a measure of short-term processing power, used in Simeon Djankov et al. (2005). Table 4 shows that females have significantly more education than males, but significantly lower Digit-span recall scores. However, allowing investment and returns to vary with ability does not affect the basic pattern of returns (Table 5, columns 2 and 5). Neither measure has a significant effect on the decision to invest the treatment in the enterprise. But the digitspan score has a very strong effect on returns to the treatment among females, at both treatment levels. Education has a significantly positive impact on treatment for males receiving the larger treatment and a significantly negative effect (controlling for digitspan) for females receiving the smaller treatment.[18]

Our survey also contains many measures developed by industrial psychologists to measure different facets of the entrepreneurial personality. Table 6 examines the robustness of

---

[18] The aggregate effect implies that higher-ability females have significantly higher returns to the treatment. This may reflect intra-household bargaining power (e.g., Nava Ashraf 2008), a point we return to below.

the female interaction term to 19 alternative measures of owner ability and motivation. These include measures commonly found in economic studies, such as mother's and father's previous business experience; the time taken for individuals to solve a maze (median time was 53 seconds); entrepreneurial traits such as passion for work, tenacity (both from J. Robert Baum and Edwin A. Locke, 2004); entrepreneurial self-efficacy; trust (taken from the General Social Survey); the achievement and power motivations of D.C. McClelland (1985); work centrality (S. R. Mishra, R. Ghosh and R. Kanungo, 1990); Impulsiveness, from three questions on the Barratt Impulsiveness Scale; financial literacy (from Anna-Maria Lusardi and Olivia Mitchell, 2006); internal locus of control (J. B. Rotter, 1966) and our own questions on reasons for going into business, on whether or not the business operates out of the home, and on whether or not their friends and family consider the owner an organized person.[19] None of these characteristics are significant when interacted with the treatment effect, and the female interaction stays large, negative, and significant. We thus conclude that differences in entrepreneurial ability, however measured, do not explain the low returns to females.

C. Differences in risk aversion

We measure risk aversion as the implied coefficient of relative risk aversion obtained by playing lottery games for real money with the firm owners (see de Mel, McKenzie and Woodruff 2008 for details). Although there is a common presumption that women are more risk averse than men in many countries, we find that Sri Lankan female microenterprise owners are more likely to take risky gambles in these lottery games than male owners (Table 4). Since theory would

---

[19] Many of these variables were measured in later rounds of the survey, after the treatment had been given to some firms. One may therefore be concerned whether these measures themselves are affected by the treatment. T-tests of difference in means only show significance for financial literacy (treated are more literate), impulsiveness (treated are less impulsive), and work centrality (treated say work is less central to their lives). None have p-values below the Bonferroni threshold for a familywise error rate of 0.10 with multiple hypothesis testing. Since we examine the heterogeneity one measure at a time, readers who are concerned about single hypothesis testing revealing a difference can choose to ignore the robustness checks for these three variables.

predict that returns are higher for more risk averse individuals if missing insurance markets cause them to under invest, the results of these lottery games suggest that differences in risk aversion will not explain the low returns for females.[20] Indeed, we see this in column 3 and 7 of Table 5. Allowing returns to vary with risk aversion does not change the female interaction terms. None of the risk aversion interaction terms are significant in either the capital stock or profits regressions.[21]

Finally, columns 4 and 8 of Table 5 include all three sets of interaction effect at the same time. Again, we find no significant effects on the pattern of returns for males and females. Based on the results reported on Tables 5 and 6, we conclude that gender is not masking heterogeneity of returns across other key dimensions of the investment decision. Females do not invest the smaller grant, and do not realize a return on investments of the larger grant even after we allow returns to vary with a wide range of characteristics.

D. Differences in reporting of profits

A final way in which gender might be masking other factors is that women and men may have different propensities to misreport profits to the survey enumerators. If women are more likely to hide profits, then the gaps in measured profits may not reflect gaps in actual profits. Are female microenterprise owners more likely than men to under report business income? One indication of this comes from questions we asked about why and how much "firms like yours"

---

[20] Of course risk aversion might also affect the choice of projects, as well as the amount invested in any particular project. For example, more risk averse individuals may choose less risky industries with lower returns if risk and return are positively correlated. According to the lottery exercise, women in the (low-return) female-dominated industries are actually less risk averse than women in the (higher-return) mixed industries. We examine the role of industry in explaining the difference in returns in the next section.

[21] This result is also robust to an alternative measure of risk aversion. We also followed the German Socioeconomic Panel in asking firm owners about the overall willingness to take risks in life, on a 10 point scale. This variable does not have a significant interaction with any of the gender*treatment level variables, and controlling for it does not qualitatively change the results of columns 3 and 7. Thus differences in risk aversion do not explain the low returns to females.

over- or under-report profits. Women and men say that "firms like theirs" under report profits by very nearly the same amount (7850 from females vs. 8067 for males, p=0.55). We also have data on who was present at the interview for each round after the baseline survey. If women are deliberately under reporting gains following treatment, we should expect to find lower reported profits when the spouse is present at the time the interview is conducted. We do in fact find some evidence that the presence of the spouse matters for the general level of reporting profits – but not in a way that explains the gap in behavior. Males underreport profits by 433 rupees (significant at the 0.10 level), while females underreport by only 216 rupees when their spouse is present (not significant at the 0.10 level).[22] As a percentage of average profits, this is approximately the same for both groups. More importantly, however, we find that the effect is the same in treated and untreated households. When we interact the presence of the spouse with treatment, the interaction term is small and statistically insignificant.

In sum, the gender differences do not appear to be masking differences in ability, liquidity, or attitudes toward risk. We find no evidence that they are driven by differences in reporting behavior.

IV. Accounting for household production and social constraints

Finding that gender is not masking differences in other measured characteristics, we turn to other possible explanations of the differences in the response of males and females. In this section, we consider a set of factors affecting the enterprise production function which are fully consistent with a unitary household decision making model. The first is that business owners may be jointly maximizing household and enterprise production. The second is that the choices

---

[22] Note these point estimates come from a model with firm fixed effects, so are identified off of the sample of firm owners who sometimes have their spouse present for the interview and who sometimes don't. The spouse was always present in only 1 case; the spouse was never present in just over 21 percent of the cases.

owners make with respect to enterprise operations—including the sector in which they operate—may be restricted by social norms. Subject to these norms, the owner's problem is to choose an allocation of time and wealth to maximize household utility from consumption, $U(C,T_l)$, where:

$$C = f(K,T_e) + g(H,T_h) + Y_o \qquad\qquad (4)$$

Wealth is allocated between investment in the enterprise (K) and household assets (H)[23], and the owner's time is allocated between production in the household (T_h), production in the enterprise (T_e), and leisure (T_l). Y_o is income produced by other household members. g(.) is the household production function, which includes tasks such as providing labor for the household, watching children, caring for elderly parents, and other similar activities. f(.) is the business production function. Both g(.) and f(.) may vary by gender, and the optimal choice of f(.) may be affected by g(.) if, for example, some businesses allow more flexibility to undertake household tasks than others. Social norms may also affect optimization, since certain household tasks and business activities are seen as socially acceptable only for one sex or the other.

Indeed, some types of business activities are carried out entirely or predominantly by males, and some entirely or predominately by females. Repair services is an example of the former, and making lace an example of the latter. Other activities, retail trade and bamboo, for example, have almost equal numbers of male and female owners in our sample. Survey questions indicate that some of this choice is social in nature. Only 10 percent of respondents said that repairing bicycles is a socially acceptable activity for women; not one respondent said that making lace is socially acceptable for men.

We use a detailed industry code that splits our sample into 73 industries to define a variable which is the proportion of owners in an industry who are female. For example, the

---

[23] We assume all wealth is allocated to these uses, and there is no savings or borrowing. This simplifies the discussion and does not materially affect the motivation for the empirical analysis.

broader industry of food sales gets divided into finer classifications such as fish sales, cashew nut sales, and fruit sales. We then interact this variable with the treatment level and with a variable indicating female ownership. The complete set of three-way interactions allows the treatment effect to vary by gender, by the proportion female, and by the interaction of the two. The results are shown in columns 1 (capital stock) and 2 (profits) of Table 7. The coefficients on the interaction terms are large, particularly for females. The standard errors are even larger, reflecting small sample sizes combined with multiple interactions. We should also note when interpreting the coefficients that only 2 percent of females work in industries with less than 40 percent female owners, and only 7 percent of males work in sectors with more than 55 percent female owners. The measured variables show a consistent pattern: both investment levels and returns decrease as the proportion of female owners in the sector increases. For women receiving the $200 treatment, both investment levels and profits increase following treatment in mixed industries such as bamboo and retail, but profit levels fall in female dominated industries such as coir and lace. For men, both investment levels and returns are increase more in male dominated industries than in mixed industries. Given large standard errors, few of these differences are statistically significant.

The returns may vary across sectors because the production function reaches diminishing returns earlier in some sectors than in others, or because women selecting into female-dominated industries differ in unmeasured ways from women selecting into gender-mixed sectors. But the proportion of females in the sector may also be proxying for other constraints in production. Social constraints and the need for flexibility may limit the geographic market of females more than males, for example, regardless of industry. Indeed, we do find that female owners report, on average, that 68 percent of their customers are within 1km of their business, compared to 60

percent for male owners (p-value of 0.027 for testing equality). Moreover, 48 percent of female firms have *all* their customers within 1km, compared to only 30 percent of men (p<0.01). Similarly, we find that 74 percent of female-owned businesses in our sample operate out of the home, compared to 52 percent of male-owned businesses.

We control for these additional constraints in columns 3 and 4 of Table 7. We do this by first running a regression to find characteristics which are associated with being a female-owned enterprise and which might affect the production function. Concretely, we run a linear probability model regressing a variable indicating female ownership against the percentage of sales made within 1 km of the enterprise, the percentage of inputs purchased within 1 km, an indicator that the business operates out of the home, an indicator that the business is less than three years old, and the proportion of the enterprises in the detailed industry which are owned by females. After controlling for the proportion of female owners, we find that female-owned businesses are significantly younger and more likely to operate out of their home.[24] From this regression, we obtain the predicted value that the business, given its characteristics, is owned by a female. We then allow the investment and returns to vary with both this predicted value and with the actual gender of the owner. Using the predicted variable from a linear probability model is equivalent to controlling for each of these factors individually, but makes the presentation of results more tractable. Note that because we include the proportion of female owners in the regression, we are essentially just adding the additional production constraints to the regressions reported in columns 1 and 2 of Table 7. The results in columns 3 and 4 are very similar to those controlling only for the proportion of female owners.

---

[24] We also find that women are more likely to say they entered self employment to have the flexibility to care for children or elderly parents. We do not include this variable in the reported regressions because it is missing for some enterprises. Including it does not qualitatively change the results.

In sum, we do find some evidence that the behavior of female grant recipients is associated with whether they are in female-dominated or mixed sectors, especially among recipients of the larger grants. However, even in the relatively mixed sectors like retail trade, bamboo, and food sales, the predicted gender differences in returns from the treatment are still large, especially in the case of the smaller treatment amounts. Thus, while joint household – enterprise production and social constraints may explain a part of the difference in the behavior of males and females, a gender difference remains even after accounting for these factors.

Section V: Non-cooperative and Inefficient models of the household

To this point, our explorations are all based on a unitary household model. More generally, we may consider a collective model, in which resource allocation within the household is efficient, but in which women have different preferences for consumption than men. However, efficiency requires income pooling (Chiappori, 1999; Esther Duflo 2003), so that a temporary fluctuation in income should not change the household's consumption allocation. While our grant was a one-off shock, the size of it was large enough for some households that it may have changed permanent income, and hence bargaining power of household members. In that case, if women have stronger preferences for spending on children and household needs than men, then perhaps part of the explanation for gender differences in the business returns may lie in differential changes in household expenditure.

In Table 8, we use the survey data to test whether the treatment has a greater effect on schooling, expenditures and household asset accumulation in households of female microenterprise owners than in households of male microenterprise owners. Columns 1 to 3 estimate the impact of the treatment on school attendance of 5 to 12 year olds, 12 to 15 year olds, and 17 to 18 year olds, respectively. School attendance information was gathered only in the

April waves of the survey and the sample for these regressions is limited to those households with children of the specified age. For the 10,000 LKR treatment level, the measured effect of the treatment on schooling attendance is positive but not significant for women. In the case of 17-18 year olds, the effect for females falls just below the .10 level (p=.101 on the sum of the coefficient on treatment 10,000 LKR and female treatment 10,000 LKR).

We also find generally insignificant differences on expenditures for groceries, health and education, both for males and females and for the difference between males and females. (See columns 4 through 6 of Table 8). The one exception is that we find a marginally significant decrease in spending on education for males receiving the 10,000 LKR treatment. We do find significant differences in the rate at which household durable goods ownership increases, and in financial assets. Column 7 of Table 8 takes as the dependent variable the first principal component of a vector of 17 household assets, including landline and cellular telephones, television, autos, bicycles and gold jewelry. The weights in the index are derived from baseline data. Asset ownership increases across time for all households, but the regression results reported in column 7 shows that the increase is significantly larger in households of male enterprise owners who received who received either of the grants. In levels, females receiving the 10,000 LKR treatment see a small increase in household assets, while those receiving the 20,000 LKR treatment see a small decrease, though the drop is far from significant. The gap between males and females is significant for the larger treatment.

The April 2007 and April 2008 household modules contain questions about financial assets. Over the two rounds, more females say they have a current account, a fixed deposit account or a savings account with a bank or other financial institution (43 percent vs. 36 percent of males, p=0.04). Households of enterprise owners receiving treatments are slightly more likely

27

to have at least one such account (42 percent vs. 36 percent, p=0.12). However, the treatment effect is again limited to households of male owners: 43 percent of both treated and untreated female enterprise owners report having an account, while 41 percent of treated males and only 29 percent of untreated males say they have an account.[25]

The lack of more significant impacts of the treatment on health and education expenditures may be due to the fact that Sri Lanka has a good, inexpensive, state system of schooling and health care. Schooling is compulsory up to age 14, and over 91 percent of children in our sample of this age are actually attending school. In countries where education and health expenses are larger burdens on households, we might find more of the treatment being spent on these categories. But males show a large gain in both household durable and financial assets following treatment, while females show no gain in assets following treatment. The results suggest that women did not divert the grants to other household investments, and that a collective household model can not explain the gender differences in treatment effects. We therefore turn to consider evidence that the gender differences might reflect inefficient behavior by households.

A. A model including capture

Consider a female business owner with endowment of wealth $\overline{A}$. She can allocate this wealth between consumption, investments in the business, and purchases of household durable assets. Money invested in the business can be invested as working capital, K, or as equipment E. Money invested in household durable assets is denoted H. For simplicity, we assume the owner inelastically supplies labor to the firm and uses the business assets to produce output valued at f(K, E). She also gets a stream of consumption from household durable assets, valued at rH, where r is the rate of return on household assets.

---

[25] Owners were also asked for the balances in the accounts. The reported balances are highly skewed, but show a similar pattern. Treated households have higher balances, but only among household with male owners.

She gets utility from her current consumption C, and from carrying assets into the future. However, the bargaining power of the woman determines how much of business profits and the flow from household assets the woman gets to use for her own consumption. This bargaining power also determines how much of her working capital can be carried over into the future without her husband taking it.

The female firm owner's problem is then the following:

$$\max_{\{C,H,E,K\}} U\left(C, H + E + (1-\theta)K\right)$$

$$C = (1-\tau_B)f(K,E) + (1-\tau_H)rH$$

$$H + E + K \leq \overline{A} \tag{4}$$

s.t. $K \geq K_{min}$ (5)

$$H \geq H_{min} \tag{6}$$

$$E \geq E_{min} \tag{7}$$

where τ_B is the share of business profits captured by the husband, τ_H is the share of the flow of household assets captured by the husband, and θ is the share of working capital the husband captures if the owner tries to keep it for the future. We assume that working capital is more liquid and easier for the husband to capture than fixed equipment. Assets carried into the future are A=H+E+(1-θ)K. We consider three cases, beginning by characterizing the unconstrained maximum.

Case 1 (Unconstrained Case): Assume first that none of the conditions (5), (6) and (7) bind. Then it is straightforward to show that the solution to the women's optimization problem is:

$$(1-\tau_H)r = (1-\tau_B)f_E{}'(K,E) = (1-\tau_B)f_K{}'(K,E) - \theta\frac{U_A{}'}{U_c{}'} \tag{8}$$

In equilibrium, the net marginal return to household assets (after the husband has taken his cut) is equal to the net marginal return to business assets (after the husband has taken his cut).

Moreover, investments in the business are distorted in the direction of fixed assets, which are more difficult for the spouse to capture, so that $f_E'(K,E) < f_K'(K,E)$. Note also that τ_H is not bounded by unity, since the spouse may take all of the flow and some of the stock of household assets. In this case, if investments in business equipment are subject to less capture, the woman would overinvest in the business to the point where she has a negative return. More generally, a higher effective tax rate from the husband on household assets will be associated with a lower return on business assets in equilibrium. Note that in this set-up, the household is not operating efficiently, since it would be better for the husband to let the wife run her business at its most efficient level, and then take a lump-sum transfer of the profits.

In the unconstrained maximization, the business owner has equated her net returns on each asset. In this case, we should expect that with a positive shock (like our grant) she will be indifferent between investing in the business and the household at the margin. We should expect some part of the grant to flow to the household, some part to working capital and some part to business equipment. Thus, the unconstrained case with spousal capture can explain part but not all of the empirical pattern we observe.

Case 2 (Constraints): We consider two cases, one where the household constraint binds ($H=H_{min}$), and the another where the working capital constraint binds ($K=K_{min}$). Letting λ_H be the lagrange multiplier on constraint (6), the solution to the optimization problem with household constraints is:

$$(1-\tau_H)r + \frac{\lambda_H}{U_c'} = (1-\tau_B)f_E'(K,E) = (1-\tau_B)f_K'(K,E) - \theta\frac{U_A'}{U_c'} \qquad (9)$$

Similarly, denoting the lagrange multiplier on (5) as λ_K, optimization with the working capital constraint requires:

$$(1-\tau_H)r = (1-\tau_B)f_E'(K,E) = (1-\tau_B)f_K'(K,E) - \theta\frac{U_A'}{U_c'} + \frac{\lambda_K}{U_c'} \qquad (10)$$

The latter case implies that the return to working capital *net of capture* is lower than the return to business equipment or household assets. This would be consistent with the grant being used to purchase equipment or household assets rather than in working capital. But neither of these cases appears consistent with the behavior of investing the 10,000 LKR grant in the household and the 20,000 LKR grant in the business.

We conclude that bargaining power may be a factor affecting how women invest the grant, but bargaining power alone is unable to explain the differences between how women respond to the smaller and larger grants. What is required is some sort of non-convexity in investment *or* in capture. Since the women in the sample are all operating microenterprises, and since the median investment level of the female-owned enterprises is almost exactly the size of the smaller grant, a production nonconvexity would have to affect expansion of the enterprise, but not entry. An alternative is that the nonconvexity enters through the capture of investments by the spouse. If small equipment purchases (e.g., a blender) are easier to capture and resell than large equipment purchases (e.g., a refrigerator), then this creates an investment non-convexity even if the underlying production function itself has no non-convexity.

The model generates several empirical predictions which are testable with our data. First, returns to working capital (gross of capture) should be higher than returns to equipment. We showed some evidence that this is the case on Table 3. Second, the capture of working capital implies that women with stronger bargaining power (that is, a lower τ_B) should invest more of the grant in working capital and less in equipment. Third, the effect of bargaining power on the level of investment in the business is ambiguous, since prior to the shock women will have equated the returns to investments in household assets, working capital and business equipment

after accounting for capture. However, if the threat of capture is large enough for women with the weakest bargaining position, then these women will remained pegged against the minimum working capital required to operate the business. In that case, we should find that the amount of the grant invested in the business increases with bargaining power. Finally, the model predicts that women might choose to invest the grant in equipment form in their business, even if doing so yields zero or negative returns, due to the threat of capture if the assets are put in the household.

B. Bargaining power and investment

We test the second and third predictions using measures of power and cooperation within the household. Two of the measures relate specifically to business decisions.[26] Our survey asked who is involved in making decisions about food purchases, other regular purchases, durable goods for the household and the owner's decisions to buy clothes. We add the number of these four decisions which the business owner reports she/he is involved in to form a measure of household decision making power. We also asked who makes decisions about reinvestment of profits and purchase of equipment for the enterprise. The owner always reports she/he has a say in these decisions. In some cases, the owner also reports that her/his spouse has a say. We code this variable as 0 if the spouse has a say in both of these investment decisions, 1 if the spouse is involved in only one of the two decisions, and 2 if the spouse is not involved in making either decision. The spouse has some role in either decision in only 15 percent of the cases. Finally, we asked owners whether they agree or disagree with the following statement: "The profits of my enterprise are higher because of my spouse's involvement." We use the response to this question

---

[26] These questions were asked in the November 2007 round of the survey, well after the treatments were given. However, we find no effect of the treatment on any of the decision making measures. This may be the result of the fact that all of the female owners were already working and earning income before the baseline survey.

(reported on a 1-5 scale) as a measure of cooperation within the household. We then use the first principal component of the three measures as our measure of bargaining power.

In Table 9, we test whether decision making power affects investments and returns. The first column of Table 9 shows the relationship between the empowerment measure and the effect of the treatment on capital stock. Since our interest is in the investment pattern of women, we limit the sample to women. We allow the effects to vary by treatment level and empowerment. We find no significant effect of empowerment on the percentage of the grant which is invested, though both coefficients are positive. There is some suggestion that empowerment leads to a more efficient investment of the larger treatment (column 2), as profits increase significantly with empowerment. Consistent with this, we find that more empowered women invest a significantly larger share of the larger treatment in inventories. If anything, more empowered women invest less in equipment, thought the effect is not significant. Empowerment is not significant for the 10,000 LKR grant in either the inventory or equipment regression, but the measured effect is positive in the inventory regression and negative in the equipment regression.

C. Discussion and Alternative Explanations

We have argued that a standard unitary household model can not account for the results of our experiment, in which women invest very little of the $100 treatment, and more of the $200 treatment, and have low returns to capital. The model of capture by other household members developed above provides one plausible framework which can generate the observed outcomes. A related explanation emerges from new work on self-control problems by Abhijit Banerjee and Sendhil Mullanaithan (2007). They provide a model in which consumption has two components, "x-goods" for which there is no temptation, and temptation "z-goods" which only provide utility to the self taking the decision. They suggest that such a framework can explain why the poor

33

(who face higher temptation) do not undertake divisible high return investments, since the returns on small investments will be mostly spent on temptation goods in the future, which the current self does not value. In contrast, when larger amounts of money are at hand, more spending occurs on x-goods which are valued. Their model also suggests that there will be a preference for illiquidity, leading to over-investment in durables to reduce the scope for future temptation.

Intuitively the Banerjee and Mullanaithan model has several parallels to our non-unitary model – but instead of the spouse capturing part of the profits, it is the temptation spending of the future self that is acting as a tax. Such a framework could explain why poor women invest less of the $100 treatment, but more of the $200 treatment, and why the returns to equipment may be less than the returns to inventories. However, in their model differences in temptation arise from wealth differences, and so to explain the gender difference in returns in such a framework, women would have to be poorer than men. Instead we find female business owners come from marginally wealthier households than male business owners in our sample. Furthermore, we find that women from richer households invest less, not more, of the treatment, which is consistent with poorer, liquidity constrained women facing higher returns and investing more, and not with poorer women facing more temptation and so investing less. Along with the above suggestive results supporting our model, we therefore believe spousal capture rather than future-self capture is the model more consistent with our results.

VI. External Validity

The experimental results in this paper clearly demonstrate a lower return to capital in female-owned enterprises in Sri Lanka than in male-owned enterprises, with the sector of work appearing to explain some of this gender difference. As with any empirical result based on data

34

from a single country, a question which then arises is whether the results of the experiment apply to other settings. In this section we provide suggestive (non-experimental) evidence that the pattern of returns by gender is not limited to Sri Lanka.

We use microenterprise data from detailed microenterprise surveys in Brazil and Mexico. The Brazilian data come from the Economia Informal Urbano survey of 2003 (see Pablo Fajnzylber, William Maloney and Gabriel Montes Rojas 2006) and Mexican data from pooling the 1992, 1994, 1996 and 1998 National Survey of Microenterprises (ENAMIN) surveys (see McKenzie and Woodruff, 2006). For each survey we restrict our analysis to firm owners aged 18 to 65, working more than 30 hours per week, with less than \$US500 of capital stock, exclusive of land and buildings.[27] We convert profits and capital stock into U.S. dollars, and run the following cross-sectional regression:

$$\begin{aligned} PROFITS = {} & \alpha + \beta FEMALE + \gamma CAPITAL + \delta CAPITAL * FEMALE \\ & + \lambda PROPFEM + \theta CAPITAL * PROPFEM + \pi' X + \varepsilon \end{aligned} \quad (10)$$

Where FEMALE is a dummy variable for females, CAPITAL is capital stock exclusive of land and buildings, PROPFEM is the proportion of firms in an industry that are female-owned, and X is a set of controls for education, age, and own hours worked. We first estimate equation (10) without the terms in PROPFEM. Then, γ is the marginal return to capital for male enterprises, and $\gamma + \delta$ the marginal return for female owned enterprises. We are most interested in the sign and relative magnitude of δ, the interaction between capital stock and the female dummy variable. We then examine whether controlling for the proportion of firms in the industry which are female-owned can explain some of the gender difference in returns.

---

[27] This upper limit on capital stock restricts the capital stock to the range over which most firms in our Sri Lanka experiment operate.

35

Of course one is concerned that capital stock may not be exogenous in this regression, and may be correlated with unobserved characteristics of the owner or firm which also increase profits - a reason for carrying out a randomized experiment in the first place. Nevertheless, our previous experience (de Mel, McKenzie and Woodruff 2008, McKenzie and Woodruff 2006, 2008) suggests that these non-experimental regressions are informative about the high returns to capital in microenterprises, and at present, they offer the only source of information for seeing whether there is any evidence that the results of our experiment apply in other countries.

Table 10 reports the results of this regression. We begin by pooling together all industries. Column 1 shows a high return to capital of 40 percent for males in Brazil, with female returns significantly lower by 13.2 percentage points. Column 3 shows a return to capital of 16.6 percent in Mexico for males, with returns for females 7.6 percentage points lower.. In both countries the gender interaction is significant at the 1 percent level, and thus there is evidence that the return to capital is substantially lower in female-owned microenterprises than in male-owned microenterprises in two other large countries.

Next we examine whether the return varies with the gender mix of the industries being considered in Mexico and Brazil. Column 2 shows that controlling for the proportion of firms which are female-owned in an industry eliminates all of the negative interaction effect between capital stock and gender in Brazil. That is, the Brazilian results suggest that the main reason for gender differences in returns is due to lower returns in the industries in which women work. In contrast, the Mexican results in column 4 continue to show a significant negative interaction of capital stock with female after controlling for the gender mix of industries. We do not have data on bargaining power for firms in either country, so are unable to look at the role of capture here. We conclude that the general finding of lower returns to female-owned enterprises appears to

36

have some external validity in other countries, with less robust external evidence for the role of industry.

VII. Conclusions

We find significant differences among male and female microenterprise owners receiving positive capital shocks. Men invest a substantial portion of both small and large grants, and their reported profits increase by 6.5 - 14 percent of the grant amount. In contrast, women invest only the large grants, and then earn no return, on average, on those investments. The data suggest that returns to the grants are heterogeneous in a number of dimensions aside from gender, but the gender differences remain even when we control for the heterogeneity. If we had found women investing larger but not smaller sums, and then earning a return on those larger investments, we might conclude that they face non-convexities in their investments. Because we find no evidence of positive returns to the larger investments, production non-convexity does not appear to explain the differences in investment behavior.[28]

We suggest a model of capture by others in the household which is consistent with the pattern of investments made by women. In the model, large assets are easier to protect from capture, and hence become a way of storing the positive shock. There is evidence in support of this model, in that women who have less autonomy in household and business decisions, and those saying their husbands do not help to increase the profits of their business invest a smaller portion of their grant in assets which are easy to capture, like working capital. The model of capture by other household members parallels Banerjee and Mullanaithan's (2007) recent model of "self capture" of certain types of investments, which might arise from a lack of self control by the individual owner.

---

[28] The results do not rule out non convexity issues. Perhaps even larger investments are profitable.

Our finding that men obtain a permanent increase in income from following the grant while women do not is quite robust and based on reasonably large samples. The reasons women invest the larger grant but not the smaller, on the other hand, are based on smaller samples. Data limitations make these explanations more speculative. We view the finding that women's behavior is affected by the level of cooperation of her spouse as illuminating a research agenda as much as (or even rather than) illuminating a fact. Quite simply, heterogeneity appears to matter a great deal in our data. But heterogeneity implies small sample sizes, and often implies non-experimental assignments. The heterogeneity by bargaining power and the implication of inefficient outcomes in at least some households is perhaps the most interesting finding, and the one with the broadest implications. Better measures of household cooperation (see Anandi Mani (2008) for a recent interesting advance in this measurement) and experimental designs which stratify on bargaining power will be necessary to confirm our conjectures. Moreover, the results presented here are based on a sample which is limited in two ways that may affect the interpretation of the results. Everyone in the sample operated an enterprise at the time of the baseline survey, and had invested less than US$1000 in capital in the enterprise. Women may select into self employment for different reasons than men, and men or women desiring to run a larger enterprise may have already grown beyond the upper limit of our sample capital stock.

The main results have implications for aid programs aimed at empowering women to make more consumption decisions in the household. There is by now quite a lot of evidence that intra household consumption is affected by which household member generates income (Duflo 2003; Duflo and Udry 2004). Our experiment gave equal amounts of cash or in-kind grants to male and female microenterprise owners. Males turned the grants into a sustained source of income by making profitable investments in their enterprises. During the three years following

the grants, these gains resulted in accumulation of household durable goods and financial assets in the households of the male grant recipients. In contrast, females, on average, did not generate a sustained source of income from the grant. They did not do so either because they did not invest the grant in their enterprise, or because they did not earn additional profits when the grant was invested. Why women failed to invest the smaller grants, and why their incomes did not increase when they invested the larger grants are questions which we see as first order for future research.

References

Akresh, Richard, 2005. "Understanding Pareto Inefficient Intrahousehold Allocations," IZA Discussion paper No. 1858

Ashraf, Nava. 2008. "Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines," *American Economic Review, forthcoming.*

Banerjee, Abhijit and Sendhil Mullanaithan. 2007. "Climbing out of Poverty: Long Term Decisions Under Income Stress", paper presented at the Eleventh BREAD Conference on Development Economics, London, October 5-6.

Baum, J. Robert and Edwin A. Locke. 2004. "The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth", *Journal of Applied Psychology* 89(4): 587-98.

Bourguignon, Francois, Martin Browning, Pierre-André Chiappori, and Valérie Lechene. 1993. "Intra Household Allocation of Consumption : A Model and Some Evidence from French Data," *Annales dEconomie et de Statistique*, Vol. 29, pp. 137-56.

Browning, Martin and Pierre-Andre Chiappori. 1998. "Efficient intra-household allocation: a characterization and tests", *Econometrica* 66(6): 1241-78.

Chiappori, Pierre-Andre. 1999. "Labor supply and efficient risk sharing", Mimeo. University of Chicago.

de Mel, Suresh, David McKenzie and Christopher Woodruff. 2008. "Returns to Capital in Microenterprises: Evidence from a Field Experiment", *Quarterly Journal of Economics,* Vol 123(4), pp. 1329-1372.

de Mel, Suresh, David McKenzie and Christopher Woodruff. 2009. "Measuring Microenterprise Profits: Must we Ask How the Sausage is Made?", *Journal of Development Economics,* Vol 88(1), pp. 19-31.

Department of Census and Statistics (DCS). 2007. *Sri Lanka Labor Force Survey: Final Report- 2006.* Department of Census and Statistics, Colombo, Sri Lanka.

Djankov, Simeon, Edward Miguel, Yingyi Qian, Gerard Roland and Ekaterina Zhuravskaya. 2005. "Who are Russia's Entrepreneurs?," *Journal of the European Economic Association* 3(2-3): 587-97.

Duflo, Esther. 2003. "Grandmothers and granddaughters: Old-age pensions and intrahousehold allocation in South Africa", *World Bank Economic Review* 17(1):1-25.

Duflo, Esther and Christopher Udry. 2004. "Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices," NBER Working Paper No. 10498

Fajnzylber, Pablo, William Maloney, and Gabriel Montes Rojas. 2006. "Does Formality Improve Micro-Firm Performance? Quasi-Experimental Evidence from the Brazilian SIMPLES program." Mimeo. World Bank.

Goldstein, Markus and Christopher Udry. 2008. "The Profits of Power: Land Rights and Agricultural Investment in Ghana," *Journal of Political Economy*, Vol. 116(6), pp. 981-1022.

Grasmuck, Sherri and Rosario Espinal. 2000. "Market Success or Female Autonomy? Income, Ideology, and Empowerment among Microentrepreneurs in the Dominican Republic," *Gender and Society* 12(2): 231-55.

Kevane, Michael and Wydick, Bruce. 2001. "Microenterprise Lending to Female Entrepreneurs: Sacrificing Economic growth for Poverty Alleviation?", *World Development*, Volume 29, Issue 7, July, p. 1225-1236.

Khandker, Shahidur R. 1998. "Using microcredit to advance women", World Bank Premnote (November) No8.   http://www1.worldbank.org/prem/PREMNotes/premnote8.pdf [accessed August 15, 2007].

Lusardi, Anna-Maria and Olivia Mitchell. 2006. "Financial Literacy and Planning: Implications for Retirement", *PRC Working Paper Series No. 2006-1*

Mani, Anandi. 2008. "Mine, Yours or Ours? The Efficiency of Household Investment Decisions: An Experimental Approach," unpublished, Warwick University.

McClelland, D.C. 1985. *Human Motivation*. Glenview, IL: Scott, Foreman.

McKenzie, David and Christopher Woodruff. 2006. "Do entry costs provide an empirical basis for poverty traps? Evidence from Mexican microenterprises", *Economic Development and Cultural Change* 55(1): 3-42.

McKenzie, David and Christopher Woodruff. 2008. "Experimental Evidence on Returns to Capital and Access to Finance in Mexico", *World Bank Economic Review*, forthcoming.

McPherson, Michael A. 1996. "Growth of Micro and Small Enterprises in Southern Africa," *Journal of Development Economics*, 48: 253-77

Mead, Donald C. and Carl Liedhom. 1998. "The Dynamics of Micro and Small Enterprises in Developing Countries," *World Development* 26(1): 61-74.

Mishra, S., R. Ghosh, and R. Kanungo. 1990. "Measurement of Family Involvement: A cross-national study of managers", *Journal of Cross-cultural Psychology* 21(2): 232-48.

Rangel, Marcos A. and Duncan Thomas. 2005. "Out of West Africa: Evidence on the Efficient Allocation of Resources within Farm Households," Harris School Working Paper Series 05-15

Rotter, J.B. 1966. "Generalized expectancies of internal versus external control of reinforcements". Psychological monographs.

SEAGA, Socio-economic and Gender Analysis Programme. 2002. "A guide to Gender sensitive microfinance", FAO. http://www.fao.org/sd/seaga/downloads/En/Microfinanceen.pdf [accessed August 15, 2007].

Udry, Christopher. 1996. "Gender, Agricultural Production, and the Theory of the Household," *Journal of Political Economy*, Vol 104(5), pp. 1010-1

Table 1: Verification of Randomization by Gender

	Total number of observations		Means by treatment: Males			Means by treatment: Females		
	Male	Female	Control	$100 Treatment	$200 Treatment	Control	$100 Treatment	$200 Treatment
Profits March 2005	188	182	4,735	4,806	4,706	2,819	2,793	3,043
Revenues March 2005	197	190	16,429	14,798	13,742	8,828	7,897	10,590
Total invested capital March 2005	197	190	153,020	136,710	233,200	112,952	145,223	140,624
Total invested capital excluding land and buildings March 2005	197	190	33,665	30,590	28,504	20,638	18,973	25,043
Own hours worked March 2005	197	190	58.37	57.54	55.85	50.28	42.45**	53.83
Family hours worked March 2005	197	190	12.61	14.64	12.94	27.78	45.63	33.93
Age of entrepreneur	197	190	43.52	43.45	40.40	40.26	41.01	43.66
Age of firm in years	197	188	8.99	13.30**	8.17	8.08	9.68	6.62
Years of schooling of entrepreneur	197	190	8.20	8.58	8.75	9.79	9.62	8.14**
Proportion whose father was an entrepreneur	197	190	0.44	0.42	0.42	0.37	0.31	0.34
Number of household members working in wage jobs	197	190	0.54	0.60	0.52	0.87	0.89	0.90
Household asset index	197	190	0.25	0.02	0.04	0.60	0.13*	0.65
Number of Digits recalled in Digit Span Recall test	179	178	5.86	5.87	5.96	5.61	5.82	5.55
Implied coefficient of relative risk aversion from lottery game	197	189	0.28	0.26	0.68	-0.17	-0.16	0.15
P-value from Chi-squared (16) test of joint significance:				0.779	0.438		0.374	0.435

Note: *, **, and *** indicate the mean for this treatment group is significantly different from the control group at the 10%, 5% and 1%

significance levels respectively.

Table 2: Treatment Effect and Returns to Capital with Gender Interactions

	Real Profits FE	Adjusted Real Profits FE	Real Profits IV-FE	Adjusted Real Profits IV-FE	Adjusted Real Profits FE MALES	Adjusted Real Profits FE FEMALES
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Amount	8.04*** (2.90)	7.78*** (2.81)				
Treatment Amount*Female	-8.24** (4.06)	-8.60** (3.97)				
Capital Stock			11.29** (4.67)	11.07** (4.53)		
Capital Stock *Female			-11.39* (6.17)	-12.05** (6.03)		
Treatment* 1-4 quarters post treatment					7.75*** (2.79)	-0.91 (2.74)
Treatment* 5-8 quarters post treatment					7.84** (3.78)	-0.84 (3.91)
Treatment* 9+ quarters post treatment					7.64* (4.57)	-3.24 (4.51)
Observations	3697	3697	3518	3518	1870	1827
Number of firms	365	365	364	364	183	182
Testing the overall female effect is zero (p-values)						
Amount+Amount*Female=0	0.945	0.769				
Capital + Capital*Female=0			0.981	0.805		
First-stage Coefficients:						
First-stage for Capital						
Amount			0.733	0.733		
(p value)			0.00	0.00		
*First-stage for Capital*Female*						
Amount*Female			0.697	0.697		
(p value)			0.00	0.00		

Notes:

Robust Standard errors in parentheses, clustered by enterprise

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Results shown trim firms with extreme increases in profits (top 1% in percentage and absolute changes)

Adjusted profits are real profits less the value of the owner's time, estimated in six education / gender

  cells using a simple production function run on the baseline data.

Table 3: Do Women invest differently?

	Capital Stock	Capital Stock (short-run)	Adjusted profits	Adjusted profits Males	Adjusted profits Females
	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)
Treatment Amount 100	1.38** (0.649)	0.63* (0.317)	13.58** (5.55)		
Amount 100 * Female	-1.39** (0.708)	-0.41 (0.402)	-14.15** (6.28)		
Treatment Amount 200	1.22*** (0.430)	1.43*** (0.386)	12.95** (5.70)		
Amount 200 * Female	0.475 (0.777)	-0.46 (0.758)	-14.83* (9.01)		
Amount * % inventories				8.53** (3.35)	1.39 (4.39)
Amount* % equipment				5.3 (6.53)	-5.8 (5.88)
Observations	3519	1135	3697	1772	1775
Number of Firms	365	365	365	173	176

Notes:

Robust Standard errors in parentheses, clustered by enterprise

*, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

The sample in Column 2 is limited to controls and the first wave after treatment

Adjusted profits are real profits less the value of the owner's time, estimated in six

education / gender cells using a simple production function run on the baseline data.

Table 4: How do the characteristics of male and female owners differ?

	Mean value		T-test
	Males	Females	p value
Ever had a formal loan	0.23	0.23	0.99
Number of Wage Workers	0.55	0.87	0.00
Household Asset Index	-0.20	0.20	0.04
Years of Education	8.57	9.41	0.01
Digitspan Recall	5.88	5.61	0.06
Entrepreneurial Self-efficacy	31.51	30.79	0.22
Polychronicity	7.76	7.32	0.06
In Self-employment to care for children	0.40	0.49	0.09
In Self-employment for business growth	0.31	0.35	0.55
Risk Aversion	0.37	-0.07	0.01

Table 5: Does treatment heterogeneity explain gender differences?

	Capital Stock				Real profits adjusted for own hours			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Amount $100	**1.31****	**1.33****	**1.41****	**1.29****	**12.32****	**12.88****	**13.43****	**11.60****
	(0.56)	(0.61)	(0.63)	(0.56)	(5.39)	(5.50)	(5.45)	(5.16)
Amount $100*Female	**-1.25***	**-1.34***	**-1.49****	**-1.32****	**-12.14****	**-11.84***	**-14.05****	**-10.26***
	(0.65)	(0.70)	(0.68)	(0.67)	(6.13)	(6.27)	(6.22)	(6.12)
Amount $200	**1.11****	**1.12*****	**1.18*****	**1.00****	**9.54**	**12.54****	**12.56****	**9.21**
	(0.43)	(0.43)	(0.41)	(0.48)	(5.83)	(5.78)	(6.08)	(5.95)
Amount $200*Female	**0.52**	**0.52**	**0.30**	**0.61**	**-10.75**	**-9.80**	**-14.74**	**-6.52**
	(0.81)	(0.83)	(0.71)	(0.85)	(8.83)	(8.94)	(9.20)	(8.65)
Controlling for treatment effect heterogeneity with:	Household Liquidity	Entrepreneurial Ability	Risk Aversion	All Factors	Household Liquidity	Entrepreneurial Ability	Risk Aversion	All Factors
Observations	3584	3584	3584	3584	3697	3655	3697	3655
Number of enterprises	365	365	365	365	365	356	365	356

Robust Standard errors in parentheses, clustered by enterprise. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.
Firm-level fixed effects regressions. All variables used in the interaction apart from gender are standardized to have mean zero by subtracting off their mean. Columns 1 and 5 allow treatment effects to vary with the number of wage workers in the household and household durable goods assets (both from the baseline survey); Columns 2 and 6 allow treatment effects to vary by years of schooling and digitspan recall test score; Columns 3 and 7 allow treatment effects to vary by the CRRA measured from a lottery exercise (see text for details); and Columns 4 and 8 allow treatment effects to vary across all of these dimensions. All regressions allow the heterogeneity of the stated characteristics to differ by gender and treatment amount and for the wave effects to vary with the stated characteristic.

Table 6: Robustness of Gender Interaction to Alternative Measures of Ability and Motivation

Characteristic	Amount $100		Amount $100* Female		Amount $200		Amount $200* Female		N
Baseline Specification									
	13.58 (5.55)	**	-14.15 (6.28)	**	12.95 (5.70)	**	-14.83 (9.01)	*	365
Adding the interaction between amount and:									
Time taken to solve a maze	13.59 (5.31)	**	-13.99 (6.06)	**	12.91 (5.56)	**	-15.75 (9.35)	*	363
Father owned a Business	13.27 (5.52)	**	-13.46 (6.25)	**	12.76 (5.91)	**	-14.03 (8.77)		365
Mother owned a Business	21.82 (5.21)	***	-21.66 (6.00)	***	12.16 (5.94)	**	-13.20 (8.88)	**	365
Optimism	13.47 (5.54)	**	-14.30 (6.25)	**	13.57 (5.59)	**	-15.53 (9.07)	*	364
Went into self-employment to care for family members	13.94 (6.02)	**	-13.97 (6.77)	**	13..18 (5.72)	**	-18.71 (9.26)	**	353
Went into Self-employment for business growth reasons	13.08 (6.11)	**	-13.73 (6.80)	**	12.78 (6.18)	**	-14.92 (9.39)		353
Business operated out of the home	14.49 (5.90)	**	-15.89 (6.96)	**	13.05 (5.75)	**	-15.94 (9.07)	*	365
Entrepreneurial Self-efficacy	13.78 (5.61)	**	-15.73 (6.45)	**	11.70 (5.85)	**	-17.88 (8.97)	**	354
Financial Literacy	13.23 (5.43)	**	-14.17 (6.16)	**	12.29 (5.50)	**	-14.19 (8.73)		365
Impulsiveness	13.21 (5.69)	**	-14.59 (6.49)	**	11.87 (5.97)	**	-12.95 (9.30)		339
Passion for Work	12.76 (5.73)	**	-13.20 (6.47)	**	12.17 (5.85)	**	-13.48 (10.39)		339
Tenacity	13.50 (5.74)	**	-14.42 (6.45)	**	12.63 (5.85)	**	-13.28 (8.40)		339
Locus of Control	13.72 (5.62)	**	-14.08 (6.38)	**	12.62 (6.02)	**	-16.48 (10.00)	*	339
Trust	13.28 (5.58)	**	-13.74 (6.36)	**	12.54 (5.87)	**	-12.99 (9.05)		339
Achievement Motivation	13.53 (5.56)	**	-13.73 (6.37)	**	12.59 (5.94)	**	-14.09 (9.49)		339
Power Motivation	14.20 (5.80)	**	-14.40 (6.58)	**	11.46 (6.35)	*	-13.39 (9.89)		339
Polychronicity	14.21 (5.78)	**	-14.09 (6.54)	**	12.83 (5.93)	**	-14.96 (9.34)		339
Work Centrality	14.25 (5.62)	**	-14.63 (6.46)	**	12.49 (6.08)	**	-14.92 (9.98)		339
Organized Person	14.08 (5.80)	**	-15.06 (6.50)	**	13.49 (5.84)	**	-15.03 (9.22)		339

Notes: Results in Rows show the coefficients from adding the interaction between a particular proxy for ability and the treatment amount to the baseline specification (column 1 of Table 7). Regressions also include the interaction between this characteristics and wave effects.
Robust Standard errors shown in Parentheses, clustered by enterprise.
*, **, and *** interact significance at the 10, 5 and 1% levels.

Table 7: Do Differences in Sector of Work explain Gender Differences?

	Capital Stock	Adjusted Profits	Capital Stock	Adjusted Profits
Amount $100	1.99*	16.93*	1.80	18.10*
	(1.20)	(9.05)	(1.17)	(9.37)
Amount $100*Female	-1.68	-16.45	-1.70	-13.00
	(1.28)	(11.20)	(1.29)	(11.47)
Amount $100*proportion females in industry	-1.89	-11.43		
	(2.28)	(17.77)		
Amount $100*proportion females in industry* Female	1.37	9.61		
	(2.20)	(18.91)		
Amount $100*predicted "femaleness" of enterprise			-1.19	-14.90
			(2.13)	(18.40)
Amount $100*predicted "femaleness" of enterprise*Female			1.00	6.47
			(2.04)	(19.26)
Amount $200	1.49*	13.91	1.41*	14.39
	(0.76)	(8.96)	(0.84)	(9.02)
Amount $200*Female	1.65	36.05	2.38	41.29*
	(2.32)	21.94	(2.50)	(21.56)
Amount $200*proportion females in industry	-0.73	-2.98		
	(1.72)	(19.66)		
Amount $200*proportion females in industry*Female	-1.80	-78.41**		
	(3.21)	(38.68)		
Amount $200*predicted "femaleness" of enterprise			-0.40	-4.52
			(1.90)	(18.99)
Amount $200*predicted "femaleness" of enterprise*Female			-2.91	-79.14**
			(3.33)	(35.54)
Obs.	3584	3697	3584	3697
Firms	365	365	365	365

Robust Standard errors shown in Parentheses, clustered by enterprise.

*, **, and *** interact significance at the 10, 5 and 1% levels.

Table 8: Do Women invest less in the business and more on children?

	School Attendance			Monthly Household Expenditure			Index Household assets
	5 to 12	12 to 15	17 to 18	Groceries	Health	Education	
	FE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Amount $100	-0.0790	-0.042	0.111	-9.35	1.31	-3.05*	0.577**
	(0.825)	(0.094)	(0.269)	(10.79)	(1.38)	(1.72)	(0.184)
Amount $100*Female	0.105	0.162	0.238	15.19	-6.25	2.99	-0.376
	(0.110)	(0.150)	(0.342)	(15.32)	(3.88)	(1.93)	(0.243)
Amount $200	-0.053	0.010	-0.083	-10.90	-0.62	0.34	0.478**
	(0.116)	(0.124)	(0.203)	(10.85)	(2.72)	(1.34)	(0.207)
Amount $200*Female	-0.1110	-0.034	0.249	21.29	2.68	-1.22	-0.517*
	(0.155)	(0.149)	(0.260)	(16.06)	(3.22)	(1.83)	(0.280)
Mean of Dependent Variable	0.92	0.92	0.53	68.1	6.78	4.74	0.00
Observations	605	433	272	1328	1328	1328	1393
Number of Firms	210	158	135	361	361	361	365

Robust Standard errors in parentheses, clustered by enterprise

 *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Data from household module conducted each April from 2005 through 2008.

Household asset index is the first principal component of 19 household 17 household assets.

Table 9: Household bargaining
Female-owned enterprises

	Capital Stock	Adjusted Profits	Inventories	Fixed Capital
	(1)	(2)	(4)	(6)
Amount $100*Female	-0.34	0.66	-17.77	-15.90
	(0.39)	(3.34)	(24.41)	(18.95)
Amount $100* Empowerment of owner* Female	0.13	2.12	33.21	-20.58
	(0.51)	(2.84)	(26.64)	(33.87)
Amount $200*Female	1.96**	2.96	116.15**	79.69*
	(0.82)	(6.68)	(48.58)	(40.64)
Amount $200*Empowerment of owner*Female	0.32	9.60*	54.22**	-23.07
	(0.52)	(4.99)	(26.03)	(34.14)
Observations	1287	1292	1287	1287
Number of Firms	124	124	124	124

Notes:

Robust Standard errors in parentheses, clustered by enterprise

 *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.
Empowerment is the first principal compenent of: 1) decision making power in the household (measured as the sum of 4 purchase decisions in which the owner is involved); 2) decision making power in the business (the owner makes input and equipment purchase decisions without input from his/her spouse; and 3) level of agreement with a statement that the enterprise profits are higher because of the spouse's input (1-5).

Table 10: Do the results generalize to other countries?

Dependent Variable: Monthly Microenterprise Profits (US dollars)

	BRAZIL		MEXICO	
	(1)	(2)	(3)	(4)
Capital Stock (excluding land and buildings)	0.400***	0.530***	0.166***	0.177***
	(0.017)	(0.022)	(0.013)	(0.016)
Capital Stock*Female	-0.132***	0.0133	-0.0764***	-0.0818***
	(0.031)	(0.038)	(0.023)	(0.028)
Female	-63.64***	-52.42***	-66.49***	-35.15***
	(4.61)	(6.25)	(4.50)	(5.26)
Capital Stock*Proportion of Industry Female		-0.559***		0.00273
		(0.065)		(0.051)
Proportion of Industry Female		-17.50*		-105.9***
		(9.59)		(9.13)
Observations	15875	15875	9773	9773
R-squared	0.22	0.23	0.19	0.21

Notes:

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

All regressions also include controls for age and education of the owner and own hours worked.