When is capital enough to get female microenterprises growing? Evidence from a randomized experiment in Ghana*

Marcel Fafchamps[†] David McKenzie[‡] Simon Quinn[§] Christopher Woodruff[¶]

March 2011

Abstract

We randomly gave cash and in-kind grants to male and female-owned microenterprises in urban Ghana. We find two striking results which contrast with a similar experiment in Sri Lanka. First, we find large average treatment effects of the in-kind grants for both female and male-owned enterprises. However, while the average increase in profits from in-kind grants to females is high, the gain in profits is almost zero for women with initial profits below the median. Second, for women we strongly reject equality of the cash and in-kind grants, with only the in-kind grants leading to business profits growing. The results for men also suggest a lower impact of cash, but are less robust. The cash grants seem to end up going to household expenses and transfers. We then investigate whether it is self-control or external pressure driving this difference between the effects of cash and in-kind grants, and find more support for a lack of self-control leading the cash to be spent than from external pressure from others. The results show that restrictions on the form that capital comes in can matter a lot for determining the likelihood of microenterprise growth.

JEL Codes: O12, O16, C93

Keywords: Randomized Experiment; Microenterprises; Ghana; Conditionality

*We are grateful to Markus Mobius and conference participants at Bristol, Stern (NYU) and Microsoft Research, Cambridge for useful comments.

[†]University of Oxford. Email: marcel.fafchamps@economics.ox.ac.uk

[‡]The World Bank

[§]University of Oxford

[¶]University of Warwick

1. Introduction

Evidence from three recent randomized controlled trials suggests that increasing the availability of capital has no significant effect on the profits of microenterprises operated by women (de Mel et al 2008, Banerjee et al 2010, and Karlan and Zinman 2010), despite the large emphasis placed by microfinance organizations on lending to female business owners. The three experiments were all run in South and Southeast Asian countries—Sri Lanka, India and the Philippines. In Sri Lanka, the capital was provided as grants, while in India and the Philippines, capital was provided by increasing the availability of microloans. In Sri Lanka and the Philippines, the lack of returns in female-owned enterprises contrasted with evidence of positive returns in male-owned enterprises, while the India study only considered females.

To date, no comparable data have been generated from Africa or Latin America, raising questions of external validity, a common refrain in recent debates about what the profession is learning from randomized experiments (e.g. Banerjee and Duflo, 2009; Ravallion, 2009; Deaton 2010). Indeed, there are reasons to believe the situation might be different outside south Asia. In much of Africa, for example, women are more integral to household income generation than in other regions. This is reflected in labor force participation rates, which are much higher among females in many African countries than in Sri Lanka, India and the Philippines. We might expect that the stronger attachment to the labor force might be associated with positive marginal returns to capital.

In this paper, we report the results of a randomized control trial in Ghana which provided microenterprise owners with more capital. The project design was modeled closely on the de Mel et al experiment in Sri Lanka. The sample includes both female and male microenterprise owners hiring no paid employees at the time of the baseline survey. Grants of 150 Ghanaian Cedi (about $120) were provided to randomly selected enterprises. As in Sri Lanka, half the grants were provided in cash and half in-kind.

While women's income may make up a larger share of household income in Africa, there is also a view that suggests entrepreneurs may face pressure to share unexpected positive shocks—like our grants—with others within or outside the household. Thus, for either females or males, we might find that only part of the grant is invested in the enterprise, perhaps more so with the cash grants.

The experiment confirms some of the findings from the Asian experiments, but adds considerable nuance to our understanding of the role of access to additional capital in determining the growth of female-owned enterprises. A one-time in-kind grant of 150 cedi is estimated to increase monthly profits by 37-39 cedi for both makes and females, a large average return on this grant. However, among females, the in-kind grants only lead to profit increases for about the top 40 percent of businesses in terms of initial size. Women running smaller subsistence businesses, those earning $1 per day on average, saw no gains from access to this additional capital. As in Sri Lanka, capital alone does not appear to be enough to grow subsistence businesses run by women.

We find that cash grants of the same size had a significantly smaller effect in the full sample, increasing profits by at most 10 and 14 GhC. When the sample is split between women and men, we find the gap between in-kind and cash grants is significant only among women. In some, but not all specifications, men show significant increases in profits following the cash grants, although this result is never significant when we condition on our baseline data.

The large marginal returns to the capital shocks are consistent with non-experimental work in Ghana which has found evidence of high returns to capital for male-owned informal enterprises at least. Bigsten et al. (2000) find much higher returns to physical capital than human capital in African small and medium scale manufacturing firms, Udry and Anagol (2006) find returns to be at least 60 percent per year among purchasers of used auto parts in Accra, and Schündeln (2006) finds strong evidence of financing constraints among small Ghanaian firms using a structural modeling approach.

Given the large gain in profits from the in-kind grants, the question is then why the same is not true for the unconditional cash grants? We find the cash grants tend to be spent or transferred out of the house, especially when given to women whose businesses were small to begin with. We examine two possible causes of this difference between in-kind and cash grants – self-control issues caused by time-inconsistent preferences, high discount rates, or lack of ability to save; and external pressure from others to share additional resources. We find the effect of the cash treatment is significantly more positive for individuals with the most self-control, whereas there is no significant treatment heterogeneity with our measures of external pressure. This is consistent with the recent evidence in Spears (2009), who suggests that present-bias is a key constraint on microentrepreneurs expanding their businesses.

The remainder of the paper is structured as follows. In Section 3 we present the conceptual framework and testing strategy. Section 3 describes the experimental design and characteristics of our sample. Section 4 gives the basic experimental results, and explores heterogeneity by gender, treatment type, and randomization strata. Section 5 then asks what happens to the cash grants and what distinguishes the profitable from less profitable female businesses. Section 6 examines why the cash and in-kind treatments differ, and Section 7 concludes.

2. Conceptual framework and testing strategy

In this section we present the conceptual framework that guides our empirical analysis. The model is organized around two key assumptions which characterize the population of microenterprises we study: entrepreneurs cannot borrow and have to self finance; and they have different abilities and ability is a complement to capital. We first present a model of capital accumulation without time inconsistency and derive testable predictions regarding the effect of a capital grant. We then introduce time consistency and self-control issues and discuss how experimental predictions are affected. Mental accounting is introduced next as a manifestation of the lack of asset integration. The testing strategy is presented at the end.

2.1. The Ramsey model

Consider an entrepreneur facing a standard accumulation problem of the form:

$$\max_{c_t>0, k_t \geq 0, w_t \geq 0} \sum_{t=0}^{\infty} \delta^t u(c_t) \text{ subject to}$$

$$c_t = \pi(k_t, \theta) + r w_t - (k_{t+1} - k_t) - (w_{t+1} - w_t) \tag{2.1}$$

where k is capital invested in a business with total return to capital $\pi(k, \theta)$, variable θ is individual specific talent, δ is the discount factor, and w is a financial asset with return r.[1] We assume $\partial \pi / \partial k \geq 0$ (positive or zero returns to capital) but $\partial^2 \pi / \partial k^2 < 0$ (decreasing returns to scale). Decreasing returns

[1] Variable $\pi(k, \theta)$ measures value added, that is, return to capital and family labor net of intermediate input costs and other recurrent costs. Given the nature of the studied firms, this corresponds to an accounting notion of profit, but not to an economic notion of profit/return to capital since we have not imputed the cost of enterpreneur labor.

to scale may be due to the presence of fixed factors, such as entrepreneur time and family labor. We also assume that $\partial^2\pi/\partial k\partial\theta > 0$: more talented entrepreneurs have higher marginal returns to capital.[2]

There are two possible treatments: a cash transfer M_t and an equipment transfer E_t at an arbitrary time t. Both can be turned into more capital k but it takes time to liquidate equipment E_t. In contrast, M_t is perfectly fungible with k or w or c. We derive model predictions about $\partial k/\partial M$ and $\partial k/\partial E$.

We first note that, by asset arbitrage, $w_t = 0$ if $\pi'_t(k,\theta) > r$. In this case, the first order conditions are as follows:

$$\beta^t u'_t = \lambda_t$$

$$\lambda_t(1+\pi'_t) = \lambda_{t-1}$$

where π' denotes the marginal return to capital and λ_t is the Lagrange multiplier associated with the constraint. From the above we get a standard Euler equation of the form:

$$1+\pi'_t(k,\theta) = \frac{1}{\delta}\frac{u'_{t-1}}{u'_t}$$

If we ignore savings w_t, there exists a steady state level of capital k^* such that profit π and consumption c are constant and:

$$\pi'(k^*,\theta) = \rho$$

where $\rho \equiv \frac{1-\delta}{\delta}$. The proof follows from the fact that, without savings w_t, the above is a standard Ramsey model. Given that $\partial^2\pi/\partial k^2 < 0$ it follows that $dk^*/d\rho > 0$ – more patient entrepreneurs have larger k^*.

If $r > \rho$, the entrepreneur stops investing in the firm once the marginal return to capital falls below r, and invests in w instead. The optimal firm size is then given by:

$$\pi'(k^{**},\theta) = r$$

[2] It is conceivable that a minimum level of capital is needed to initiate a business. Since all households in our sample by construction have a business, we ignore this here and assume that the Inada conditions are satisfied.

with $k^{**} < k^*$. Given our assumption that, $\partial^2\pi/\partial k\partial\theta > 0$ comparative statics imply that both $dk^*/d\theta > 0$ and $dk^{**}/d\theta > 0$ – more talented entrepreneurs have larger steady state capital and firm size. Only patient agents, that is, those with $\rho < r$, ever hold non-zero savings $w_t > 0$.

If $k_t < \min\{k^*, k^{**}\}$, the cash and equipment treatments are predicted to increase capital and profits by the same amount.[3] Their long term effect is to shorten the time necessary to reach the steady state firm size. In contrast, when a entrepreneur has reached k^* or k^{**}, the effect of the two treatments is different. If $k = k^{**}$, a cash transfer has no effect on capital and $\partial k_{t+s}/\partial M_t = 0$ for any $s \geq 0$; it raises consumption c and savings w instead. In this case we should observe no cash treatment effect on profits $\pi_{t+s}(k, \theta)$: the cash treatment M_t should not be invested firms that have already reached their optimal size; it should be saved instead. If the equipment treatment E_t cannot be liquidated immediately, however, we expect a temporary positive effect on profit: $\pi(k + E, \theta) > \pi(k, \theta)$ since by assumption $\partial\pi/\partial k \geq 0$. But this effect should be short-lived: the firm should return to its steady state capital level as soon as E can be divested. If $k = k^*$ with $\rho > r$, then instead of saving in asset w in order to smooth consumption of the capital grant, it is optimal for the entrepreneur to use a temporary investment in the firm as buffer to smooth consumption. In this case, M_t and E_t have a similar short-run effect on capital and profits.

In all cases the model predicts that the cash and equipment treatments will result in higher consumption. In the steady state case with $\rho > r$, the household is impatient and the treatment will be consumed rapidly before consumption returns to its steady state level. In the case where $r > \rho$, there will be more smoothing, that is, part of the treatment will be saved and consumed later. In the case where k_t is below its steady state, we expect an increase in consumption out of higher profits.

2.2. Time inconsistent preferences

We now introduce quasi-hyperbolic preferences as in Laibson (1997). At time t the household sets k_t so as to solve:

$$\max_{\{c_s, w_s, k_s\}} u(c_t) + \beta \sum_{s=t+1}^{\infty} \delta^s u(c_s) \text{ subject to (2.1)} \tag{2.2}$$

where $\beta < 1$. But once at time $t + 1$, the household sets k_{t+1} according to:

[3] To save space we do not discuss the borderline case where $k_t + M > \min\{k^*, k^{**}\}$.

$$\max_{\{c_{s+1},w_{s+1},k_{s+1}\}} u(c_{t+1}) + \beta \sum_{s=t+2}^{\infty} \delta^s u(c_s) \text{ subject to (2.1)} \tag{2.3}$$

This means that at time $t+1$ the household wants to revisit decisions taken at time t and set paths for $\{c_{t+1}, c_{t+2}, ...w_{t+1}, w_{t+2}, ..., k_{t+1}, k_{t+2}, ...\}$ that differ from those set in period t.

In Appendix 1 we show that the entrepreneur stops investing after reaching a steady state level of capital k^s (for a sophisticate) or k^m (for a myopic decision maker) which are, in general, smaller than k^*. Model predictions regarding the effect of a capital grant are similar to the Ramsey model. If the firm has already reached its steady state k^s or k^m, the cash transfer M will be rapidly consumed while the equipment transfer E will be divested as quickly as is feasible. If $k_t < k^s$ or k^m, then the additional cash M or equipment E will remain in the business and increase future profits.

To summarize, the standard and time inconsistent models both predict that the long-term effect of the cash and equipment transfers on capital and profit are nihil for firms that are already at their steady state capital level. The short-term effect of the cash transfer on capital and profit is also nihil. For the equipment treatment there is a short-term increase in capital and profit until the household is able to divest, which is expected to happen as soon as is feasible. In contrast, for firms that are below steady state, both cash and equipment transfers are predicted to be entirely invested and the effect is to reduce the time taken to reach the optimal firm size.

2.3. Asset integration and family pressure

The two models presented so far assume that people make decisions regarding asset accumulation in an integrated manner, i.e., they assume that consumption c, profits π, capital k and savings w are regarded as fungible. Yet experimental evidence suggests that asset integration often fails. For instance, it is common for experimental participants to exhibit considerable risk aversion even though the stakes are very small stakes relative to their wealth (Harrison, Lau and Rutstrom 2007; Andersen, Harrison, Lau and Rutstrom 2008). Similarly, Camerer, Babcock, Loewenstein and Thaler (1997) find that cab drivers make labor supply decisions based on single-day earnings. In other words, they fail to integrate earnings over a longer time period of a week or a month when making enterprise decisions.

Follow in the footsteps of Camerer and others, we posit that entrepreneurs do not make integrated investment and consumption decisions but rather have a target take-home cash h, and set capital k as the difference between profit and take-home pay. The law of motion of entrepreneurial capital is now written as:

$$k_{t+1} = k_t + \pi(k_t, \theta) - h_t \tag{2.4}$$

where $\pi(k_t, \theta) - h_t$ is the portion of retained earnings that is reinvested in the firm and $h_t = h(\pi_t)$ with $h' \geq 0$.

There are several possible interpretations of (2.4). One possibility is mental accounting, that is, decision makers keep mentally separate 'enterprise' and 'household' accounts and have a target take home income h_t which depends on profit π_t but not on consumption or savings. This is an idea similar to that of Camerer et al (1997) according which small entrepreneurs such as cab drivers have a target take-home income h_t that depends on current cash flow π, but do not choose investment and consumption as a single integrated decision process. Here, the decision maker simply earmarks part of business income π for consumption and reinvest the rest.

Another possibility is that pressure from household members and other relatives works as a tax $h' \geq 0$ on the business. Family pressure may have various causes. Perhaps household members – spouse, parents, children – fear that investment in a personal enterprise generates an income that falls largely outside their control – if only because they observe it imperfectly. Anderson and Baland (2002), for instance, argue that women in poor urban households save in microfinance organizations to escape the scrutiny of their husband.

Pressure to redistribute business profit may also arise because of sharing norms (Platteau 1996). Fafchamps (1992), for instance, argues that redistributing capital – e.g., land, working capital – is an effective way of minimizing the cost of caring for those in need: giving others the means to produce their own income substitutes for the need to provide ex post assistance out of one's own income. What is important for our purpose is that, with mental accounting, family pressure, or social norms, cash and equipment treatments could have different effects: the household may regard the equipment transfer as belonging to the capital of the firm, not to be touched, while the cash treatment is part of the firm's cash flow and subject to implicit taxation.

How the cash and equipment grants affect future profits ultimately depend on the form of $h(\pi)$, that is, on the specific form that mental accounting, family pressure, or social norms take. We briefly some special cases here. The steady state firm size k^v is defined as the capital stock that satisfies:

$$\pi(k^v, \theta) = h(\pi(k^v, \theta))$$

For some functions $h(\pi)$, the steady state is not stable. For instance, if $h(\pi) = b$ with b a positive constant, the steady state k^v is given by $\pi(k^v, \theta) = b$, but the firm eventually closes down if $k_t < k^v$ while it expands forever for $k_t > k^v$. In contrast, if $h(\pi) = \pi$, the law of motion of capital becomes $k_{t+1} = k_t$ and any capital level k is an equilibrium.

Combining the two examples above, let $h_t = a\pi_t + b$ with $0 < a < 1$. The law of motion of capital becomes:

$$k_{t+1} = k_t + (1-a)\pi(k_t, \theta) - b \tag{2.5}$$

which resembles a Solow model with a negative drift term b. Provided that the marginal return to capital is high enough at low values of k,[4] difference equation (2.5) has two equilibria (see Figure 1): a high, stable equilibrium k^v_{high} similar to the steady state of a Solow model; and an low, unstable equilibrium k^v_{low} below which the firm closes down. For k such that $k^v_{low} < k_t < k^v_{high}$, the firm is growing. For $k < k^v_{low}$ the firm is unstable and eventually disappears – and is thus unlikely to be part of our sample.

We now introduce capital grants. Following the mental accounting idea, we assume the household regards the equipment grant as an addition to the capital of the firm, and therefore exempt from $h(\pi)$, while the cash treatment is part of the firm's cash flow and thus subject to taxation $h(\pi)$. With these assumptions, equation (2.5) is rewritten:

$$k_{t+1} = k_t + E_t + (1-a)(\pi(k_t, \theta) + M_t) - b$$

[4] A standard Inada condition.

which implies that for initial values of k such that $k^v_{low} < k_t < k^v_{high}$, the equipment treatment E_t has a one-for-one effect on capital stock k_{t+1} but the cash treatment only has a $1-a$ effect on k_{t+1}:

$$\frac{d\Delta k_t}{dE_t} = 1 > 1 - a = \frac{d\Delta k_t}{dM_t}$$

where the notation Δk_t denotes $k_{t+1} - k_t$. In other words the cash treatment is predicted to have a lower effect on future capital – and hence profits – than the equipment treatment as long as $a > 0$, that is, as long as $h' > 0$.

Turning to long-term predictions, if the firm was below its equilibrium size k^v_{high}, the equipment treatment speeds up convergence to the steady state k^v_{high}. Future additional profits generated by $k_t + E_t$ are subject to taxation and raise future consumption. If the firm was at – or above – equilibrium size k^v_{high}, then decreasing returns in capital imply $\pi(k_t, \theta) - h_t < 0$ and the firm should slowly decapitalize the equipment treatment E_t. In the special case where $h(\pi) = b$ and initial capital $k_t < k^v_{low}$ but $k_t + E_t + (1-a)\pi(k_t, \theta) - b > k^v$, the equipment treatment pushes the firm above the minimal threshold size and ensures its long term survival. In the special case where $h(\pi) = \pi$, the equipment treatment pushes the firm to a new equilibrium level of capital $k_t + E_t$: future profits increase but there is no further addition or subtraction to capital after $t+1$.

Another case of interest is if h_t depends on capital stock, e.g., $h_t = a\pi_t + \eta k_t$ with and $0 < \eta < 1$. Here external pressure combines a tax on cash flow at rate a with a tax on capital at rate η. The steady state k^w is the solution to:[5]

$$(1-a)\pi(k^w, \theta) = \eta k^w$$

It is stable. Equilibrium firm size is a decreasing function of both a and η. In this case the equipment treatment has a $1-\delta$, that is, less-than-one-for-one effect on k_{t+1} while the cash treatment has a $1-a$, also less-than-one-for-one, effect on k_{t+1}.

[5] This is a Solow model in disguise. If we set $\pi(k, \theta) = k^\lambda e^\theta$, the steady state is the usual:

$$k^w = \left[\frac{1-a}{\eta} e^\theta\right]^{\frac{1}{1-\lambda}}$$

where $1-a$ is the savings rate and η plays the role of depreciation.

2.4. Testing strategy

We estimate models of the form:

$$\pi_{it} = \beta_1 M_{it} + \beta_2 E_{it} + u_{it} \tag{2.6}$$

$$k_{it} = \alpha_1 M_{it} + \alpha_2 E_{it} + v_{it} \tag{2.7}$$

where π_{it} is the profit of entrepreneur i at time t, k_{it} is the capital stock, and u_{it} and v_{it} are error terms. Coefficients α's and β's are the average effects of each of the two treatments on capital stock and profits, respectively, across the population of firms in our sample.

The Ramsey and time inconsistent models predict $\alpha_1 = \alpha_2 > 0$ and $\beta_1 = \beta_2 > 0$ if the firm was below its steady state at the time of the treatment. They also predict $\alpha_1 = \beta_1 = 0$ if the firm had already reached its equilibrium size at time t such that $k_t = k^{**}, k^m$, or k^s. Because the equipment treatment is not immediately fungible, these models also predict $\alpha_2 > 0$ and $\beta_2 > 0$ for s small, but eventually $\alpha_2 = \beta_2 = 0$ for s large enough, as k returns to its steady state from above. A similar result obtains if $k_t = k^*$ and firm capital is used as buffer to smooth consumption.

In contrast, the mental accounting/external pressure model makes predictions that do not in general depend on whether the firm is above or below steady state k^v_{high}. Predictions however depends on the form taken by the external pressure function $h(.)$. If h_t is a constant lumpsum b with $a = 0$, then both treatments M_t and E_t increase capital one for one, that is, $\alpha_1 = \alpha_2 = 1$ at time $s = t + 1$, that is, one period after treatment. If, in contrast, $h_t = \pi_t$ and M_t is regarded as part of the firm's cash flow π_t but E_t is not, then $\alpha_1 = 0$ and $\alpha_2 = 1$ at all $s \geq t + 1$.

For the intermediate case where $h_t = a\pi_t + b$ with $a < 1$, the model predicts that E_t has a one-for-one effect on capital stock k_{t+1}, that is, that $\alpha_2 = 1$ but M_t only has a $1 - a$ effect on k_{t+1}, i.e., $0 < \alpha_1 = 1 - a < 1$. The larger a is, the closer α_1 is to 0. Finally, when $h_t = a\pi_t + \eta k_t$, that is, when external pressure also puts a tax on capital, then $0 < \alpha_2 = 1 - \eta < 1$ while we still have $0 < \alpha_1 = 1 - a < 1$.

We seek to empirically identify external pressure in various ways. First we note that men and women are typically subject to different internal and external pressure. The nature of the pressure depends on the social and cultural context, but it is generally believed that female entrepreneurs are subject to more pressure, and that the pressure comes primarily from their spouse and children (e.g., de Mel et al 2008). To investigate this possibility, we allow treatment effects β_1 and β_2 to differ for male and female entrepreneurs and we test whether the difference is statistically significant.

We also investigate external pressure more directly. To this effect, we use a variable z_i that serves as proxy for external pressure. For instance, if external pressure comes primarily from the spouse, unmarried individuals should show a lower a and thus a stronger response to treatment. If pressure comes from children or the extended family, a stronger response to treatment will be observed for entrepreneurs without children or with a smaller extended family. To implement this idea, let $a = a_0 + a_1 z$ and $\eta = \eta_0 + \eta_1 z$ with z a vector of proxies for different kinds of external pressure. We estimate a model of the form:

$$\begin{aligned} \pi_{it} &= (1-a)M_{it} + (1-\eta)E_{it} + v_{it} \\ &= (1-a_0)M_{it} - a_1 M_{it} z_i + (1-\eta_0)E_{it} - \eta_1 E_{it} z_i + v_{it} \end{aligned} \tag{2.8}$$

and similarly for profit. If a specific z_i is associated with a higher implicit tax rate on cash flow, then the coefficient of $M_{it}z_i$ should be negative and significant. Similarly, if it is associated with higher taxation of capital, the coefficient of $E_{it}z_i$ should be negative and significant.

We test internal pressure using a similar approach. In this case, pressure comes from the non-business minded self, that is, the self susceptible to temptation and intent on immediate gratification. In this context, mental accounting can be seen as a commitment device: by keeping the business account mentally separate from the consumption account, the business self seeks to insulate future business income from the immediate gratification self. In our model this can be formalized by letting $a = a_0 + a_1 z$ and $\eta = \eta_0 + \eta_1 z$ with z a set of proxies for susceptibility to self-commitment problems. Individuals with more self-commitment problems have a larger a and η. However, if mental accounting is successfully used as commitment device, we should observe that $\eta_1 < a_1$: taxation out of capital is less than taxation out of cash flow. This can be tested using regression model (2.8) with z_i a proxy for self-commitment problems, and test whether $\eta_1 < a_1$.

3. The Experiment

3.1. The Sample

We purposively chose urban Ghana as the setting for this study. The choice of Ghana was motivated by the desire to provide evidence in an African context, in a country known for a history of involvement of women in business, which provides a setting that is potentially conducive to female business success. Women in Ghana have similar labor force participation rates to men, and are more likely to be self-employed. Evidence of this is seen in data from the 2000 Ghanaian Census: the labor-force participation rates for 15-60 year olds are 69.6 percent for females and 73.9 percent for males, and in urban areas 45 percent of females are non-agricultural own-account workers, compared to 33 percent of males. This contrasts sharply with Sri Lanka, the setting for the experiment in de Mel et al. (2009a), in which self-employed individuals are only 7.8 percent of prime age females, compared to 29.7 percent of prime age males.

Within Ghana we chose Accra, the capital and largest city, and the nearby industrial city of Tema. A sample of microenterprises (which we term the Ghana Microenterprise Survey) was then constructed as follows. First, enumeration areas (EAs) were selected with probability proportional to the number of households in these EAs according to the 2000 census. We randomly selected 70 EAs in Accra and 30 in Tema. Then, to reduce the costs of listing, we subdivided EAs into equal areas, such that each area would contain approximately 70 to 80 households. This typically required dividing an EA into half or thirds. One of these areas was then randomly selected from each EA. Enumerators went door to door in this area to carry out a screening survey of each household. Households were screened for whether they contained any individual who was aged 20 to 55, and who was self-employed, worked 30 or more hours per week, had no paid employees, and did not own a motor vehicle that was used in the business. These criteria were used to select full-time microenterprise owners who were not so large that the grants in our experiment would have little effect.

The gender and business sector of all individuals passing this screen were then recorded. This resulted in screening 7,567 households to identify 3,907 individuals who passed the screen. Only 19.4 percent of these individuals were male, confirming the predominance of women among small enterprise operations in urban Ghana. We classified business sector into male-dominated industries, identified as construction, repair services, manufacturing, and shoe making and repair; female-dominated industries, identified as hair and beauty care, and food and restaurant sales; and mixed industries, identified as trade and retail, and sewing and tailoring. This classification into male-dominated, female-dominated, or mixed was based on the gender mix of self-employed in these industries in the 2000 Census. These industries cover the vast majority of the industries in which the self-employed work in Ghana. The 4.6 percent of those screened who worked in other industries such as communication services, pharmacy, photography, fishing, and agriculture were not included in the sample.

Our aim was then to arrive at a sample of roughly 900 baseline firms stratified by gender and sector. In order to minimize the spillovers from the treatments to be carried out, we did not want to select too many individuals from any given EA who were in the same line of business. We therefore randomly selected up to 5 males in male-dominated and up to 5 males in mixed industries from each EA, and up to 3 females in female-dominated and up to 3 females in mixed industries from each EA to survey, in the process ensuring that only one individual was chosen from any given household. This resulted in an initial sample of 907 firms, consisting of 538 females and 369 males. A baseline survey of these firms was conducted in October and November 2008. The firm owners were asked for details of both their firm and their household.

A second pre-treatment survey of these firms was conducted in February 2009. The purpose of a second pre-treatment round was to eliminate firms most likely to attrit. In particular, 55 firms could not be found on at least three attempts, 15 firm owners refused this second round, 24 firm owners were no longer operating a business, and 20 firms that did not provide details on their firm profits, expenses and sales were eliminated. This left a final sample for the experiment of 793 firms, comprising 479 females (248 in female-dominated industries and 231 in mixed industries) and 314 males (146 in male-dominated industries and 168 in mixed industries).

3.2. The Experiment

The design of the experiment closely followed that used in Sri Lanka by de Mel et al. (2008, 2009). Firms which completed the first two survey rounds were randomly allocated into three groups: a control group of 396 firms, a treatment group of 198 firms which would receive 150 Ghanaian Cedi (approximately US$150 at the time of the baseline) in cash which they could use for any purpose, and a treatment group of 198 firms which would receive 150 cedi in equipment, materials, or inventories for their business. In the case of the in-kind treatment, the equipment or materials were selected by the firm owner and purchased directly by our research assistants with the owner. The majority of this was in the form of inventories to sell (e.g. beauty care products, electronic goods, alcohol, food) and raw materials (e.g. wood, sandpaper, cloth, oil and other cooking ingredients, shampoos and supplies for beauty salon use). Only 24 percent of those receiving the in-kind treatment elected to buy physical equipment, with the most common equipment purchased being sewing and knitting machines by tailors, hair dryers by owners of beauty salons, and drills and other carpentry equipment by firms in woodwork. Males were more likely to get some equipment with this treatment than females (33 percent versus 19 percent). With the cash treatments, firm owners were notified by phone, or in-person, and then received the cash through money transfer at a local bank or in-person.

We also randomly selected when firms would receive their grant, staggering the timing of the grants, so that 198 firms were assigned to receive the grants after the second round, a further 181 firms assigned to receive the grants after the third round, and 18 firms were assigned to receive the grants after the fourth round. This staggering was done both for the purpose of managing the logistics of making these grants, and to provide incentives for firms to remain in the study for multiple rounds since they could be told more grants would be given out after rounds 3 and 4. These grants were framed to firms as prizes to thank firms for participating in the survey. Participants in the survey were told that we were undertaking a study of small firms in Ghana, and that some of the firms would be randomly chosen to receive prizes as a token of our appreciation for their participation in the survey. Firms which were selected in either treatment group were not told they had been selected for a prize until the time their prize was being given out.

Randomization was done via computer after the second round of data was collected. Firms were first stratified into 16 strata on the basis of gender and sector (males in male dominated industries, males in mixed industries, females in female-dominated industries, and females in mixed industries); baseline capital stock (above or below the raw baseline median of 181 cedi in capital stock); and on a binary variable called "high capture". In the second survey round, firm owners were asked on a 5 point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree) to assess how strongly they agreed or disagreed with the statements "Whenever I have money on hand, my spouse or other family members always end up requesting some of it", and "People who do well in their business here are likely to receive additional requests from family and friends for money to help out with some expense or another". We summed the responses to these two questions, and classified as "high capture" firm owners with scores of the median of 8 or above – that is if on average they agree with both statements.

Then within each strata, we ranked firms according to January 2009 reported profits (collected in the second round survey), and formed matched quadruplets of firms. We used wave 2 rather than baseline profits for the match since 9 percent of the firms did not report round 1 profits. Within the quadruplet one firm was then randomly chosen to receive the cash treatment, one to receive the equipment treatment, and two to be control firms. We then randomly selected which quadruplets would receive their treatments after each round. In the end this resulted in the 793 firms being matched into 195 groups, of which 4 groups ranged in size from 5 to 8 firms and the remainder were quadruplets.

This randomization design was based on the analysis in Bruhn and McKenzie (2009) who showed the potential for significant increases in power and baseline balance from matched pairs (with a single treatment group) and stratification compared to simple randomization. The variables used for stratification were motivated by the results in de Mel et al. (2009a). In particular, we stratified by gender and industry since the ex post heterogeneity analysis in that paper found strong differences by gender, and some suggestion of differences according to whether women were working in female-dominated versus mixed industries. The choice of "high capture" as a stratifying variable was motivated by the literature referenced in the introduction that has suggested that many individuals who succeed in raising their incomes face large demands to share it from others. In addition, there was some suggestive evidence in Sri Lanka that a reason for the low returns to women was capture of resources by other household members. Stratification on baseline capital stock was done both because this was believed to be a variable which would be correlated with future profits, as well as to allow for testing potential heterogeneity in treatment effects for smaller and larger microenterprises. Matching of quadruplets on profits was done to achieve greater balance on the pre-treatment value of the main outcome of interest. It also enables us to eliminate quadruplets with outlier values of profits pre-treatment and still be assured of random allocation to treatments and control among the remaining sample.

3.3. Data collection and description of firms

The two pre-treatment survey rounds were followed up by four additional survey waves in May 2009, August 2009, November 2009, and February 2010. Of the 793 firms which completed the first two rounds, 730 answered the final wave survey. Appendix 1 details wave by wave attrition rates and shows the robustness of our main treatment effects to corrections for attrition.

Each follow-up round collected data on changes over the quarter in fixed capital from purchases, sales or repair; the current value of inventories and raw materials, and the value of the last month's expenses, sales, and profits. The most important firm outcome variable measured is firm profits. Profits were elicited via a direct question, following the recommendations of de Mel et al. (2009b). Firm owners were directly asked "After paying all expenses, what was the income of the business (the profits) during January 2009? (Consider all expenses, including wages of employees but not including any income you paid yourself as an expense)". Nominal profits were converted to October 2008 real profits using the Greater Accra region Consumer Price Index collected by the Ghana Statistical Service. An innovation in this experiment was the use of computerized cross-sectional and panel consistency checks. Data was collected using PDAs, and a consistency check was triggered whenever reported profits exceeded reported sales in the cross-section, whenever a firm reported sales but not profits, and whenever the change in profits from one quarter to the next was less than -33.3 percent or greater than +50 percent (provided the absolute change in profits was at least 20 cedi). We discuss these consistency checks in more detail in Fafchamps et al. (2010), where we show that they lead to some improvements in data quality. We therefore use the profits which incorporate the consistency checks in this paper. Nonetheless, our results are similar when we use the raw profit data.

Table 1 summarizes the basic characteristics of firms and their owners in our experimental sample, and compares the pre-treatment characteristics of firms in the control group to those assigned to either treatment group. The top of the table shows balance for the characteristics used for stratification or matching, while the remaining rows compare the characteristics of other variables of interest. Mean (median) monthly profits in January 2009 were 130 (68) cedi, and mean (median) capital stock at the same point in time was 452 (172) cedi. The grants of 150 cedi were therefore approximately equivalent to two months profits and almost equal to the size of existing capital stock for the median firm. However, since we did not explicitly cap profits or capital stock when selecting firms into the experimental sample, there are also a small number of firms with much higher levels – the maximum profit reported in our pre-treatment waves is over 5000 cedi per month. The inclusion of these few larger firms does not greatly affect our basic treatment effects, but once we start looking at treatment heterogeneity in smaller samples can exert a large influence. As discussed below, we therefore focus most of our analysis on the vast majority of firms for whom a 150 cedi grant might be expected to make a noticeable difference. We do this by eliminating quadruplets or groups which have baseline profits exceeding 1500 cedi per month. Since randomization occurred within quadruplets or groups, balance on baseline characteristics should be achieved for this subsample also.

Table 1 shows that overall the two treatment groups look similar to the control group in terms of pre-treatment characteristics. The exceptions are October/November 2008 profits and January 2009 sales, which show significant differences across treatment groups in the trimmed sample, and differences in magnitude, if not statistical significance, in the full sample. Recall the matched randomization used the wave 2 profits. However, the correlation between wave 1 and wave 2 profits is only 0.19, compared to a correlation of 0.58 between wave 2 and wave 3 profits, and of 0.72 for the control group between waves 5 and 6 (which is the same seasonality as between waves 1 and 2). This difference in baseline profits is due to pure chance, and is in a variable which the data suggests involves considerable noise. Imbalance on this baseline profit measure is thus unlikely to imply imbalance on follow-up profits, particularly given the pre-treatment balance on wave 2 profits (Bruhn and McKenzie, 2009). Nevertheless, we will show our results are robust to the use of firm fixed effects which account for any baseline imbalances.

Table 1 shows that the mean owner in our sample is 36 years old, has almost 9 years of schooling, and has been running her firm for 7 years. The mean number of digits recalled in a Digitspan recall test is 5.1, which is almost one digit lower than the 5.9 average among Sri Lankan microenterprise owners (de Mel et al, 2008). The majority of firms are run out of the home, with 83 percent of women and 69 percent of men operating a business from their dwelling. Most firms are informal, with only 14 percent registered for taxes, and only 10 percent have ever had a loan from a bank or microfinance institution. Half of the firm owners use a susu collector, with this more common among women (58 percent) than men (34 percent). A susu collector is an informal mobile banker, who typically collects a savings deposit daily from individuals and returns them at the end of the month after subtracting one day's deposit as a fee. That is, saving is at negative interest rates in exchange for safekeeping. Besley (1995, p. 2150) states that "a frequently heard rationale for the existence of this institution is that there are difficulties for those who have a stock of liquid assets in resisting the claims of their friends and relatives (or even spouses)".

4. Estimation of Experimental Treatment Effects

Almost everyone assigned to receive a grant received it: only 9 firm owners assigned to receive a grant did not (2% of those assigned to treatment). One of these firm owners had died, 3 women refused the grant saying their husbands would not let them accept it, and the other 5 firms had attrited from the survey and could not be located to give them the grant. Given this, we focus on intent-to-treat effects, which show the impact of being randomly assigned to receive the grant – in practice there will be little difference between the intent-to-treat effect and the treatment on the treated effect of actually receiving the grant given that compliance is almost 100%.

4.1. Impact on Profits by Grant Type and Gender

Figures 1 and 2 graphically show the main results of the experiment by displaying the cumulative distribution functions (CDFs) of real profits by gender and treatment group for the final two rounds of the survey. For males, Figure 1 shows that both the equipment and cash treatments have distributions to the right of the control distribution, with separation over most of the range of profits. The equipment and cash treatments have similar distributions up to about the 80th percentile, and then separate with the distribution of profits for the equipment treatment lying to the right of the cash treatment profits distribution. In contrast, the distribution of real profits by treatment group for females shows two noticeable differences from that of males. First, the distribution of the cash treatment group lies right on top of that of the control group, suggesting no impact of the cash treatment on profits. Second, while the equipment distribution lies to the right of the other two groups, this separation really only occurs at about the 50th or 60th percentile. That is, the equipment treatment seems to have only had an effect for women over the top half of the distribution.

We then estimate the average impact of the cash and equipment grants on firm profits. We begin by pooling together male and female business owners, and running an OLS regression of the form:

$$\pi_{it} = \beta_1 M_{it} + \beta_2 E_{it} + \sum_t \delta_t D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it} \tag{4.1}$$

where M_{it} and E_{it} are dummy variables indicating whether firm i has been assigned to receive either the cash or equipment treatment by time t. The error term u_{it} has been decomposed into wave fixed effects D_{it}, quadruplet fixed effects S_{ig}, and a residual ε_{it}. The G quadruplets are the strata used in the randomization of the two treatments across entrepreneurs (see Section 3.2) and are included following the recommendation of Bruhn and McKenzie (2009).

We test whether either treatment is significantly different from zero. We also test the equality of effects of the two treatments $\beta_1 = \beta_2$. We estimate equation (4.1) for the full sample, and then for the sub-sample which trims out matched quadruplets which have a firm with pre-treatment profits above 1500 cedi. Only 7 firms have pre-treatment profits above this level, but this trimming involves dropping 28 firms (1% of the sample) since we need to drop other firms in the matched quadruplet. Doing this ensures that randomization occurred within the trimmed sample, and prevents a few firms with scale well above the rest of the sample exerting undue influence on the results. In addition to OLS estimation conditional on group dummies, we also estimate equation (1) via fixed effects. The inclusion of fixed effects controls for any time invariant small-sample differences between treatment groups, such as the difference in baseline profits seen in Table 1.

Equation (1) pools together all the waves of the survey, thereby giving the average impact of the treatments over the observed time period. We observe firms at quarterly intervals, up to at most 12 months since treatment. Appendix 2 tests robustness to allowing the impact of the grants to vary with the time since treatment, and tests for equality of treatment effects. There is some suggestion that the impact of the equipment treatments are greater 9-12 months after treatment than immediately afterwards, but we cannot reject a constant treatment effect for either cash or equipment for the pooled sample of men or women, or for the subsample of males. We reject equality of treatment effects over time at the 10% level for the equipment treatment for females with a fixed effects specification, but not with the OLS specification. Given the sample sizes we have and lack of strong evidence to reject pooling, we therefore continue to pool all waves for the remainder of the paper.

The first four columns of Table 2 then show the treatment effects for the pooled sample. All four specifications show a large positive impact of the equipment treatment on firm profits. Monthly firm profits are estimated to be 31-43 cedi higher as a result of the 150 cedi equipment treatment. The cash treatment is significant at the 10 percent level in the untrimmed OLS specification, but becomes insignificant when trimming or using fixed effects. The coefficients are always much smaller than for the equipment treatment, and we can reject equality of cash and equipment at the 5 percent significant level for three out of four specifications and at the 10 percent level for the other. That is, cash grants have less impact on business profits than equipment.

In the remainder of Table 2 we allow the impact of the grants to vary by gender. Recall the randomization was stratified by gender. We modify equation (4.1) to allow both the treatment effects and the wave effects to vary by gender:

$$\begin{aligned}\pi_{it} = {} & \beta_1 F_i M_{it} + \beta_2 F_i E_{it} + \beta_3 (1-F_i) M_{it} + \beta_4 (1-F_i) E_{it} \\ & + \sum_t \delta_t D_{it} + \sum_t \delta_t^F F_i D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it} \end{aligned} \tag{4.2}$$

where $F_i = 1$ if entrepreneur i is female, and 0 otherwise.

Columns 5 and 6 estimate equation (4.2) by OLS with matched quadruplet or group dummies, and columns 7 and 8 by fixed effects. Finally, columns (9) and (10) restrict the OLS estimation to use only the last two waves of data. This corresponds to the data in Figures 1 and 2. In addition, it is possible that readers may be concerned that profits may be artificially high in the quarter immediately after the equipment treatment if firms receiving inventories to sell count this as pure profit. The fact that Appendix 2 shows that, if anything, the treatment effect is rising with time since treatment, and that the treatment effects are still present when focusing on these final rounds which are six months or more removed from almost all the treatments should alleviate this concern.

For women, the estimated treatment effect of the cash grant is always small (5 cedis or less) and statistically insignificant, whereas the treatment effect of the equipment grant is large (35-50 cedis) and statistically significant. In all specifications we can reject equality of the cash and equipment treatment effects. This confirms what is seen visually in Figure 2, that only the equipment grants have a significant effect for women. For males, the equipment treatment effect is also large, although more sensitive to specification, ranging in size from 28 to 60 cedis, and statistically significant in all but one specification. After trimming, the magnitude of the equipment treatment effect for males is very similar to that for females, and we cannot reject equality of equipment treatment effects by gender in any specification. In contrast to females, we can never reject equality of cash and equipment treatment effects for males. The cash treatment effect for males is statistically significant and large when we restrict analysis to waves 5 and 6, which is consistent with the effects seem in Figure 1. However, using all waves of the data the estimated impact varies between 5 and 29 depending on specification, with large standard errors. The lower cash effect estimate using fixed effects than when using OLS here is the result of the imbalance in baseline profits for males, with the group assigned to the cash grant having higher wave 1 profits (despite the same wave 2 pre-treatment profits) than the control group and the group assigned to the equipment treatment. Given this imbalance is due to chance and we have balance at wave 2, it is not clear whether one should control for this pre-treatment difference. The confidence interval for the male cash treatment effect when we do control for it with fixed effects is (-26.5, +36.7), indicating that the data really have no information about the cash treatment effect for males when we condition on this difference. If we are prepared to treat this chance imbalance as noise and not condition on it, then there is some evidence for a significant cash effect, at least in the last two rounds. In contrast, the equipment treatment effect for males and the cash and equipment treatment effects for females are much more robust to the choice of specification, giving us more confidence in the results for these groups.

4.2. Treatment Heterogeneity by Randomization Strata

We next examine treatment effect heterogeneity according to the other variables used for stratification and matching. We do this separately by gender, given the differences observed above. Let A and B denote the two categories of a binary variable used for stratification (e.g. $A_i = 1$ if i works in a single-sex dominated industry, and $B_i = 1$ if i works in a mixed-gender industry). Then we estimate separately for each gender:

$$\begin{aligned}\pi_{it} =& \beta_1 A_i M_{it} + \beta_2 A_i E_{it} + \beta_3 B_i M_{it} + \beta_4 B_i E_{it} \\ &+ \sum_{t=2}^{6} \delta_t D_{it} + \sum_{t=2}^{6} \delta_t B_i D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it}\end{aligned}$$

The results are shown in Table 3. The top two rows of the table show the categories A and B which define strata. Columns (1) and (2) show the OLS and fixed effects estimates of treatment heterogeneity by the gender mix of the industry firms work in. De Mel et al. (2009a) found some evidence in Sri Lanka that the impact of grants was less for women in female-dominated industries than those in mixed industries. In Ghana, panel A of column (2) shows that with fixed effects, the cash treatment has a -6.9 cedi effect in female-dominated industries versus a 1.8 cedi effect in mixed industries, and the equipment treatment has a 25.4 cedi effect in female-dominated industries compared to a 39.8 cedi effect in mixed industries. The point estimates are therefore consistent with the idea that the grants may have more effect on the businesses of women who operate in mixed industries. However, the differences in treatment effects by industry category are not statistically significant. Likewise panel B shows no significant heterogeneity by industry category for men.

Columns (3) and (4) examine heterogeneity according to the baseline measure of capture. Recall that individuals in the "high capture" category agree more that whenever they have money on hand their family members are likely to request some of it, and that people who do well in business get requests from others for help. We do not obtain significant heterogeneity according to this variable for either men or women, with large standard errors and the point estimates varying quite a lot between the OLS and fixed effects specifications. Later in the paper we examine alternative measures of capture to see whether this lack of significance is due to the particular choice of measure being used.

Finally we look at heterogeneity according to the initial size of the firm. Columns (5) and (6) consider this in terms of the initial capital stock of the firm, as firms were stratified as being above or below median baseline capital stock. Since wave 2 profits was matched to form quadruplets, we first calculate the maximum wave 2 profit within a quadruplet or group, and then define firms as being in a low profits group if the maximum wave 2 profits for the group is less than 138 cedi (the median of profits over the whole sample). This classifies 62 percent of females and 45 percent of males as being in the low profits group. The results confirm the visual impression in Figures 1 and 2. In particular, we see that the cash grants have no significant impact for any size female firm, while the equipment grants only have an impact for the 40 percent or so of firms with higher initial profits or higher initial capital stock. The impact of the equipment grants is extremely large for these female firms – monthly profits increase by 77 to 96 cedi per month for the female firms in high initial profits quadruplets, compared to an insignificant 2 to 5 cedi per month for the low profits female firms. This difference is statistically significant. In contrast, there is no such pattern for male-owned firms – the point estimates for the lower profits firms are typically just as large as those for the higher profits firms, and the difference is not statistically significant.

Taking these results together, it appears that cash grants are not increasing profits for female-owned firms, and the equipment grants only increase profits for female-owned firms which were larger in size to begin with. The equipment treatments also increased profits for male-owned firms, and the effect of the cash grants is inconclusive for males. There does not appear to be the same heterogeneity by initial firm size in terms of male responsiveness to the grants. The remainder of the paper therefore focuses on explaining these patterns.

5. What explains these results?

5.1. Where do the grants go?

Table 4 examines the extent to which the grants are being used to increase the capital stock of the firm, to make transfers to non-household members, and for household spending. In panel A we show the results of estimating equation (2) with different outcomes, while in panel B we show the results of estimating equation (3) for the female sample and the categorization of low and high initial profits groups, since this is where we found large differences in treatment effects. For reasons of space we report the fixed effects estimates only (with the exception of transfers out which were not measured pre-treatment), but note when the OLS results show large differences.

We begin by looking at the impact of the grants on the capital stock of the firms. Column (1) shows this for total capital stock. In order to reduce the influence of large outliers, column (2) truncates capital stock at the 99.5th percentile, which is 6130 cedi. Both specifications suggest that capital stock is increasing by more for the equipment treatments than for the cash treatments, both for men and women. However, the capital stock data is noisy and the standard errors are large, meaning we cannot reject equality of cash and equipment effects on capital stock. Panel B shows stark differences between the women whose profits were initially low and those who had higher initial profits – there are large increases in capital stock for the high initial profits group, and no increase in capital stock for the low initial profits group that received the cash treatment. After truncating outliers, we can reject equality in treatment effects for the low and high initial profits groups for both cash and equipment.

Figures 3 and 4 show the CDFs of the post-treatment capital stock distribution by treatment group and gender for the final two waves of the survey. Figure 3 for males shows a similar pattern to that of profits – namely that the distribution of the equipment treatment group is shifted to the right compared to that of the control group across the distribution. The cash distribution is in between, although right at the top of the distribution crosses the control distribution curve several times, which explains the sensitivity of the cash treatment effect to where we truncate the data. For females, Figure 4 shows that both treatment groups overlap with the control group for the bottom 60 percent of the distribution, similar to seen for profits. The equipment distribution then separates from the control above this, with women in the equipment treatment group having higher 70, 80, and 90th percentiles of their capital stock distributions than the control group. The cash treatment group lies in between, and, unlike in the case of profits, does separate somewhat from the control group at the top of the distribution, suggesting some increases in capital for some firms as a result of the cash treatment.

Next we examine where the grants are going if not into the business. Beginning in wave 4, firm owners were asked "During the past three months, did you make any payments in cash or goods to people living outside your household?", and if so, the value of such transfers. Columns 3 and 4 show that women who received the cash grant were more likely to have made such a transfer, and to have sent more transfers. On average they are estimated to have sent 8 cedi more a quarter over the last 3 quarters of the survey. This also does not account for any transfers out made in the first quarter after treatment by firms treated after wave 2, since the wave 3 survey did not collect transfers data. However, restricting the analysis to only the control group and firms treated after wave 3 only marginally increases the coefficient on the cash treatment, raising it to 8.9 cedi.

The remaining columns report the estimated impacts on household expenditure, which was collected each wave. Households were asked to recall the last week's expenditure on food, last month's expenditure on 9 categories (housing, fuel and light, non-durable households goods, communication, recreation, transport, household services, personal care services, and contributions to associations) and last three month's expenditure on a further 9 categories (clothing, footwear, ceremonies such as funerals and weddings, electronic goods, household furnishings, household appliances, vehicles, health expenses, and education expenses). We aggregate several categories to report estimates of impact on several categories of interest, as well as impacts on total quarterly spending (which adds 13 times weekly food, and 3 times the last month's expenses to the three month expenses). Unlike profits, panel consistency checks were not programmed for these expenditure items, and the data are quite noisy. In order to ensure extreme outliers are not driving the reported results, we report results using expenditures truncated at the 99.5th percentile. Results using the untruncated expenditures are qualitatively similar with larger standard errors, and slightly larger point estimates.

The impacts on specific household expenditure categories are not well-identified due to this noise.

The point estimates generally suggest higher positive impacts on expenditure for those receiving the cash treatments than those getting the equipment treatment or the control group, especially for women in the low initial profits group. Aggregating all the different expenditure categories can average out random measurement error in particular categories of expenditure and average over different households having different temporal patterns in expenditure categories. We then see a large and highly significant effect of the cash treatment on total quarterly spending for women as a whole, and for the subgroup of women with low initial profits. The coefficients are huge: women who were given a 150 cedi cash grant are estimated to be spending 120 cedi more a quarter after the grant. The magnitude of this coefficient appears to be driven by a few firm owners reporting very large spending levels – truncating at the 99th percentile of total expenditure lowers this coefficient to 95, and at the 95th percentile lowers it to 76 cedi (which is still significant at the 5% level). For males receiving the cash treatment, the point estimates also suggest large increases in total quarterly spending (with a coefficient of 50 to 73 cedi depending on the level of truncation), but the standard error is so large that we can never reject equality with zero.

These results therefore offer an explanation at a basic level for the profits results. More of the equipment grants ended up in the business than for the cash grants. Women, especially those with lower initial profits, appeared to have spent most, if not all, of the grants on household expenditure and transfers to non-household members. As a result, we see more impact of equipment grants than cash grants on business profits. Note however that for high initial profit women who received the cash treatment, Table 4 shows capital stock increased and no significant change in spending. This is despite the lack of a significant increase in profits for this group. There are only 44 women who are in the high initial profits group who received the cash treatment, so small sample noise is a potential explanation. Indeed, the confidence interval for the effect on profits of the cash treatment for the initial high profit group is (-26, +40). So despite the small and insignificant point estimate, it may still be that the high initial profit women receiving the cash treatment are also investing it in the business and benefiting through higher profits.

5.2. How do the low and high initial profit women differ?

We have seen that the impact of the grants differs greatly between women with low initial profits and women with high initial profits. It is therefore worth examining in more detail the composition of these two subsamples. The first point to note is that these groups don't differ greatly in the industry or type of business, just in the scale. The low initial profit group is made up of 31 percent food sales, 18 percent beauty and hair, 9 percent sewing, and 42 percent trade, compared to 37 percent food sales, 9 percent beauty and hair, 6 percent sewing and 47 percent trade. Even when we look more finely within these broad sectors, we see a similar broad range of types of firms in both subgroups: kenkey and banku (both traditional prepared foods) sellers, dressmakers, beauty salons, used clothes sellers, and retail trade.

In contrast, the scale of the firms differs substantially. Table 5 compares the pre-treatment characteristics of these two subgroups of female firms to each other and to the male-owned firms. The final column also offers a comparison to the sample of female microenterprises from Sri Lanka used in de Mel et al. (2009a). We see that mean and median monthly profits for the low initial profits female subsample is 37-38 cedi, approximately US$1 per day, while mean and median profits are 4 to 6 times this level in the high profit group. Similarly, mean and median sales differs by a factor of 5 to 6 between the low and high initial profit groups. Mean capital stock for the low initial profits group is 251, versus 456 for the high profits group. Comparing to the other two groups, we see that the high initial profit females have larger profits than the average male-owned firms in the sample, while the low initial profits group are similar in size to the female-owned firms in the Sri Lankan study.

Table 5 also shows that women in the high initial profits group are more educated, have richer households (which may be a consequence of the higher profits rather than a cause), are more likely to keep accounts and to have had a formal loan, and have been in business slightly longer than the low initial profits firms. When it comes to the reasons for choosing the particular sector of self-employment they are in rather than some other sector, the women in the high profits group are more likely to say they chose their sector for earnings potential and less likely to say they chose it because it had a low capital requirement.

Overall this paints a picture of the low profits group as much smaller in size, with subsistence level income. For this group we see no impact of the grants on business profits. This is consistent with the finding in Sri Lanka, where the grants also had no impact on female-owned businesses. The Sri Lankan businesses are similar in scale to the low initial profits female firms in Ghana – the 95th percentile of profits is only 70 per month in the Sri Lankan sample, which is the 10th percentile of profits for the high initial profit group in Ghana. So for the types of female-owned businesses in Ghana that are similar in scale to those in Sri Lanka, we obtain similar results. The difference is that the Ghanaian sample also yields this group of more successful female-owned businesses with larger scale, who do show increased profit growth from at least the equipment treatment.

6. Why does the impact of cash and in-kind treatments vary?

The difference between the impacts of cash and in-kind grants is stark, particularly for women, and contrasts with the failure to reject equality of cash and in-kind treatment effects in grants to microenterprises in Sri Lanka and Mexico (de Mel et al, 2008; McKenzie and Woodruff, 2008). This raises two key questions. First, why do the results differ from the prior experiments in other countries?, and second, what explains the difference between cash and in-kind treatments in Ghana?

We note first that the sample sizes used in the experiments in Sri Lanka and Mexico ultimately resulted in low power to distinguish between cash and in-kind grants. In Sri Lanka the sample size for analysis in de Mel et al. (2008) is 385 firms. They find an ITT return of 4.17 percent for the in-kind treatment, and of 6.70 percent for the cash treatment. However, the standard errors on these estimates are 2.6-2.8 percent, and one cannot reject at the 10 percent level that the in-kind treatment has twice the effect of the cash treatment (p=0.102). The sample size in Mexico for the analysis by McKenzie and Woodruff (2008) is even smaller, at 113 firms after trimming. The ITT returns are 34.4 percent for cash and 16.1 percent for in-kind, but with standard errors of 23-24 percent. Thus it may not be that Ghana is different, but rather that the prior studies did not have sufficient sample to detect differences between cash and equipment.

6.1. What does the literature suggest?

The difference between the cash and in-kind treatments arises in what is first done with the grant. The in-kind grants must first go into the business. Since most of the grants were used to purchase inventories and raw materials, rather than machinery (and firm owners could chose which of these it was), it should be relatively easy to de-capitalize these grants (by selling and not replacing additional stock) and take them back out of the business if the firm owner wanted to. This differs from the conditionality on school attendance or vaccination in traditional conditional cash transfers, which are not reversible. This suggests that we should think about the difference between the two treatments as being largely one of the initial earmarking for a specific purpose and the initial degree of liquidity.

Give these differences, the literature suggests two main possibilities for why cash and in-kind grants to firm owners might be spent differently, and therefore have different effects on profitability. These can be broadly summarized as self-control issues and external pressure to share.

Self-control issues arising from dynamic inconsistencies in preferences are one reason people may not undertake productive activities today that have large payoffs in the future. For example, Duflo et al. (2010) find farmers in Kenya fail to undertake profitable investments in fertilizer due to present-bias, but that offering small time-limited discounts can induce them to do so. Banerjee and Mullanaithan (2010) show that these time-inconsistency issues can be particularly important for the poor. The in-kind grants may then act as a "nudge" to get firm owners to invest in their business, and once the money is in the business, mental accounting and the partial illiquidity may lead the firm owner to keep the money in the business rather than spend it.

An alternative explanation is that of external pressure to share. Platteau (2000) introduces the idea of sharing norms to economics from anthropology. He notes that in many developing countries, especially in sub-Saharan Africa, individuals often live in large households and have strong links to extended family and kinship networks. Social sharing norms then can make it hard for individuals to save, and deter investment, as they are forced to share additional resources with others. These sharing norms can vary according to the source of income and how it is stored. For example, Duflo and Udry (2004) find evidence that the proceeds of different crops are used for different purposes in Côte d'Ivoire, and note that income from some crops is expected to be shared within the household and income from others is not. Charlier (1999), based on work in Côte d'Ivoire, notes that as a result of these sharing norms, individuals may develop an illiquidity preference in order to be able to resist social claims without appearing selfish. Suggestive evidence supporting this view comes from di Falco and Bulte (2009), who show in South Africa that households with more kinship links spend less of their income on liquid and sharable assets, and from Baland et al. (2007), who find individuals in Cameroon taking loans even though they have high savings balances, which their interviews reveal to be a way of resisting demands for financial assistance by others. However, Grimm et al. (2010) offer a more mixed picture, finding in seven West-African countries that local social networks within the city actually have a positive association with business performance, whereas there is a negative association between business performance and a smaller distance to the village of origin.

In our context the existence of such a "social solidarity tax", either from other household members or from extended family members may then lead to less of the cash grant being invested in the business than is the case with the in-kind grant. This could arise either due to the difference in liquidity (it takes some time to decapitalize inventories and raw materials and this time is sufficient to resist pressure for on-the-spot transfers) or to the difference in form and function (there could be an expectation to share cash coming into the household, but not to share the value of additional materials going into the business).

6.2. What do the data show?

Our surveys contain a number of variables which we can use to proxy both the degree of self-control, and the degree of external pressure to share facing business owners. With the exception of the "low/high capture" dummy variable which we looked at in Table 3, the randomization was not stratified on any of these variables. Our analysis should therefore be considered exploratory in nature.

We have four measures which each measure an aspect of self-control and the ability to save cash, all of which were measured pre-treatment. The first is whether the business owner used a susu collector at baseline. Second, whether firm owners agree or strongly agree with the statement "I save regularly" (which two-thirds of owners do). Firm owners were also asked the standard discounting questions to elicit hypothetically the amounts that would leave them indifferent between an amount today, and 100 cedi in one month; and between an amount cedi in five months and 100 cedi in six months respectively. From this we construct an indicator of whether they have a discount rate above the median for the one month versus today comparison (the median person would take 90 today instead of 100 in one month), and an indicator of being a hyperbolic discounter based on comparison of discount rates over the two horizons (28 percent of the sample are classified as hyperbolic). We then attempt to extract the common signal in these four variables by forming a principal component, which we call "lack of self-control", for which high scores indicate lower likelihoods of using a susu and saving regularly, and higher likelihoods of being hyperbolic and having a high discount rate.

The first five columns of Table 6 estimate model (2.8) to examine the heterogeneity in the treatment effect with respect to these self-control variables for the pooled sample in panel A, and for females only in panel B. The signs of the coefficients on the interaction with cash treatment for each of the four variables are consistent with the idea that lack of self-control is associated with smaller increases in business profits from the cash treatment – thus the point estimates show a larger impact of the cash treatment when the firm owner uses a susu, saves regularly, is patient, and is not hyperbolic. Column 5 shows that when we combine all these variables into an index of self-control using principal components, that the interaction between the cash treatment and lack of self-control is significant at the 5 percent level. The principal component has mean zero, and ranges from -1.67 to 2.26. This implies that the treatment effect of the cash for someone with the most self-control is 29.2, which is similar to the average impact of the equipment treatment of 30.9 in column 4 of Table 2. The female only sample in panel B shows a similar pattern in terms of signs of the coefficients, but the interactions are not significant in this smaller sample.

The remaining columns of Table 6 examine how the treatment effects vary with variables intended to proxy for the extent of external pressure facing the firm owner. Column 6 considers whether the firm owner says they feel a lot or some pressure to share extra business income with other household members rather than invest it in the business. This variable was only measured in the last wave, after treatments, and although there is no difference in means on this variable between treated and untreated, it should be considered suggestive only. 23 percent of females and 22 percent of males claim to feel this pressure.

Column 7 restricts to married individuals and uses whether they agree they can spend their income without consulting their spouse (72 percent of women and 71 percent of men say they can). Columns 8 and 9 then consider having a large household, and having a larger number of siblings in the Accra/Tema area as proxies for the potential demands to share cash.

When we look at the full sample we do not see any significant interactions between the cash treatment effect and these proxies for external pressure, and the size of the interactions on pressure to share and spending freely are too small to generate large positive impacts of the cash treatment. When we consider the females only sample in panel B, we actually get significant positive interactions on household size and on the number of siblings in the area. This is consistent with the finding of Grimm et al. (2010) of a positive impact of nearby networks on firm growth, rather than with a story that external pressure to share resources is the reason for a lack of treatment effect from cash. These findings are also in line with the lack of sizeable or significant interaction with low capture seen in Table 3 for the low capture/high capture variable we stratified on.

The evidence in Table 6 therefore appears more consistent with self-control rather than external pressure issues being the cause of the lack of an effect of the cash treatment. Of course the measures we have for both factors are only proxies, and one might wonder whether the reasons we observe people having trouble saving and having time-inconsistent preferences with high discount rates is because they face large external pressures. We examine this in Table 7, by testing whether any of several variables we have to potentially capture external pressure are significantly associated with our lack of self-control index. In addition to the variables used to proxy external pressure in Table 6, we also consider whether they think machines and equipment held in the business are a good way of saving money so others don't take it (55 percent of women and 72 percent of men say yes), whether their spouse had compelled the owner to give money to the spouse in the three months prior to the baseline (10 percent of married women and 15 percent of married men said yes), and whether their spouse is supportive of them running a business (84 percent say yes for both men and women). We see that we cannot reject the null hypothesis that none of these proxies for external pressure are associated with the lack of self-control index. While measuring external pressure is difficult, if self-control was merely proxying for or the result of external pressure, we would expect some relationship here. Based on Tables 6 and 7, we therefore conclude there is more evidence to support the difference in cash and equipment treatments being driven by self-control issues than by external pressures.

7. Conclusions

We find that the effect of in-kind and cash grants is significantly different, a finding that is difficult to reconcile with models of accumulation that take either a standard Ramsey form, or allow for pure time inconsistence. These results suggest a lack of asset integration, as if entrepreneurs fail to take consumption and investment decisions jointly. The difference between in-kind and cash grants is suggestive either of mental accounting, as a self-commitment device against the tempted self – or of a social solidarity tax, by household members and relatives, on the cash flow of the firm but not its equipment and inventories.

We find that cash and in-kind grants have significantly different effects for female entrepreneurs in Ghana. In-kind grants lead to large increases in business profits, but only for female-owned firms which were initially more profitable – subsistence firms don't grow when given more capital. In-kind grants also lead to large increases in business profits for men, while the effect of the cash grants is less robust – we find large positive and significant effects if we don't condition on the baseline level of profits, but smaller and insignificant effects when we do. The evidence further suggests that the difference between cash and in-kind treatments arises due to issues with self-control, rather than because of social solidarity taxes or external pressure to share.

Ghana offers a setting where women are the majority of small business owners, and in this setting we find the top 40 percent of women in terms of profitability look similar or more profitable than the average male firm. Such a large group of relatively high achieving women is not present in the Sri Lankan sample of de Mel et al. (2009a), and indeed the remaining group of subsistence-level Ghanaian female business owners have similar negligible business impacts from the grants as the group of women in the Sri Lankan experiment.

The results offer partially good news for advocates of directing microfinance at women. We do find in Ghana a relatively large group of women whose profits increase a lot when given in-kind transfers.

Microcredit has recently been argued as providing a way to allow individuals to overcome present-bias by providing self-discipline and encouragement through regular payments and group meetings (Bauer et al, 2010). In such a context it is more likely to be used like the in-kind grants than the cash grants here, thereby leading to improvements in business outcomes. However, our findings suggest this effect to be more powerful for women who are already earning more to begin with, suggesting possible limits on the ability of capital alone to generate business growth among poor subsistence-level female enterprises. Moreover, as in prior work in Sri Lanka and Mexico, the results show that the average male-owned microenterprise gains a lot from being granted additional access to capital, suggesting that microfinance's focus primarily or exclusively on women is not providing access to a large group of people with a need for more capital.

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Appendix 1: Steady state firm size with time inconsistency

Let τ denote the one period-ahead discount rate:[6]

$$\frac{1}{1+\tau} \equiv \beta\delta$$

Let k^s be the level of capital that satisfies:

$$\pi'(k^s, \theta) = \tau$$

Is k^s the steady state capital of a time inconsistent entrepreneur? It depends on whether the decision maker is sophisticate or myopic, that is, whether he or she realizes that future decisions were taken according to (2.3) or not.

Suppose the decision maker is sophisticate and sets $k_t = k^s$. Is this a steady state? The Euler equation between t and $t+1$ is:

$$1 + \pi'(k_{t+1}, \theta) = \frac{1}{\beta\delta} \frac{u_t'(c_t)}{u_{t+1}'(c_{t+1}^P)} \tag{7.1}$$

where c_{t+1}^P denotes the household's predicted future decision about c_{t+1}. If the household is myopic, c_{t+1}^P is expected to coincide with the decision made at time t, i.e., as given by (2.2). If the household is sophisticate, it is the correctly anticipated decision taken at time $t+1$ as given by the solution to (2.3).

First note that if $c_{t+1}^P = c_t$, then $u_t'(c_t) = u_{t+1}'(c_{t+1}^P)$ and setting $k_t = k^s$ satisfies the above Euler equation. If the entrepreneur is sophisticate and sets $k_t = k^s$, she realizes that the decision problem and Euler equation at $t+1$ will be identical to those at t. Hence she correctly anticipates that $c_{t+1}^P = c_t$. It follows that k^s is the steady state level of firm capital for a sophisticate entrepreneur.

If the entrepreneur is myopic and sets $k_t = k^s$, she incorrectly believes that she will be more patient next period. Let c_{t+1}^M denote the consumption level she sets for $t+1$, not realizing that at $t+1$ she will want to increase consumption beyond c_{t+1}^M. At $k_t = k^s$ the entrepreneur expects $c_{t+1}^M < c_t$, which implies that $u_{t+1}'(c_{t+1}^P) > u_t'(c_t)$. Hence k^s does not satisfy the Euler equation (7.1) and is not a steady state. For a myopic decision maker, the steady state capital k^m is such that $c_t = c_{t+1}$ and $c_{t+1}^M = c_{t+2}^M$. Since

[6] It is clear that $\tau > \rho$. If, as is likely, $\tau > r$, the household will never want to set $w > 0$. So we ignore savings here.

$c_{t+1}^M < c_{t+1}$, it follows that $\frac{u_t'(c_t)}{u_{t+1}'(c_{t+1}^M)} < 1$, which in turn implies that $k^s < k^m$ and

$$\pi'(k^m, \theta) > \tau$$

Appendix 2: Robustness to Attrition

Attrition in the panel comes from firms closing, refusing to answer the survey, or answering the survey but not providing profits data. Appendix Table A1 provides attrition rates per round for the experimental sample. Recall that we eliminated firms which closed or refused to answer the round 2 survey before undertaking the randomization. As a result, attrition from the survey is zero by definition for the experimental group in rounds 1 and 2, although there is some item non-response on profits. Over the course of our experiment we observe 6 percent of the firms closing, with this rate not varying between treatment and control. We were able to keep attrition fairly low over waves 3 through 6 of the survey, and exerted additional effort in round 6 to try and track and induce responses by firms that had attrited in previous waves. As a result, only 8 percent of the sample is not present in wave 6, although 11 percent do not report profits data. Nevertheless, overall attrition rates are higher for the control group than either treatment group, likely reflecting either an implicit obligation felt by those receiving grants to continue in the survey, or discouragement of those who weren't randomly selected for the grants. Whilst statistically significant, the difference in attrition magnitudes are not that large, which should limit the impact of this differential attrition on our results.

To examine how robust our results are to attrition, we use the bounding approach of Lee (2009) to construct upper and lower bounds for the treatment effect. The key identifying assumption for implementing these bounds is a monotonicity assumption that treatment assignment affects sample selection only in one direction. In our context, this requires assuming that there are some firms who would have attrited if they had not been assigned to treatment, but that no firm attrits because of getting assigned to treatment. This seems plausible in our context. We then construct the bounds by trimming either the top or the bottom of the distribution of profits for the treatment groups by the relative difference in attrition rates between treatment and control. This is done on a wave by wave basis, and involves trimming up to 6 percent from the top or bottom of the distribution of the treatment group.

Table A2 shows the results of estimating these Lee bounds. Columns 1 and 2 repeat the main trimmed estimates from Table 2 for comparison. These lie between the bounds estimated in columns 3 and 4 using OLS, and in columns 5 and 6 using fixed effects. We see that our parameter estimates are much closer to the upper bounds than the lower bounds, which reflects the skewed distribution of profits.

The lower bounds occur only if it is the most profitable control firms that attrit. However, a panel regression predicting attrition in the control group (in the form of missing profits) as a function of the previous period's profits finds that having the previous period's profits in the top 10 percent or in the bottom 10 percent, or below the median has no significant effect on attrition. Similarly, we firms which experience large changes in profits over two waves are no more likely to attrit in the subsequent wave. As a result, it seems attrition in the control group is not associated with previous levels or previous changes in profits. Given this, it seems reasonable to assume that profits are either missing at random, or missing in firms which suffer negative shocks that cause the firm to shut down or the owner to be sick in the survey period. That is, there seems reason to believe either the panel estimates in columns (1) or (2), or the upper bound estimates which are based on the least successful control firms attriting. There seems to be no evidence to support the most successful control firms attriting, which is what the lower bound estimates assume. We therefore conclude the main results do not seem to be driven by attrition.

Appendix 3: Is it reasonable to pool effects over time?

To test for pooling of treatment effects we allow the coefficients on treatment in equation (1) to vary with time since treatment. In doing this, one should note that we only observe effects 12 months after treatment for the firms treated after round 2, which is half of the treated sample. In contrast, we observe effects at 3 months and 6 months for the entire treated sample, and effects at 9 months for almost all the sample (excepting the 18 firms treated after round 4). Appendix Table A3 then shows the results. We cannot reject that the impact of treatment does not vary with time since treatment for the pooled sample, and for the male sample, or for the female sample using OLS. For the female sample using fixed effects, the p-value for equality of equipment treatment effects over time is 0.057, offering some suggestion that the impact is greater with more time since treatment.

Figure 1: Post-treatment CDFs of Monthly Profits for Males by Treatment Group

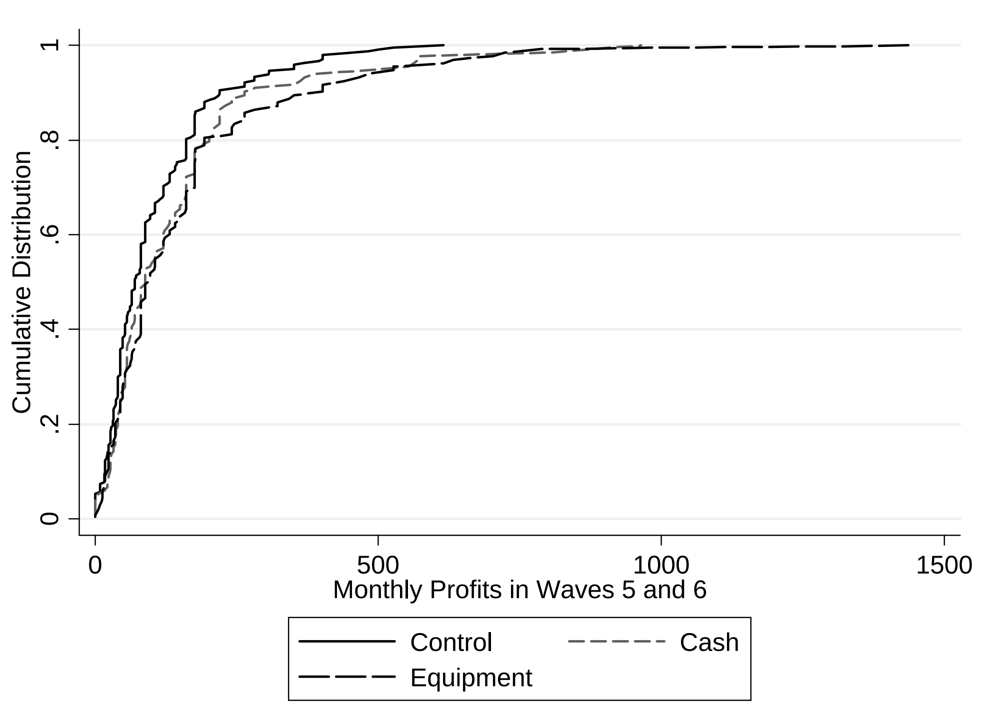

Figure 2: Post-treatment CDFs of Monthly Profits for Females by Treatment Group

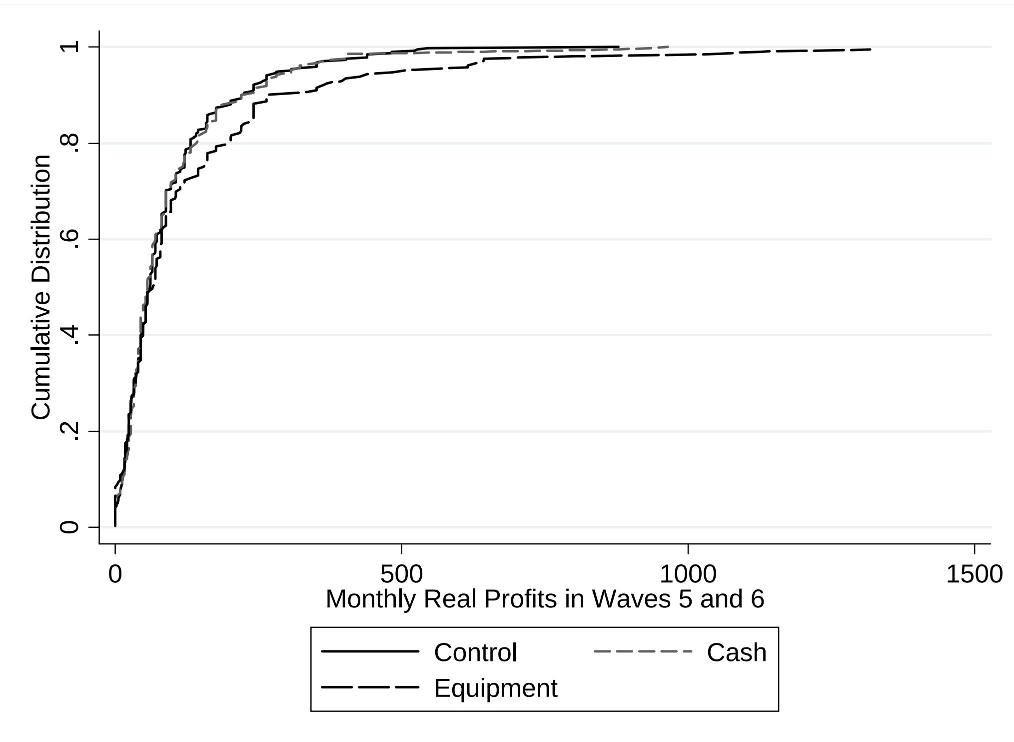

Figure 3: Post-treatment CDFs of Capital Stock for Males by Treatment Group

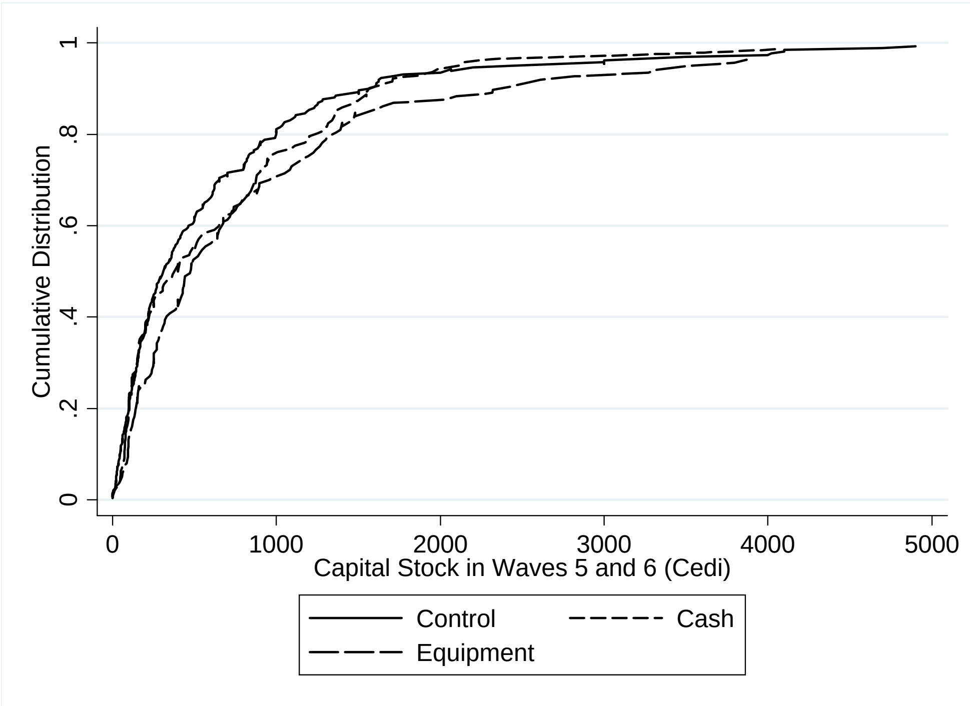

Figure 4: Post-treatment CDFs of Capital Stock for Females by Treatment Group

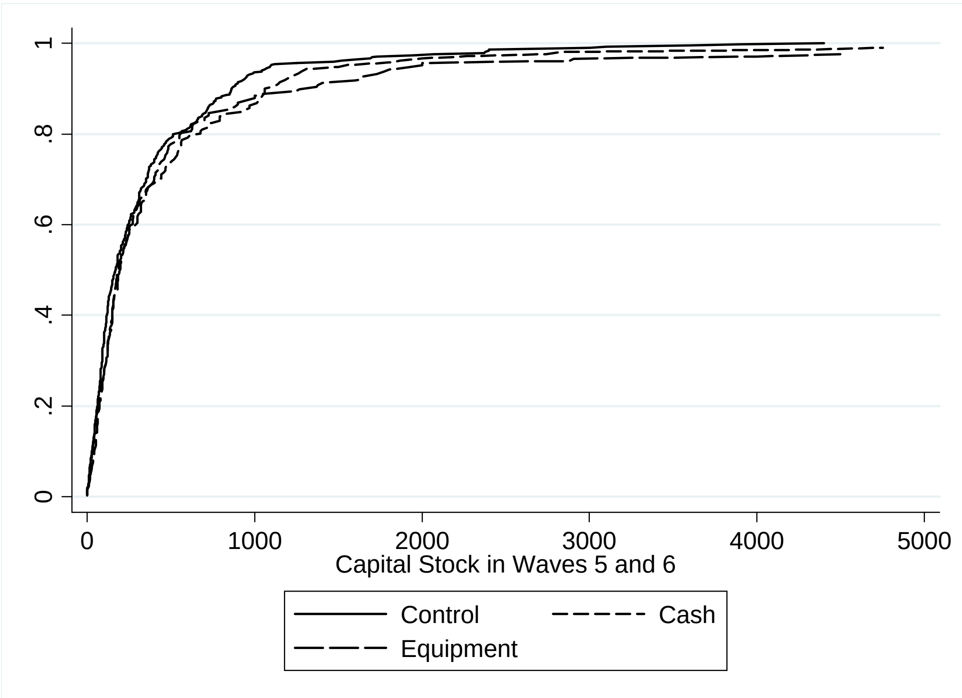

Table 1: Characteristics of Microenterprises and Verification of Randomization

	Full Sample				Trimmed Sample			
	N	Control	Cash	Equipment	N	Control	Cash	Equipment
Variables Using to Stratify or Match								
Monthly profits in January 2009	781	128	132	131	753	103	99	115
Female	793	0.60	0.60	0.61	765	0.62	0.62	0.62
High Capture	793	0.58	0.58	0.57	765	0.58	0.58	0.57
High Baseline Capital Stock	793	0.49	0.49	0.49	765	0.48	0.48	0.48
Male in Male dominated industry	793	0.18	0.19	0.18	765	0.18	0.18	0.18
Male in Mixed industry	793	0.21	0.21	0.21	765	0.20	0.20	0.20
Female in Female dominated industry	793	0.29	0.29	0.29	765	0.30	0.29	0.30
Female in Mixed industry	793	0.31	0.31	0.31	765	0.32	0.32	0.32
Other Variables								
Monthly profits in October/November 2008	729	124	133	104	704	93	129	99
Monthly sales in January 2009	790	724	463	630	762	412	402	595
Number of hours worked in last week	785	58.82	60.55	57.13	757	59.03	60.64	56.64
Total Capital Stock in January 2009	784	468	454	418	757	446	438	410
Inventories at end of January 2009	791	258	213	201	763	239	203	198
Uses a Susu Collector	791	0.49	0.46	0.49	763	0.49	0.46	0.51
Business operated out of home	793	0.76	0.78	0.82	765	0.77	0.78	0.83
Age of Firm	788	7.87	7.13	7.22	761	7.88	7.11	7.14
Ever had bank or microfinance loan	793	0.11	0.10	0.07	765	0.10	0.09	0.07
Business has a tax number	786	0.15	0.14	0.13	758	0.14	0.14	0.13
Owner is Married	791	0.65	0.64	0.67	763	0.65	0.63	0.68
Owner's Years of Education	775	8.87	8.75	9.05	749	8.81	8.70	9.00
Owner's Digitspan Recall	768	5.11	5.07	5.03	740	5.07	5.10	4.99
Owner is Akan Speaker	793	0.45	0.41	0.43	765	0.46	0.41	0.43
Owner is Ga/Dangme Speaker	793	0.28	0.27	0.31	765	0.29	0.27	0.32
Owner's Age	791	36.39	35.43	35.74	763	36.36	35.37	35.79

Note: Trimmed Sample eliminates matched groups in which baseline profits for at least one firm in group exceed 1500 cedi per month

The only differences between groups which are statistically significant at conventional levels are January 2009 sales and October/November 2009 profits in the trimmed sample.

Table 2: Main Treatment Effects

Dependent Variable: Real Monthly Profits (Cedi)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	FE	FE	OLS	OLS	FE	FE	OLS	OLS
Cash Treatment	14.50*	9.59	3.96	0.48						
	(8.68)	(7.32)	(13.89)	(8.23)						
Equipment Treatment	38.60***	36.75***	43.23***	30.87***						
	(11.21)	(10.67)	(12.31)	(10.73)						
Cash Treatment*Female					5.21	5.17	1.22	-2.30	5.74	5.59
					(8.47)	(8.54)	(9.35)	(8.77)	(11.57)	(11.62)
Equipment Treatment*Female					35.75**	37.65**	35.61***	32.87**	47.35**	49.92**
					(14.94)	(14.94)	(13.56)	(13.21)	(21.35)	(21.44)
Cash Treatment*Male					28.99	16.81	8.74	5.13	44.79**	34.17**
					(17.68)	(13.25)	(31.58)	(16.10)	(19.42)	(15.51)
Equipment Treatment*Male					43.38**	35.45**	55.15**	27.83	60.33***	50.61***
					(16.80)	(14.04)	(23.06)	(18.15)	(19.76)	(17.66)
Constant	119.69***	102.19***	120.34***	103.05***	119.70***	102.20***	120.37***	103.05***	99.47***	94.92***
	(8.84)	(4.40)	(7.37)	(3.71)	(8.85)	(4.39)	(7.38)	(3.70)	(5.95)	(5.50)
Baseline trimming	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Waves	All	All	All	All	All	All	All	All	5 and 6	5 and 6
Observations	4354	4203	4354	4203	4354	4203	4354	4203	1392	1344
Number of sheno	792	764	792	764	792	764	792	764	736	710
P-values for testing:										
Cash = Equipment	0.0668	0.0306	0.0128	0.0156						
Cash = Equipment for Females					0.0725	0.0565	0.0205	0.0187	0.0736	0.058
Cash = Equipment for Males					0.4873	0.2998	0.1486	0.3051	0.5164	0.4207
Cash Male = Cash Female					0.2254	0.4604	0.8196	0.6854	0.0845	0.1406
Equip Male = Equip Female					0.7346	0.9145	0.4653	0.8224	0.6555	0.9804

Notes:

All estimation includes wave effects, which vary by gender in columns 5 on. Standard errors in parentheses, clustered at the firm level.

Trimmed specifications trim out matched quadruplets which have at least one firm with profits above 1500 cedi per month in wave 1 or 2

OLS estimation includes dummies for the matched quadruplets.

*, ** and *** denote significant at the 10%, 5% and 1% levels.

Table 3: Treatment Heterogeneity by Randomization Strata

Dependent Variable: Real Monthly Profits (Cedi)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Interaction Category A	Single-Sex Industry		Low Capture		Low Capital		Low Profits	
Interaction Category B	Mixed Industry		High Capture		High Capital		High Profits	
Panel A: Females								
Cash Treatment*Category A	9.62	-6.87	2.12	-8.53	3.13	-11.25	3.29	-8.58
	(10.08)	(10.57)	(12.40)	(13.55)	(10.62)	(11.75)	(7.15)	(9.65)
Cash Treatment*Category B	1.44	1.78	7.89	4.49	8.29	8.98	6.83	6.81
	(13.37)	(13.47)	(12.00)	(11.35)	(14.05)	(13.06)	(20.59)	(17.01)
Equipment Treatment*Category A	26.37*	25.39	28.30	35.41	15.96	14.25	2.21	4.58
	(14.31)	(17.03)	(23.00)	(24.07)	(10.77)	(10.41)	(6.97)	(7.52)
Equipment Treatment*Category B	48.26*	39.77**	46.66***	31.06**	65.06**	55.67**	96.18***	76.53**
	(25.60)	(19.94)	(14.15)	(12.50)	(30.21)	(26.19)	(36.95)	(30.69)
Number of Observations	2604	2604	2604	2604	2604	2604	2604	2604
Number of Firms	474	474	474	474	474	474	474	474
P-values for testing:								
Cash Treatments equal	0.625	0.614	0.740	0.462	0.771	0.250	0.871	0.432
Equipment Treatments equal	0.456	0.584	0.457	0.873	0.124	0.142	0.013	0.023
Cash=Equipment	0.156	0.058	0.056	0.061	0.155	0.051	0.119	0.056
Panel B: Males								
Cash Treatment*Category A	-2.82	-5.75	-0.06	10.72	0.68	-0.72	17.23	-1.50
	(16.42)	(21.54)	(19.55)	(23.92)	(18.06)	(20.14)	(12.99)	(12.76)
Cash Treatment*Category B	36.60*	17.00	25.13	0.77	30.16	8.66	15.43	9.50
	(20.25)	(23.63)	(17.36)	(21.00)	(18.83)	(24.00)	(22.96)	(27.99)
Equipment Treatment*Category A	44.85**	23.47	43.56	58.33	46.55**	26.33	35.08*	32.20
	(21.72)	(31.46)	(27.06)	(35.74)	(19.24)	(25.52)	(18.00)	(23.07)
Equipment Treatment*Category B	28.55	33.69	30.49*	8.94	25.78	28.51	34.88	21.99
	(18.54)	(20.66)	(15.76)	(19.42)	(20.31)	(25.59)	(21.57)	(27.48)
Observations	1599	1599	1599	1599	1599	1599	1599	1599
Number of sheno	290	290	290	290	290	290	290	290
P-values for testing:								
Cash Treatments equal	0.132	0.477	0.337	0.755	0.260	0.765	0.946	0.721
Equipment Treatments equal	0.569	0.786	0.677	0.226	0.458	0.952	0.994	0.776
Cash=Equipment	0.151	0.596	0.312	0.349	0.171	0.509	0.563	0.417

Notes:

All estimation includes wave effects which vary by category. Standard errors in parentheses, clustered at the firm level. Trimmed sample used. OLS estimation includes dummies for the matched quadruplets.

*, ** and *** denote significant at the 10%, 5% and 1% levels.

Table 4: Where do the grants go?

	Capital Stock	Truncated Capital Stock	Made a Transfer Out	Amount Transferred Out	Weekly Food Spending	Quarterly Clothing Spending	Quarterly Health & Education Spending	Quarterly Ceremonies Spending	Total Quarterly Spending	Log Quarterly Spending
	FE	FE	OLS	OLS	FE	FE	FE	FE	FE	FE
Panel A: Males and Females										
Cash Treatment*Female	82.61	49.17	0.05*	8.05**	3.81	3.38	-1.05	1.39	120.54***	0.08*
	(72.01)	(37.27)	(0.03)	(3.46)	(2.44)	(3.90)	(13.42)	(3.17)	(45.61)	(0.04)
Equipment Treatment*Female	135.34**	120.24***	0.02	1.76	-0.07	-0.50	-6.08	2.33	45.36	-0.02
	(65.55)	(34.51)	(0.03)	(2.92)	(2.60)	(4.39)	(13.03)	(3.46)	(44.36)	(0.04)
Cash Treatment*Male	31.36	2.21	0.03	-4.06	3.93	9.52*	0.98	3.27	63.94	0.03
	(70.33)	(61.10)	(0.04)	(3.93)	(3.12)	(5.08)	(11.26)	(3.92)	(50.82)	(0.04)
Equipment Treatment*Male	157.71	83.74	0.01	-6.01	-2.82	3.63	-0.85	4.36	20.95	-0.01
	(102.12)	(69.85)	(0.04)	(3.95)	(3.42)	(5.83)	(23.28)	(5.20)	(65.12)	(0.05)
Number of Observations	4256	4256	2033	2203	4268	3911	3713	4286	4495	4299
Number of Firms	765	765	722	722	765	761	753	765	765	765
P-values testing:										
Cash = Equipment Females	0.573	0.107	0.294	0.137	0.198	0.478	0.776	0.817	0.172	0.054
Cash = Equipment Males	0.212	0.291	0.693	0.630	0.111	0.428	0.942	0.856	0.573	0.611
Panel B: Female Sub-sample										
Cash Treatment*Low Profits	-39.36	-6.78	0.07**	6.13**	7.26**	4.66	15.39	2.94	197.84***	0.16**
	(54.38)	(29.69)	(0.03)	(2.80)	(3.32)	(4.24)	(18.93)	(4.11)	(58.16)	(0.06)
Cash Treatment*High Profits	314.86**	145.84*	0.02	11.54	-2.13	8.29	-25.71	-8.05	-53.38	-0.07
	(135.42)	(85.70)	(0.04)	(8.35)	(4.27)	(8.08)	(18.79)	(5.48)	(81.92)	(0.06)
Equipment Treatment*Low Profits	84.94	59.17**	0.01	-0.40	1.11	4.10	3.83	-2.38	32.92	-0.02
	(85.24)	(28.46)	(0.03)	(2.02)	(3.93)	(5.20)	(18.81)	(3.09)	(63.98)	(0.06)
Equipment Treatment*High Profits	306.90**	223.24***	0.03	5.12	-1.99	-2.43	-18.48	3.11	18.07	-0.04
	(146.47)	(77.66)	(0.05)	(6.76)	(3.94)	(8.01)	(17.24)	(7.79)	(68.53)	(0.06)
Number of Observations	2654	2654	1260	1260	2657	2440	2323	2666	2790	2670
Number of Firms	475	475	446	446	475	475	468	475	475	475
P-values testing:										
Cash Treatments Equal	0.193	0.093	0.351	0.540	0.083	0.691	0.124	0.109	0.013	0.007
Equipment Treatments Equal	0.228	0.048	0.769	0.435	0.578	0.494	0.382	0.513	0.874	0.827

Notes:
All expenditure data truncated at the 99.5th percentile of the data.
All estimation includes wave effects which vary by gender, and by category in panel B. Standard errors in parentheses, clustered at the firm level.
High and Low profits refers to groups defined on pre-treatment profits.
Trimmed sample used. OLS estimation includes dummies for the matched quadruplets.
*, ** and *** denote significant at the 10%, 5% and 1% levels.

Table 5: Comparison of Characteristics of High and Low Profit Women

	Men	Low Initial Profit Women	High Initial Profits Women	Sri Lankan Women
Monthly profits in January 2009[a]				
Mean	130	38	173***	28
Median	91	37	137***	20
Monthly sales in January 2009				
Mean	502	187	822***	87
Median	240	120	500***	50
Total Capital Stock in January 2009				
Mean	611	251	456***	207
Median	255	102	162***	100
Age of Owner	35.4	35.9	37.0	41.1
Age of Firm	9.1	6.0	7.4**	9.5
Ever had a formal loan	0.07	0.08	0.15**	0.23
Keeps accounts	0.45	0.31	0.44**	0.29
Years of Education	10.04	7.80	8.63**	9.44
Digitspan Recall	5.70	4.59	4.80	5.68
Chose sector as it had low capital requirement	0.17	0.40	0.32*	n.a.
Chose sector for profit potential	0.18	0.11	0.18**	n.a.
Willingness to Take Risks	5.64	4.28	4.40	6.08
Save regularly	0.71	0.62	0.73**	0.67
Household Asset index	0.29	-0.40	0.14***	n.a.
Household has a Cellphone	0.94	0.88	0.91	0.22
Sample Size	**290**	**296**	**179**	**190**

Notes:
Means shown unless indicated otherwise. Trimmed subsample used.
*, **, and *** indicate high profit women statistically different from the low profit women at the 10%, 5% and 1% levels respectively.
a. Figures for Sri Lanka are reported as of March 2005 Sri Lankan baseline, converted at an approximate exchange rate of 100 Sri Lankan rupees to 1 cedi.
n.a. indicates not available in Sri Lankan data.

Table 6: Heterogeneity according to self-control and external pressure

Dependent variable: Real profits

Interaction Category:	Used a Susu at Baseline	Said they Save regularly	Discount rate above median	Hyperbolic Discounter	Lacks Self-control	Says there is pressure to share with hh	Can spend freely without spouse	Household Size	Number of Siblings in Area
Panel A: Pooling Treatment Effects across Gender									
Cash Treatment	-5.117	-34.97**	13.26	6.219	2.768	1.187	-8.618	2.191	0.414
	(11.05)	(14.58)	(13.92)	(10.33)	(8.579)	(9.886)	(18.29)	(8.350)	(8.624)
Equipment Treatment	25.24	-4.260	13.97	40.35***	29.80***	31.54**	8.972	28.79***	25.61**
	(15.34)	(9.341)	(11.20)	(14.49)	(10.81)	(12.49)	(13.33)	(10.62)	(10.40)
Cash Treatment * Interaction	14.54	50.95***	-21.97	-18.70	-16.13**	-0.705	13.44	5.937	2.166
	(16.70)	(17.69)	(17.15)	(16.82)	(8.102)	(17.82)	(22.54)	(4.238)	(3.284)
Equipment Treatment *Interaction	10.35	49.41***	31.00	-38.88**	-6.587	-23.61	20.68	0.451	6.469*
	(20.80)	(17.91)	(20.66)	(18.09)	(6.273)	(20.36)	(20.09)	(5.022)	(3.835)
p-value for testing interactions jointly zero	0.6355	0.001	0.1024	0.0708	0.0983	0.501	0.535	0.371	0.198
Observations	4,170	4,157	4,169	4,157	4,145	3,880	2,702	4,169	3,750
Number of firms	758	755	758	755	753	675	490	757	652
Panel B: Females Sub-sample only									
Cash Treatment	-8.313	-20.90	9.207	0.955	-0.608	-3.369	0.710	-3.461	0.0197
	(12.94)	(17.44)	(15.23)	(10.69)	(9.100)	(10.76)	(19.53)	(8.711)	(9.261)
Equipment Treatment	24.79	-2.700	12.62	41.12**	31.20**	35.56**	-4.982	30.52**	33.84**
	(21.96)	(8.508)	(11.47)	(17.56)	(13.04)	(17.04)	(12.88)	(13.40)	(13.80)
Cash Treatment * Interaction	12.37	28.15	-19.78	-11.43	-11.65	16.55	2.671	10.49**	5.174**
	(17.51)	(20.15)	(18.47)	(18.97)	(7.963)	(16.63)	(24.14)	(4.602)	(2.092)
Equipment Treatment *Interaction	14.44	50.76**	38.26	-34.74	-3.526	-10.42	42.57**	-1.392	2.144
	(27.10)	(20.86)	(25.00)	(23.17)	(7.445)	(23.13)	(17.84)	(6.528)	(2.694)
p-value for testing interactions jointly zero	0.704	0.033	0.139	0.297	0.318	0.479	0.051	0.064	0.045
Observations	2,588	2,586	2,587	2,580	2,574	2,398	1,730	2,592	2,375
Number of firms	471	470	471	469	468	418	312	471	414

Notes: Results from Fixed effects estimation on trimmed sample.

*, ** and *** denote significant at the 10%, 5% and 1% levels.

All regressions include wave effects which vary with the interaction.

Table 7: Is self-control just proxying for external pressure
Dependent Variable: "Lack of Self-control" Index

	Males & Females (1)	Married Males & Females (2)	Females (3)	Married Females (4)
Female	-0.0860	-0.0969		
	(0.0885)	(0.110)		
Baseline profits below the median	0.0954	-0.00624	0.101	-0.0329
	(0.0887)	(0.113)	(0.118)	(0.148)
Says there is pressure to share extra profits	0.0505	-0.0609	0.0359	-0.111
with other household members	(0.103)	(0.122)	(0.138)	(0.162)
Baseline household Size	0.0144	0.00290	-0.000428	-0.0191
	(0.0226)	(0.0305)	(0.0307)	(0.0404)
Number of Siblings in Accra/Tema	0.0239	0.0120	0.0378**	0.0250
	(0.0157)	(0.0208)	(0.0190)	(0.0238)
Agrees that whenever they have money on hand, their	0.0583	0.115	-0.00133	0.0620
spouse or other family members always end up requesting some.	(0.0989)	(0.125)	(0.128)	(0.154)
Agrees that people who do well in their business are likely to receive	0.0393	-0.100	0.0916	-0.0605
additional requests from family and friends for money to help out	(0.115)	(0.146)	(0.145)	(0.184)
Agrees that machines and equipment held in their business are a good	0.0303	0.0507	-0.00774	-0.0186
way of saving money so that others don’t take it.	(0.0906)	(0.113)	(0.115)	(0.143)
At baseline spouse had compelled them to give money that they		-0.0699		0.220
didn't want to during last 3 months		(0.158)		(0.210)
Can spend their income without consulting their spouse		-0.148		-0.219
		(0.122)		(0.156)
Spouse is supportive of them running a business		-0.218		-0.215
		(0.160)		(0.204)
Constant	0.00766	0.487**	-0.0548	0.493*
	(0.130)	(0.240)	(0.157)	(0.284)
Number of Observations	667	427	403	262
R-squared	0.009	0.017	0.010	0.025
P-value for testing joint insignificance of all variables	0.581	0.897	0.682	0.705

Notes:
Coefficients are from an OLS regression of an index formed as the first principal component of using a susu, saving regularly, being a hyperbolic discounter, and having above the median discount rate on the variables listed in the table.
Robust standard errors in parentheses; *, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

Appendix Table A1: Attrition Rates by Round

	All firms	Control	Cash	Equipment	P-value test of equality
Didn't Answer Survey					
Wave 1	0	0	0	0	1
Wave 2	0	0	0	0	1
Wave 3	0.029	0.031	0.010	0.042	0.106
Wave 4	0.073	0.086	0.068	0.052	0.303
Wave 5	0.112	0.131	0.099	0.089	0.262
Wave 6	0.080	0.102	0.047	0.068	0.050
Any Wave	0.166	0.196	0.131	0.141	0.070
Missing profits data					
Wave 1	0.080	0.091	0.071	0.071	0.615
Wave 2	0.016	0.013	0.025	0.010	0.477
Wave 3	0.069	0.076	0.061	0.071	0.740
Wave 4	0.098	0.123	0.076	0.071	0.064
Wave 5	0.129	0.149	0.121	0.106	0.207
Wave 6	0.114	0.141	0.086	0.086	0.059
Any Wave	0.285	0.329	0.236	0.246	0.019
Ever close business	0.064	0.073	0.063	0.047	0.463

Note: Test of equality if based on regression of attrition on treatment group with controls for stratification groups and robust standard errors.

Appendix Table A2: Robustness of Treatment Effect to Lee Bounds

Dependent Variable: Real Monthly Profits (Cedi)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	FE	OLS	OLS	FE	FE
Cash Treatment*Female	5.167	-2.298	6.093	1.148	-1.441	-3.297
	(8.545)	(8.768)	(8.767)	(7.106)	(8.927)	(7.226)
Equipment Treatment*Female	37.65**	32.87**	40.88***	9.378	35.34***	11.06
	(14.94)	(13.21)	(15.41)	(7.066)	(13.59)	(7.661)
Cash Treatment*Male	16.81	5.132	21.82	6.218	9.154	-5.718
	(13.25)	(16.10)	(13.28)	(11.28)	(16.02)	(13.87)
Equipment Treatment*Male	35.45**	27.83	37.26***	14.71	28.11	8.421
	(14.04)	(18.15)	(14.07)	(10.14)	(18.21)	(14.07)
Lee Bounding	No	No	Upper	Lower	Upper	Lower
Number of Observations	4203	4203	4165	4167	4165	4167
Number of Firms	764	764	764	764	764	764

Notes:

All estimation includes wave effects. Standard errors in parentheses, clustered at the firm level.

Trimmed Sample used for all columns

OLS estimation includes dummies for the matched quadruplets.

*, ** and *** denote significant at the 10%, 5% and 1% levels.

Appendix Table A3: How does Treatment Effect Vary with Time Since Treatment?
Dependent Variable: Real Monthly Profits

	Males and Females Pooled				Males		Females	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	FE	FE	OLS	FE	OLS	FE
Cash Treatment at 3 months	14.27	9.12	5.89	1.13	5.05	-2.58	11.52	3.25
	(10.26)	(8.01)	(11.23)	(8.31)	(15.03)	(15.86)	(9.15)	(9.24)
Cash Treatment at 6 months	7.18	6.30	-1.36	-2.75	16.11	5.90	-0.18	-8.42
	(9.86)	(9.16)	(17.27)	(10.34)	(17.21)	(20.45)	(10.32)	(10.91)
Cash Treatment at 9 months	12.97	5.99	9.60	3.74	12.64	11.01	2.37	-0.30
	(12.23)	(10.96)	(15.97)	(11.07)	(20.12)	(21.36)	(12.47)	(11.93)
Cash Treatment at 12 months	38.09***	27.98**	17.73	17.01	57.54***	30.41	10.01	8.82
	(13.55)	(12.81)	(23.52)	(13.42)	(20.87)	(25.94)	(16.15)	(14.69)
Equipment Treatment at 3 months	26.37**	26.65**	30.20**	18.86*	33.59	25.34	22.25*	14.81
	(12.10)	(11.42)	(12.64)	(11.36)	(22.86)	(24.82)	(11.89)	(10.06)
Equipment Treatment at 6 months	34.62***	32.61***	38.34***	25.49**	19.12	9.98	41.03***	35.16***
	(11.68)	(11.19)	(12.75)	(10.93)	(15.11)	(18.99)	(15.44)	(13.10)
Equipment Treatment at 9 months	48.33**	48.90**	54.91***	45.24**	39.49**	36.59*	54.76*	50.66*
	(20.63)	(19.96)	(20.25)	(18.50)	(17.33)	(19.41)	(30.35)	(27.33)
Equipment Treatment at 12 months	58.35***	46.91***	78.17***	58.00***	69.76*	75.71**	32.76*	47.10***
	(19.42)	(17.52)	(19.23)	(17.02)	(35.62)	(36.58)	(17.47)	(15.33)
Constant	119.70***	102.20***	120.34***	103.05***	127.88***	128.69***	86.43***	87.33***
	(8.85)	(4.40)	(7.38)	(3.71)	(7.52)	(6.47)	(5.40)	(4.49)
Baseline trimming	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	4354	4203	4354	4203	1599	1599	2604	2604
Number of Firms	792	764	792	764	290	290	474	474
P-value for testing constant effect:								
of Cash Treatments	0.166	0.435	0.262	0.389	0.170	0.534	0.579	0.353
of Equipment Treatments	0.492	0.577	0.121	0.163	0.458	0.249	0.189	0.057

Notes:
All estimation includes wave effects. Standard errors in parentheses, clustered at the firm level.
*, ** and *** denote significant at the 10%, 5% and 1% levels.
Trimmed specifications trim out matched quadruplets which have at least one firm with profits above 1500 cedi per month in wave 1 or 2.
OLS estimation includes dummies for the matched quadruplets.