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

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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 imply an inefficiency of resource allocation within households. We show evidence that this inefficiency is reduced in more cooperative households. (*JEL* D13, D14, J16, L25, L26, O12, O16)

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; Socio-Economic and Gender Analysis Programme (SEAGA) 2002).

Half of the shocks were provided as cash, and half were provided 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 cash 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

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behavior in favor of models of intrahousehold bargaining. However, bargaining does not imply inefficiency (P. A. Chiappori 1999; M. 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 found in 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 household. Inputs are over allocated to plots controlled by men, and under allocated to plots controlled by women.[2] In a more recent finding, that 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 US $100 and the remaining third was for US $200, representing about 50 percent and 100 percent of the baseline median capital stock. In previous work (de Mel, McKenzie, and Woodruff 2008), we show that the mean real return to capital exceeds 5 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 about 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 as 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-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

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

[2] Whether Udry's results can be generalized has been questioned 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 (2006) suggest that production decisions cannot be analyzed in isolation from consumption decisions. Using data on production and consumption, they are unable to reject efficiency within households in Burkino Faso.

[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

samples for studies of clients of microfinance programs, however, reflect selection decisions 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). Large gender differences remain even after we control for industry, however.

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 noncooperative 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 nonexperimental 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 that randomly provided grants to some microenterprise owners. More details on the basic experimental design can be found in de Mel, McKenzie, and Woodruff (2008).

Michael A. McPherson (1996), Donald C. Mead and Carl Liedholm (1998), and Sherri Grasmuck and Rosario Espinal (2000) for additional evidence on the size and growth of enterprises owned by men and women.

A. *Participants and Survey Design*

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 100,000, about US $1,000) 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:

- be self-employed, full-time (at least 30 hours of work per week) outside of agriculture, transportation, fishing, and professional services;
- be aged 20–65 years; and,
- 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 3,361 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 that 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 that 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 are run by females. In the remaining 18 firms, both husband and wife claim themselves as owners. Given their small number, we drop these dual-owner firms. The result is a sample of 387 firms almost evenly split by gender and 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 reinterviewed 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 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, 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. In the baseline survey, 370 of our 387 firms reported profits. In the fifth wave (1 year later), 348 firms reported profits, an attrition rate of only 5.9 percent. In the eleventh wave (3 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 3 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, and 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: LKR 10,000 (~$100) in materials for their business, LKR 20,000 in materials, LKR 10,000 in cash, or LKR 20,000 in cash. In the case of in-kind grants, the materials were selected by the enterprise owner, and purchased by research assistants working for the project.[6] Cash treatments were given without restrictions. Those receiving

[4] Sri Lanka Department of Census and Statistics, http://www.statistics.gov.lk (accessed February 17, 2007). Inflation was low over the first year of the survey, with a 4 percent annual rate. Inflation was higher in the second and third years of the survey, with an annual rate of 18.6 percent between March 2006 and March 2007, and 28 between March 2007 and March 2008. The Sri Lankan price indices were revamped 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 nonattritors for males or females. We cannot reject that attrition is unrelated to the age, education, and marital status of the owner, and to the baseline age of business and baseline profits.

[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 the item. 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.

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 LKR 10,000 treatment and 40 receiving a LKR 20,000 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 that did not receive treatment after the first round: 62 receiving the LKR 10,000 treatment and 42 the LKR 20,000 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 LKR 2,500 (∼$25) was made, after round 5, to firms that 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 LKR 25,000 for male-owned enterprises and LKR 10,000 for female-owned enterprises, implying the smaller treatment was equal to the median initial invested capital for women and 40 percent of the median initial capital for men. For both men and women, the treatment amounts were 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 LKR 10,000 and LKR 20,000 levels since much of our analysis will compare these treatments separately. Randomization does appear to have given comparable treatment and control groups for 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

[7] Allocation to treatment was done ex ante, and as a result, there were an additional seven firms assigned to receive the treatment after round three, but 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 LKR 2,500 payment was made to limit attrition after additional funding was obtained to extend the survey for an additional four waves. We count the LKR 2,500 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.

[9] There are baseline differences at the 10 percent 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.

TABLE 1—VERIFICATION OF RANDOMIZATION BY GENDER

	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 χ^2 (16) test of joint significance				0.779	0.438		0.374	0.435

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

female owners, as it does for male owners, we estimate the following equation for firm i in period t:

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

where $AMOUNT_{i,t}$ is a single variable indicating how much treatment firm i had received by time t, coded in terms of LKR 100 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 LKR 10,000 treatment, 200 if the firm had received the LKR 20,000 treatment, 25 if they had received the LKR 2,500 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 businesses, 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:

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

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 the owner was ill or due to a lack of demand. Because these occurrences represent real risks of operating a business, we choose to trim only the top 1 percent 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 LKR 15,000, from one quarter to the next.[10]

[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 eliminate coding errors without excluding firms that are growing rapidly.

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 to worry about. When we estimate equation (1) using own hours worked as the dependent variable, we find the mean treatment effect is an increase of 1.8 hours per week for males, and 0.3 hours per week for females. We cannot 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 males and females. The value of an additional hour worked varies from LKR 0 to LKR 9.2 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 and 4 display the corresponding returns to capital regressions. Column 1 shows that a LKR 10,000 treatment increases real profits for treated males by LKR 804 per month, or 8 percent of the treatment amount. There is a large negative and significant gender interaction, however.[12] The overall female effect is the sum of the female interaction and overall effect, and is LKR −20, or negative 0.20 percent per month, which is not statistically different from zero. That is, we cannot 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.

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

[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 0.05 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 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.

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

	Real profits	Adjusted real profits	Real profits	Adjusted real profits	Adjusted real profits	Adjusted real profits
	FE	FE	IV-FE	IV-FE	FE males	FE females
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment amount	8.04***	7.78***				
	(2.90)	(2.81)				
Treatment amount × female	−8.24**	−8.60**				
	(4.06)	(3.97)				
Capital stock			11.29**	11.07**		
			(4.67)	(4.53)		
Capital stock × female			−11.39*	−12.05**		
			(6.17)	(6.03)		
Treatment × 1–4 quarters post treatment					7.75***	−0.91
					(2.79)	(2.74)
Treatment × 5–8 quarters post treatment					7.84**	−0.84
					(3.78)	(3.91)
Treatment × 9+ quarters post treatment					7.64*	−3.24
					(4.57)	(4.51)
Observations	3,697	3,697	3,518	3,518	1,870	1,827
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 are in parentheses, clustered by enterprise. Results shown trim firms with extreme increases in profits (top 1 percent 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.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

for males and 0.70 for females, suggesting that, on average, 73 percent of the treatment given to male owners ended up as capital stock for the business, while females invested almost as much. We explore this in more detail.

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

Table 3—Do Women Invest Differently?

	Capital stock	Capital stock (short-run)	Adjusted profits	Adjusted profits	Adjusted profits
	FE	FE	FE	FE males	FE females
	(1)	(2)	(3)	(4)	(5)
Treatment amount 100	1.38**	0.63*	13.58**		
	(0.649)	(0.317)	(5.55)		
Amount 100 × female	−1.39**	−0.41	−14.15**		
	(0.708)	(0.402)	(6.28)		
Treatment amount 200	1.22***	1.43***	12.95**		
	(0.430)	(0.386)	(5.70)		
Amount 200 × female	0.475	−0.46	−14.83*		
	(0.777)	(0.758)	(9.01)		
Amount × percent inventories				8.53**	1.39
				(3.35)	(4.39)
Amount × percent equipment				5.3	−5.8
				(6.53)	(5.88)
Observations	3,519	1,135	3,697	1,772	1,775
Number of firms	365	365	365	173	176

Notes: Robust standard errors are in parentheses, clustered by enterprise. 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.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

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 LKR 20,000 treatment is twice that of the LKR 10,000 treatment. We cannot 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 gender and treatment amount. This implies estimating equation (1) with four separate variables indicating treatment of LKR 10,000 and LKR 20,000 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 differ by treatment level. The first row of column 1 indicates that, averaged over the 11 survey rounds, males invested 138 percent of the smaller treatment in their enterprises. Although we cannot 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 LKR 10,000 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 LKR 20,000 treatment, females invested 85 percent of the larger treatment (1.22 plus 0.48 divided by 2 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 LKR 10,000 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 cannot 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 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 LKR 10,000 cash treatment, −0.11 for the LKR 10,000 in-kind treatment, 1.99 for the LKR 20,000 cash treatment, and 1.16 for the LKR 20,000 in-kind treatment. So, in both cases, the smaller treatment is not invested in the business while the larger treatment is. Therefore, we 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 LKR 10,000 treatment have profit increases that 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

[13] In the survey following the treatment, owners receiving cash grants were asked how they had spent the cash grant. Among those receiving the LKR 10,000 grants, females report spending significantly less on the business (4,900 versus 7,700, $p < 0.01$) and more on household durable or nondurable consumption (2,700 versus 1,600, $p = 0.09$).

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

working capital (58 percent versus 45 percent for female, $p = .03$). Among the equipment purchases, women appear to have spent more on items that have uses 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 spent 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 that 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?

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

[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 that 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 what will most maximize profits.

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
Digit-span 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

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':

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

As in Table 3, amount is defined as a vector consisting of separate variables indicating treatment of LKR 10,000 and LKR 20,000 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. Then, we 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.

[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. Therefore, we present the more general specification results.

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	3,584	3,584	3,584	3,584	3,697	3,655	3,697	3,655
Number of enterprises	365	365	365	365	365	356	365	356

Notes: Robust standard errors are in parentheses, clustered by enterprise. Firm-level fixed effects regressions. All variables used in the interaction apart from gender are standardized to have mean zero by subtracting 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 Digit-span recall test score. Columns 3 and 7 allow treatment effects to vary by the constant relative risk aversions (CRRA) measured from a lottery exercise (see text for details). 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.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

A. *Gender Differences in Liquidity Constraints*

Table 5 shows the results allowing heterogeneity in the investment (columns 1–4 and profits (columns 5–8) 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 LKR 10,000 and LKR 20,000 treatment levels. We still find high returns for males, and cannot reject the return being zero for females after these controls for differences in access to credit.

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

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 Digit-span 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 Digit-span) 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 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 Robert J. Baum and Edwin A. Locke 2004); entrepreneurial self-efficacy; trust (taken from the General Social Survey); the achievement and power motivations of David C. McClelland (1985); work centrality (Sasi Misra, Ratna Ghosh, and Rabindra N. Kanungo 1990); impulsiveness, from three questions on the Barratt Impulsiveness Scale; financial literacy (from Annamaria Lusardi and Olivia S. Mitchell 2006); internal locus of control (Julian 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,

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

[19] Many of these variables were measured in later rounds of the survey, after the treatment had been given to some firms. One may 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.

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**	−14.15**	12.95**	−14.83*	365
	(5.55)	(6.28)	(5.70)	(9.01)	
Adding the interaction between amount and:					
Time taken to solve a maze	13.59**	−13.99**	12.91**	−15.75*	363
	(5.31)	(6.06)	(5.56)	(9.35)	
Father owned a business	13.27**	−13.46**	12.76**	−14.03	365
	(5.52)	(6.25)	(5.91)	(8.77)	
Mother owned a business	21.82***	−21.66***	12.16**	−13.20**	365
	(5.21)	(6.00)	(5.94)	(8.88)	
Optimism	13.47**	−14.30**	13.57**	−15.53*	364
	(5.54)	(6.25)	(5.59)	(9.07)	
Went into self-employment to care for family members	13.94**	−13.97**	13.18**	−18.71**	353
	(6.02)	(6.77)	(5.72)	(9.26)	
Went into self-employment for business growth reasons	13.08**	−13.73**	12.78**	−14.92	353
	(6.11)	(6.80)	(6.18)	(9.39)	
Business operated out of the home	14.49**	−15.89**	13.05**	−15.94*	365
	(5.90)	(6.96)	(5.75)	(9.07)	
Entrepreneurial self-efficacy	13.78**	−15.73**	11.70**	−17.88**	354
	(5.61)	(6.45)	(5.85)	(8.97)	
Financial literacy	13.23**	−14.17**	12.29**	−14.19	365
	(5.43)	(6.16)	(5.50)	(8.73)	
Impulsiveness	13.21**	−14.59**	11.87**	−12.95	339
	(5.69)	(6.49)	(5.97)	(9.30)	
Passion for work	12.76**	−13.20**	12.17**	−13.48	339
	(5.73)	(6.47)	(5.85)	(10.39)	
Tenacity	13.50**	−14.42**	12.63**	−13.28	339
	(5.74)	(6.45)	(5.85)	(8.40)	
Locus of control	13.72**	−14.08**	12.62**	−16.48*	339
	(5.62)	(6.38)	(6.02)	(10.00)	
Trust	13.28**	−13.74**	12.54**	−12.99	339
	(5.58)	(6.36)	(5.87)	(9.05)	
Achievement motivation	13.53**	−13.73**	12.59**	−14.09	339
	(5.56)	(6.37)	(5.94)	(9.49)	
Power motivation	14.20**	−14.40**	11.46*	−13.39	339
	(5.80)	(6.58)	(6.35)	(9.89)	
Polychronicity	14.21**	−14.09**	12.83**	−14.96	339
	(5.78)	(6.54)	(5.93)	(9.34)	
Work centrality	14.25**	−14.63**	12.49**	−14.92	339
	(5.62)	(6.46)	(6.08)	(9.98)	
Organized person	14.08**	−15.06**	13.49**	−15.03	339
	(5.80)	(6.50)	(5.84)	(9.22)	

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 these characteristics and wave effects. Robust standard errors are shown in parentheses, clustered by enterprise.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

and significant. We 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 predict that returns are higher for more risk averse individuals if missing insurance markets causes 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 columns 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 in 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 underreport business income? One indication of this comes from questions we asked about why and how much "firms like yours" overreport or underreport profits. Women and men say that "firms like theirs" underreport profits by very nearly the same amount (7,850 from females versus 8,067 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 underreporting gains following treatment, we should expect

[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 ten-point scale. This variable does not have a significant interaction with any of the gender $\times$ 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.

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 LKR 433 (significant at the 0.10 level), while females underreport by only LKR 216 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 that is 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 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

$$C = f(K, T_e) + g(H, T_h) + Y_o. \tag{4}$$

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 predominantly by females. Repair services is

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

[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.

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 that is the proportion of owners in an industry who are female. For example, the 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 US $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 increased 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 1 kilometer 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 1 kilometer, 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 that are associated with being a female-owned enterprise and that 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 one kilometer of the enterprise, the percentage of inputs purchased within one kilometer, an indicator that the business operates out of the home, an indicator that the business is less than three years old,

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)
Observations	3,584	3,697	3,584	3,697
Firms	365	365	365	365

Note: Robust standard errors are shown in parentheses, clustered by enterprise.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

and the proportion of the enterprises in the detailed industry that 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 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.

V. Noncooperative 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 1–3 estimate the impact of the treatment on school attendance of 5–12-year-olds, 12–15-year-olds, and 17–18-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 LKR 10,000 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 0.10 level ($p = 0.101$ on the sum of the coefficient on treatment LKR 10,000 and female treatment LKR 10,000).

We also find generally insignificant differences on expenditures for groceries, health, and education, for males and females, and for the difference between males and females. (See columns 4–6 of Table 8.) The one exception is that we find a marginally significant decrease in spending on education for males receiving the LKR 10,000 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 show that the increase is significantly larger in households of male enterprise owners who received either of the grants. In levels, females receiving the LKR 10,000 treatment see a small increase in household assets, while those receiving the LKR 20,000 treatment

Table 8—Do Women Invest Less in the Business and More on Children?

	School attendance			Monthly household expenditure			
	5–12	12–15	17–18	Groceries	Health	Education	Index household assets
	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (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	1,328	1,328	1,328	1,393
Number of firms	210	158	135	361	361	361	365

Notes: Robust standard errors are in parentheses, clustered by enterprise. Data from household module conducted each April from 2005–2008. Household asset index is the first principal component of 17 household assets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

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 versus 36 percent of males, $p = 0.04$). Households of enterprise owners receiving treatments are slightly more likely to have at least one such account (42 percent versus 36 percent, $p = 0.12$). However, the treatment effect is, again, limited to households of male owners. Forty-three 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

[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.

the grants to other household investments, and that a collective household model cannot explain the gender differences in treatment effects. Therefore, we 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.

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:

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

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

$$H + E + K \leq \overline{A} \tag{5}$$

$$\text{s.t. } K \geq K_{\min} \tag{6}$$

$$H \geq H_{\min} \tag{7}$$

$$E \geq E_{\min}, \tag{8}$$

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 $A = H + E + (1-\theta)K$. We consider three cases, beginning by characterizing the unconstrained maximum.

Case 1: (Unconstrained Case.) Assume, first, that none of the conditions (6), (7), and (8) bind. Then, it is straightforward to show that the solution to the women's optimization problem is:

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

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 over invest 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 setup, 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 another where the working capital constraint binds ($K = K_{\min}$). Letting λ_H be the lagrange multiplier on constraint (7), the solution to the optimization problem with household constraints is

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

Similarly, denoting the lagrange multiplier on (6) as λ_K, optimization with the working capital constraint requires

$$(11) \qquad (1-\tau_H)r = (1-\tau_B)\, f_E'(K,E) = (1-\tau_B)\, f_K'(K,E) - \theta \frac{U_A'}{U_c'} + \frac{\lambda_K}{U_c'}.$$

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 LKR 10,000 grant in the household and the LKR 20,000 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 nonconvexity 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 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 nonconvexity even if the underlying production function itself has no nonconvexity.

The model generates several empirical predictions that 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 in 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 remain 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 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 zero if the spouse has a say in both of these investment decisions, one if the spouse is involved in only one of the two decisions, and two 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 (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

[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.

TABLE 9—HOUSEHOLD BARGAINING (*Female-owned Enterprises*)

	Capital stock (1)	Adjusted profits (2)	Inventories (3)	Fixed capital (4)
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 \$100 × empowerment of owner × female	0.32	9.60*	54.22**	−23.07
	(0.52)	(4.99)	(26.03)	(34.14)
Observations	1,287	1,292	1,287	1,287
Number of firms	124	124	124	124

Notes: Robust standard errors are in parentheses, clustered by enterprise. Empowerment is the first principal component of: decision-making power in the household (measured as the sum of four purchase decisions in which the owner is involved); decision-making power in the business (the owner makes input and equipment purchase decisions without input from his/her spouse, and level of agreement with a statement that the enterprise profits are higher because of the spouse's input (1–5).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

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 that 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 LKR 10,000 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 cannot 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 that can generate the observed outcomes. A related explanation emerges from new work on self-control problems by Abhijit Banerjee and Sendhil Mullainathan (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 (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 Mullainathan model has several parallels to our nonunitary 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 US $100 treatment, but more of the US $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 investing less. Along with the above suggestive results supporting our model, we 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 from a single country, a question that arises is whether the results of the experiment apply to other settings. In this section, we provide suggestive (nonexperimental) 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 US$500 of capital stock, exclusive of land and buildings.[27] We convert profits and capital stock into US dollars, and run the following cross-sectional regression:

$$(12)\quad PROFITS = \alpha + \beta FEMALE + \gamma CAPITAL + \delta CAPITAL \times FEMALE + \lambda PROPFEM + \theta CAPITAL \times PROPFEM + \pi' X + \varepsilon,$$

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

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 (12) 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 that are female-owned can explain some of the gender difference in returns.

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 nonexperimental 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 that 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 females after controlling for the gender mix of industries. We do not have data on bargaining power for firms in either country, so, we 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 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

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*** (0.017)	0.530*** (0.022)	0.166*** (0.013)	0.177*** (0.016)
Capital stock × female	−0.132*** (0.031)	0.0133 (0.038)	−0.0764*** (0.023)	−0.0818*** (0.028)
Female	−63.64*** (4.61)	−52.42*** (6.25)	−66.49*** (4.50)	−35.15*** (5.26)
Capital stock × proportion of industry female		−0.559*** (0.065)		0.00273 (0.051)
Proportion of industry female		−17.50* (9.59)		−105.9*** (9.13)
Observations	15,875	15,875	9,773	9,773
R^2	0.22	0.23	0.19	0.21

Notes: Robust standard errors are in parentheses. All regressions also include controls for age and education of the owner and own hours worked.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

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 nonconvexities in their investments. Because we find no evidence of positive returns to the larger investments, production nonconvexity 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 that are easy to capture, like working capital. The model of capture by other household members parallels Banerjee and Mullainathan'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.

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 one, 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

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

in our data. But heterogeneity implies small sample sizes, and often implies nonexperimental 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$1,000 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 intrahousehold 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 that we see as first order for future research.

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