Female Microenterprises and the Fly-paper Effect: Evidence from a Randomized Experiment in Ghana*

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Abstract

Standard models of investment predict that credit-constrained firms should grow rapidly when given additional capital, and that how this capital is provided should not affect decisions to invest in the business or consume the capital. We randomly gave cash and in-kind grants to male- and female-owned microenterprises in urban Ghana. Our findings cast doubt on the ability of capital alone to stimulate the growth of female microenterprises. First, while the average treatment effects of the in-kind grants are large and positive for both males and females, the gain in profits is almost zero for women with initial profits below the median, suggesting that capital alone is not enough to grow subsistence enterprises owned by women. Second, for women we strongly reject equality of the cash and in-kind grants; only in-kind grants lead to growth in business profits. The results for men also suggest a lower impact of cash, but differences between cash and in-kind grants are less robust. The difference in the effects of cash and in-kind grants is associated more with a lack of self-control than with external pressure. As a result, the manner in which funding is provided affects microenterprise growth. JEL Codes: O12, O16, C93

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1 Introduction

Despite the emphasis placed by microfinance organizations on lending to female business owners, evidence from three recent randomized controlled trials has cast doubt on the ability of capital alone to grow female-operated microenterprises (de Mel et al 2008, Banerjee et al 2010, and Karlan and Zinman 2010).[1] 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.

These results raise questions about the underlying reasons for capital's seeming limitations in spurring growth of female-run businesses. The existing literature focuses on two potential explanations. The first is that labor market imperfections limit opportunities for women in wage work, leading to higher rates of entry into self employment (Emran et al. 2007). Women excluded from wage labor markets may have low efficient scale, and hence already be operating at their efficient level of capital. Barriers to participation in the wage labor market are particularly strong in societies like those in South Asia, as evidenced by low labor force participation rates among women. This raises the question of whether capital might be more successful in growing female-owned microenterprises in other areas of the world.[2] In much of Africa, for example, female labor force participation rates are higher than in Asia, and women are more integral to household income generation. It is therefore possible that the scope for female firm growth from more capital is higher in Africa. This is specially true in Ghana, a developing country known for its vibrant tradition of female enterprise (e.g., Hill 1984).

A second explanation which has received attention is that the small scale of many female-owned firms is in fact not efficient, but instead arises from a lack of separation between household and business decision-making and from inefficiencies in the way people allocate assets between them. One form of inefficiency can arise from self-control problems, leading individuals to not undertake productive investments today that have large payoffs in the future (Banerjee and

[1] Bjorvatn et al. (2011) also find no effect of capital grants on either male of female small businesses in Tanzania, but their sample is restricted to non-credit constrained entrepreneurs so it is unclear how relevant these are for microenterpreneurs in general.

[2] This is related to the more general issue 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).

Mullainathan, 2010; Duflo et al, 2010). A second form of inefficiency can come from inefficient intra-household allocation of resources (Udry, 1996; Somville, 2011) or pressure to share with others in ones social network (Charlier, 1999; Platteau, 2000; di Falco and Bulte, 2009). Either of these cases can cause a lack of asset integration, so that it is not only how much capital, but whether, for example, the capital comes as a shock to cash or a shock to business inventories, which determines the extent to which it helps grow the business. On this question there is limited evidence with regard to microenterprise investment. De Mel et al (2008) find no difference in the effect of grants provided in cash or in-kind in an experiment in Sri Lanka. But Drexler et at (2011) find evidence that training microenterprise owners to separate household and business accounts has positive effects on enterprise revenues.

This paper uses a randomized experiment in Ghana to test both for differences in returns by gender and difference in returns to capital provided in-kind or in cash. The design follows closely that used by de Mel et al in Sri Lanka. A sample of both female and male microenterprise owners who had no paid employees at the time of the baseline survey were randomly allocated into treatment and control groups. The treatment group received grants of 150 Ghanaian cedis (approximately $120 at the time of the baseline). As in Sri Lanka, half the grants were provided in cash and half in kind. A key difference is that the Ghanaian sample contains more than twice as many firms as in the Sri Lankan study, providing more power to distinguish the effects of providing capital in different forms. Thus, the paper serves as more than a test of external validity for the Sri Lanka results. By using the different context and the larger sample, we have the power to focus more attention in our analysis on the differences in gender and the differences in cash vs. in-kind treatments.

To preview the results, we find both similarities and differences with Sri Lanka. First, consistent with the earlier results, we find that average returns to capital are extremely high. On average, a grant of 150 GhC (about $120) increases monthly profits by about 25 GhC, a return of just more than 15% per month. When we split the sample by gender, we find large average returns for both males and females,[3] the latter result suggesting some differences with

[3]The high marginal returns to the capital shocks for males are consistent with non-experimental work in Ghana which has found evidence of high returns to capital for male-owned informal enterprises. 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.

Sri Lanka. However, for females, we find that returns are positive only for women with baseline profits above the median. Among the sample of women with below-median baseline profits, those with more subsistence business, we find the grant has no effect. The subsample with below median profits in Ghana has characteristics which are very similar to the full sample of females in Sri Lanka. Hence, in both countries, we find that capital shocks have no effect on profits in subsistence enterprises owned by females. The women with more robust businesses earn high returns from the grants in Ghana; they are absent from the sample in Sri Lanka, consistent with differences in female labor force participation in the two countries.

As we have noted, de Mel et al find no differences in returns to grants provided in cash or in-kind in Sri Lanka. In Ghana, we find that the return depends very much on the way in which the grant is delivered. High returns are generated only when the grant is delivered in-kind, a result which is particularly strong among females. We find that little of the cash grant finds its way into the business. Moreover, the largest differences between cash and in-kind grants are in the sample of females with above median baseline profits. These are precisely the women who are not represented in the Sri Lanka sample, where de Mel et al find no differences for cash and in-kind grants.

We note that in Africa, even lenders often provide loans 'in-kind,' for instance by giving fertilizer and other inputs to farmers instead of offering them cash to purchase the inputs they need. The standard response of economists to this is that resources are fungible, and only under special circumstances should we expect the in-kind loans (or grants) to produce results different from cash loans (or grants). With this in mind, we write down a simple framework, building up from the Ramsey model, to make clear when and where we might expect cash grants and in-kind grants to produce different results, and in which a "flypaper effect" can arise such that inducing capital to be initially invested in the business causes it to stick there, even though it is in an easily liquidated form of capital.

The experiment thus allows us to test between competing models of microenterprise investment and growth. The results are not consistent with either a standard Ramsey model or with a variation of this model that incorporates time-inconsistent preferences. To explain a large difference in outcomes between cash and in-kind grants, we need a model with a flypaper effect, that is, a model with a lack of asset integration where the form in which capital arrives affects the extent to which it is invested in the business. We argue that a flypaper effect might arise if forcing the initial grant to take the form of equipment and inventories helps the entrepreneur

resist pressures to divest.

We examine two possible types of pressure: self-control issues caused by time-inconsistent preferences, high discount rates, or lack of ability to save; and external pressure from others to share the additional capital. We find that the effect of the cash treatment is significantly more positive for individuals with the most self-control while the effect of the in-kind treatment is not significantly different. This suggests that handing out capital in kind helps entrepreneurs with a self-control problem keep the capital invested in the firm. The flypaper effect thus arises from a combination of asset non-integration and present bias, and is relevant only for entrepreneurs who are present biased.

This interpretation is broadly consistent with the recent evidence in Spears (2009) who suggests that present-bias is a key constraint on microentrepreneurs expanding their businesses. But it contradicts other results that emphasize external pressure: evidence from Anderson and Baland (2002) for Kenya and from Somville (2011) for Benin suggests that women seek to save outside the household in order to avoid contributing to household expenses; and findings by Brune et al. (2011) in Malawi suggest that the reason for the success of a saving commitment product is the desire to escape external pressure. In our urban environment such social pressures may be less, especially for individuals who have self-selected into running microenterprises.

The remainder of the paper is structured as follows. In Section 2 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

2.1 Asset integration and the flypaper effect

While much recent research has focused on the saving ability of poor households (e.g., Ashraf, Karlan and Yin, 2006; Banerjee and Mullainathan 2010), less is known on the enterprise investment behavior of the poor. The literature on saving has brought to light behavioral reasons – such as quasi-hyperbolic discounting or response to consumption impulses – for departure from time consistent choices. Less is known about behavior factors possibly affecting investment

choices. In standard models of investment, such as the Ramsey model – or in Laibson's (1997) $\beta\delta$ model of time inconsistency – the investor is assumed to condition choices on cash-in-hand, that is, on the combination of current monetary income and liquid wealth. In other words, investment decisions depend on total cash-in-hand, not components of liquid wealth, and there is no flypaper effect. We illustrate this principle in Appendix 1 under both modeling frameworks.

Evidence from laboratory experiments, however, has suggested that individuals often fail to integrate all their assets into a single cash-in-hand measure when making decisions. For instance, it is common for experimental participants to exhibit considerable risk aversion even though the stakes are very small 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 labor decisions. What is unclear, however, is how the failure to integrate assets may affect the investment decisions of poor households, and what policy implications this may have.

Valuable insights into this question can be gained by observing common practices in grant and credit programs directed at the poor. It is common for poverty alleviation programs to restrict the usage that recipients can make of the grants and subsidies they receive. Examples of restricted grants include: food stamps; school vouchers; conditional cash transfers; subsidized housing, education and health care; and homeless shelters. These restrictions are present even though the Le Chatelier principle predicts that restricting grant usage can only reduce the maximum utility that a recipient can achieve.

Similar observations can be made regarding credit. Most consumer credit is provided in kind, in the sense that the lender pays for the good or service financed with the loan. Examples include: house and car loans; supplier credit for inputs and equipment; and agricultural loans in fertilizer and other inputs.[4] These restrictions probably serve multiple purposes, such as sale promotion or collateral protection. But these explanations are unlikely candidates for certain credit forms such as in-kind fertilizer credit to small farmers where fertilizer is easily fungible and is not collaterizable (e.g„ Duflo et al. 2010). One alternative explanation suggested by some

[4] Forms of credit that at first glance appear unrestricted – such as an overdraft facility or a credit card – include some restriction on usage. An overdraft facility granted for business purposes will typically be withdrawn by the bank if used for other purposes. Cash withdrawals on a credit card are limited to a small daily amount, which restricts the use of credit for gambling or for purchasing illegal goods and services.

of the above examples is the fear that unrestricted funds may be used for the 'wrong' kind of expenditure – e.g., for spending on consumption or transfers to others instead of on investment, or for fufilling a need for instant gratification rather than a forward looking purpose (e.g., De Mel et al 2009a).

To investigate this possibility, we rely on an experimental design inspired from the above examples, that is, a design in which capital is forced to stay, even for short while, within the firm. We wish to test whether forcing the capital grant to be initially invested in the firm leads it to 'stick' within the firm even though it can easily be divested. Such a flypaper effect is difficult to account for within a standard framework. But it can be interpreted as a failure of asset integration: funds invested in inventories are seen by the household as distinct from household cash-in-hand even though, in the kind of enterprises we study, they are quite liquid.

2.2 What does theory say about a flypaper effect?

In Appendix 1 we present a standard Ramsey model with credit constraints as well as a capital accumulation model with $\beta\delta$ time inconsistency. Both models are organized around two key assumptions which characterize the population of microenterprises we study: entrepreneurs cannot borrow and have to self finance (only 10 percent of our sample has ever had a formal loan); and heterogeneous ability is a complement to capital, which implies that entrepreneurs have different optimal firm sizes.

The standard and time inconsistent models both predict that the long-term effect of the cash and in-kind grants on capital and profit are nil for firms that have already reached their steady state capital level. For these firms, the short-term effect of the cash grant on capital and profit is also nil. For the in-kind grant, there is a short-term increase in capital and profit until the household is able to divest, but this is expected to happen as soon as is feasible. In contrast, for firms that are below steady state, both models lead us to expect no difference between cash and in-kind grants: both treatments are predicted to be entirely invested and their effect is simply to reduce the time taken to reach the optimal firm size.

To generate a flypaper effect for firms that have not yet reached their optimal size, a different theory is needed. This theory, whatever its micro foundation may be, must have the feature that in kind grants are not treated as fungible with cash grants. This can be represented formally by letting the law of motion of entrepreneurial capital be written as:

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

where $h_t \equiv c_t + w_{t+1} - (1+r)w_t$ represents what is taken out of the enterprise either to be consumed, given to others, or invested in other assets. In the Ramsey and time inconsistent models, the optimal choices of consumption c_t and savings w_{t+1} depend on total cash-in-hand $k_t + \pi(k_t, \theta) + (1+r)w_t$. Unless k_t is illiquid, increasing k_t or π_t has the same effect on cash-in-hand and thus on h_t, k_{t+1} and π_{t+1}. In the more general case, $h_t = h(\pi_t, k_t)$ and asset integration requires that $h(\pi_t, k_t) = h(\pi_t + k_t)$. If households regard k_t and π_t as not fungible, they are imperfect substitutes in $h(k_t, \pi_t)$ and there is no asset integration, i.e., $h(\pi_t, k_t) \neq h(\pi_t + k_t)$. A flypaper effect arises if $\partial h/\partial k < \partial h/\partial \pi$: the rate at which the household extracts funds from the firm is higher for profit than for liquid capital. This simple observation forms the basis for our testing strategy for the difference between in-kind and cash grants.

There are several possible micro-foundations for $h(\pi_t, k_t)$, and hence several reasons for the existence of a flypaper effect. Asset integration may fail because assets k_t are less susceptible to internal pressure than profits π_t. Turning working capital into inventories or equipment may serve as a self-commitment device against the temptation of impulse purchases. This is akin to consumers putting money in a savings account that is not conveniently accessible. Cash and inventories may also be seen as different mental accounts, thereby serving as a mental device to resist the temptation to divest.

Another possibility is that pressure from household members works as a tax on the business with $\frac{\partial h}{\partial \pi} > \frac{\partial h}{\partial k} \geq 0$. Money tied up in inventories or equipment, being slightly less liquid, may be partly insulated from external pressure. A similar point is made by Schaner (2011) for bank accounts. If successful, this tactic would yield a marginal tax rate on cash flow $\frac{\partial h}{\partial \pi}$ that is higher than the marginal tax on capital $\frac{\partial h}{\partial k}$. If the flypaper effect signals an effort to escape taxation of this kind, it is more likely to be observed among enterprises operated by more subordinate household members, such as married women. Anderson and Baland (2002) for instance show that women in urban Kenya join rotating savings and credit associations (ROSCAs) to shelter money away from their spouse. A similar result is reported by Somville (2011) for Benin. de Mel et al. (2009a) suggest women may inefficiently over-invest in less liquid forms of business assets in order to resist spousal pressure.

Pressure to redistribute resources can also be exerted from outside the household. 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 can make it hard for individuals to save and invest, 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. Evidence of external pressure to resdistribute has been documented by numerous authors.[5] Much of this evidence, however, comes from rural societies where the enforcement of sharing norms can occur through repeated social interaction between a small set of individuals. Social pressures may be weaker in urban environments like ours.

In the presence of a flypaper effect, cash and in-kind treatments have systematically different effects. To illustrate, consider the simple case where $\frac{\partial h}{\partial k} = 0$ but $\frac{\partial h}{\partial \pi} > 0$, and thus $h(\pi_t, k_t) = h(\pi_t)$. A steady state firm size k^v is defined as a capital stock that satisfies:

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

To fix ideas, consider a linear function of the form $h_t = a\pi_t + b$ with $0 < a < 1$. The law of motion of capital becomes:

$$k_{t+1} = k_t + (1 - a)\pi(k_t, \theta) - b \tag{2}$$

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, difference equation (2) has two equilibria: 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

[5] 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 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, Guirkinger and Mali (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. Jakiela and Ozier (2011) find in a lab experiment in rural Kenya that women invest less when the income they earn is observable to relatives, even when this reduces their expected total earnings. 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.

to be part of our sample. Equation (2) can then be rewritten to accommodate cash and in-kind grants M_t and E_t, respectively:

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

For initial values of k such that $k^v_{low} < k_t < k^v_{high}$, the in-kind treatment E_t has a one-for-one effect on capital stock k_{t+1} – the flypaper effect – but the cash treatment only has a $1-a$ effect on k_{t+1}.

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

The above example can be generalized to allow h_t to depend on both π_t and k_t. For instance, let $h_t = a\pi_t + \eta k_t + b$ with and $0 < \eta < 1$. The no-closure stable steady state k^w is the (highest) value of k that solves:

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

It follows that equilibrium firm size is a decreasing function of both a and η. The in-kind treatment has a $1-\eta$ effect on k_{t+1} while the cash treatment has a $1-a$, also less-than-one-for-one, effect on k_{t+1}. Asset integration requires that $a = \eta$. If investing in inventories and equipment is successful as protecting the capital of the enterprise, we should observe $a > \eta$. This forms the basis of our testing strategy.

2.3 Testing strategy

We estimate models of the form:

$$\pi_{i,t+s} = \beta_1 M_{it} + \beta_2 E_{it} + u_{i,t+s} \tag{3}$$

$$k_{i,t+s} = \alpha_1 M_{it} + \alpha_2 E_{it} + v_{i,t+s} \tag{4}$$

where t is the time of treatment, $\pi_{i,t+s}$ is the profit of entrepreneur i at time $t+s$ after treatment, $k_{i,t+s}$ is the capital stock, M_{it} and E_{it} denote cash and in-kind grants, respectively, and $u_{i,t+s}$ and $v_{i,t+s}$ 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 standard Ramsey and $\beta\delta$ 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 in-kind treatment is not immediately fungible, these models also predict $\alpha_2 > 0$ and $\beta_2 > 0$ for a small time from treatment s, 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 model without asset integration makes predictions that depend on the form taken by the external pressure function $h(.)$. As argued in the previous sub-section, when firms are at or above steady state, the return to capital in the business is low. Consequently, even recipients of the in-kind treatment wish to take the capital out of the business. Hence there should be no difference with the response to the cash treatment for this category of entrepreneurs: in both cases, the capital grant will not 'stick'.

When firms are below steady state, there is a tension between what is best for the business and what internal and external pressures are demanding. If receiving the capital grant in kind helps the entrepreneur resist these pressures more successfully, we expect to observe a flypaper effect for in-kind grants, resulting in a higher growth in profits and capital stock, whereas the cash treatment has less effect. In contrast, asset integration requires that $\alpha_1 = \alpha_2$ and hence that $\beta_1 = \beta_2$.

We have discussed two main reasons why household asset integration may fail: internal pressure driven by self-commitment problems; and external pressure from household and family members. If external pressure comes primarily from husbands, unmarried women should show a lower a and η 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 $a = a_0 + a_1\mathbf{z}$ and $\eta = \eta_0 + \eta_1\mathbf{z}$ with $\mathbf{z}$ a vector of proxies for different kinds of external pressure. We estimate

a model of the form:

$$\begin{aligned}\pi_{i,t+s} &= (1-a)M_{it} + (1-\eta)E_{it} + v_{i,t+s} \\ &= (1-a_0)M_{it} - a_1 M_{it}\mathbf{z}_i + (1-\eta_0)E_{it} - \eta_1 E_{it} z_i + v_{i,t+s} \end{aligned} \tag{5}$$

If a specific element of $\mathbf{z}_i$ is associated with a higher implicit tax rate on cash flow, then the coefficient of $M_{it}\mathbf{z}_i$ should be negative and significant. Similarly, if it is associated with higher taxation of capital, the coefficient of $E_{it}\mathbf{z}_i$ 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 immediate gratification. In this context, keeping excess liquidity in less fungible inventories and equipment can be seen as a way to insulate working capital from temptation. If this strategy is successful, we should observe that $\eta_1 < a_1$ for individuals with more self-commitment problems proxied by $\mathbf{z}_i$.

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 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), where only 7.8 percent of prime age females are self-employed, 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 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 to identify those with an individual aged 20 to 55 who was self-employed and working 30 or more hours per week in a business with no paid employees and no motorized vehicle. 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, showing the predominance of women among small enterprise owners in urban Ghana. Based on the gender mix of self-employed in these industries in the 2000 Census, we classified business sectors 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. 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 limited the sample from each EA to no more than 5 males in male-dominated and 5 males in mixed industries, and no more than 3 females in female-dominated and 3 females in mixed industries. We also ensured 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 (see the timeline in Table 1). 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.[6] 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

[6] In particular, 55 of the initial 907 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.

168 in mixed industries).

3.2 Experimental design

The design of the experiment closely followed that used in Sri Lanka by de Mel et al. (2008, 2009a). 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 cedis (approximately US$120 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 cedis 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 the in-kind treatments were chosen 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 that they had won a cash prize for participating in our survey, and then received the cash through money transfer at a local bank or in-person.

We 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 were 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 cedis 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 in-kind 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 is motivated by the literature referenced earlier that has suggested that many individuals who succeed in raising their incomes face large demands to share it from others. Stratification on baseline capital stock was done both because this was believed to be a variable which would be correlated with future profits, and 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 as well as to investigate treatment heterogeneity in this dimension. It also enables us to eliminate quadruplets with outlier values of pre-treatment profits and still be assured of balance and 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 2 (and tables A1 and A2) 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 asked: "After paying all expenses, what was the income of the business (the profits) during the last month? (Consider all expenses, including wages of employees but not including any income you paid yourself as an expense)". This definition of profit thus includes the return to the entrepreneur's labor and managerial talent. 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 exceeded a pre-specified threshold. 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 2 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) cedis, and mean (median) capital stock at the same point in time was 452 (172) cedis. The grants of 150 cedis 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 a small number of firms with much higher levels – the maximum profit reported in our pre-treatment waves is over 5000 cedis per month. The inclusion of these few larger firms does not have much effect our basic results, but has a larger effect on our analysis of treatment heterogeneity. As discussed below, we therefore focus most of our analysis involving heterogeneity of treatment response on the firms in quadruplets which have baseline profits of 1500 cedis per month or less. Since randomization occurred within quadruplets, balance on baseline characteristics is achieved for this subsample also.

Table 2 shows that overall the two treatment groups look similar to the control group in terms of pre-treatment characteristics. The only 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). 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.

As seen in Table 1, the mean owner in our sample is 36 years old, has almost 9 years of schooling, and has been running the firm for 7 years. 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 not 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).[7]

4 Estimation of Experimental Treatment Effects

Only nine firm owners assigned to receive a grant (2% of those assigned to treatment) did not receive one. One of these firm owners had died, three women refused the grant saying their husbands would not let them accept it, and the other five 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 is 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 empirical 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 in-kind and cash treatments have distributions to the right of the control distribution, with separation over most of the range of profits. The in-kind and cash treatments have similar distributions up to about the 80th percentile, and then separate with the distribution of profits for the in-kind 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 in-kind distribution lies to the right of the other two groups, this separation only occurs at about the 50th or 60th percentile. That is, for women, there is a flypaper effect but it only affects the top half of the distribution.

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

[7] 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.

the form:

$$\pi_{it} = \beta_1 M_{it} + \beta_2 E_{it} + \sum_t \delta_t D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it} \quad (6)$$

where M_{it} and E_{it} are dummy variables indicating whether firm i has been assigned to receive either the cash or in-kind 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.

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 (6) 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 cedis.[8] In addition to OLS estimation conditional on group dummies, we also estimate equation (1) via individual fixed effects. The inclusion of fixed effects controls for any time invariant small-sample differences between treatment groups. We cluster errors at the firm level in all specifications.

The first four columns of Table 3 show the treatment effects for the pooled sample. All four specifications show a large positive impact of the in-kind treatment on firm profits. Monthly firm profits are estimated to be 31-43 cedis higher as a result of the 150 cedis in-kind 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 in-kind treatment, and we can reject the absence of a flypaper effect 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 in-kind grants.

These initial results pool together all waves of the survey, thereby giving the average impact of the treatments over the observed time period and improving power (McKenzie, 2011). We observe firms at quarterly intervals, up to 12 months after treatment. Appendix 3 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 in-kind treatments are greater 9-12 months after treatment than immediately afterwards, but we reject equality of treatment effects over time at the 10% level only for the in-kind treatment for females, and then

[8] 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 balanced 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.

only with a fixed effects 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.

In the remainder of Table 3 we allow the impact of the grants to vary by gender. Recall the randomization was stratified by gender. We modify equation (6) to allow both the treatment and wave effects to vary by gender:

$$\pi_{it} = \beta_1 F_i M_{it} + \beta_2 F_i E_{it} + \beta_3 (1 - F_i) M_{it} + \beta_4 (1 - F_i) E_{it} + \sum_t \delta_t D_{it} + \sum_t \delta_t^F F_i D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it} \quad (7)$$

where $F_i = 1$ if entrepreneur i is female, and 0 otherwise. Columns 5 and 6 estimate equation (7) by OLS with quadruplet dummies, and columns 7 and 8 with individual fixed effects. Finally, columns (9) and (10) restrict the OLS estimation to the last two waves of data. This corresponds to the data in Figures 1 and 2.[9]

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 in-kind grant is large (35-50 cedis) and statistically significant. In all specifications we can reject equality of the cash and in-kind treatment effects. This confirms what is seen visually in Figure 2, that only the in-kind grants have a significant effect for women. For males, the in-kind 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 in-kind treatment effect for males is very similar to that for females, and we cannot reject equality of in-kind treatment effects by gender in any specification. In contrast to females, we can never reject equality of cash and in-kind treatment effects for males, despite the point estimates always being smaller for the cash than the in-kind treatment.

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 seen in Figure 1. However, using all waves of the data, the estimated impact varies between 5 and 29 cedis depending on specification, with large standard errors. The impact of cash is larger using OLS than fixed effects because of the slight imbalance in wave 1 profits for males. The group assigned to the

[9] Readers may be concerned that profits are artificially high in the quarter immediately after the equipment treatment if firms receiving inventories to sell count this as pure profit. But Appendix 3 shows that, if anything, the treatment effect is rising with time since treatment. Furthermore, the treatment effects are still present when focusing on these final rounds which are six months or more removed from almost all the treatments.

cash grant has higher wave 1 profits (despite the same wave 2 pre-treatment profits) than either the control group or the group assigned to the in-kind treatment. Because we balanced on wave 2 profits in the randomization, the imbalance is due to chance. It is therefore not clear whether or not one should control for this pre-treatment 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. But 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.

4.2 Treatment Heterogeneity by Randomization Strata

Next we 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:

$$\begin{aligned}\pi_{it} =& \beta_1 A_i M_{it} + \beta_2 A_i E_{it} + \beta_3 B_i M_{it} + \beta_4 B_i E_{it} \\ &+ \sum_{t=2}^{6} \delta_t D_{it} + \sum_{t=2}^{6} \delta_t B_i D_{it} + \sum_{g=1}^{G} \gamma_g S_{ig} + \varepsilon_{it} \end{aligned} \tag{8}$$

The results are shown in Table 4. 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 cedis effect in female-dominated industries versus a 1.8 cedis effect in mixed industries, and the in-kind treatment has a 25.4 cedis effect in female-dominated industries compared to a 39.8 cedis 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 state 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, while columns (7) and (8) define initial size in terms of initial profits. 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 cedis (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 in-kind 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 in-kind grants is extremely large for these female firms – monthly profits increase by 77 to 96 cedis per month for the female firms in high initial profits quadruplets, compared to an insignificant 2 to 5 cedis 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 in-kind grants only increase profits for female-owned firms which were larger in size to begin with. The in-kind 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.

5 Interpretation of the results

5.1 Where do the grants go?

Table 5 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), since the OLS results are similar.

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 cedis. Both specifications suggest that capital stock is increasing by more for the in-kind 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 the effect of cash and in-kind grants 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 in-kind grants.

Figures 3 and 4 show the empirical CDFs of the post-treatment capital stock distribution by treatment group and gender for the final two waves of the survey. For males, Figure 3 shows a similar pattern to that of profits – namely that the distribution of the in-kind 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, a pattern similar to that seen for profits. The in-kind grant distribution then separates from the control above this, with women in the in-kind 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, asked 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 given more. On average they are estimated to have given 8 cedis more a quarter over the last 3 quarters of the survey. This 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 the control group and firms treated after wave 3 only marginally increases the coefficient on the cash treatment, raising it to 8.9 cedis.

The remaining columns report the estimated impacts on household expenditure, which was collected each wave.[10] Point estimates suggest higher positive impacts on expenditure for those receiving the cash treatments than those getting the in-kind treatment or the control group, especially for women with low initial profits. We 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 cedis cash grant are estimated to be spending 120 cedis 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 cedis (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 cedis 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 in-kind grants ended up in the business than the cash grants. Women, especially those with

[10] Unlike profits, panel consistency checks were not programmed for household 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.

lower initial profits, appear 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 in-kind grants than cash grants on business 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 for the high initial profit group. 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 6 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 cedis, 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 6 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 a particular sector, 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 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 GhC 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. Such businesses fit the hypothesis of Emran et al. (2007) that many of the women drawn into subsistence self-employment have very low efficient scale and are there only because of labor market imperfections. As a result, according to our models, neither cash nor in-kind grants should have any long-term impacts on business profitability for these types of low productivity firms. The difference is that the Ghanaian sample also includes a group of more successful female-owned businesses with larger scale, who do show increased profit growth from at least the in-kind treatment.

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

Our results show that cash and in-kind grants have very different impacts on the profitability of female-owned businesses, with this difference arising from the impacts on the initially more profitable women. This section investigates empirically why this difference arises.

6.1 Can this variation be explained by a standard Ramsey model?

As shown in the appendix, the only way a difference between the two treatments can arise in the standard Ramsey model (with or without time inconsistent preferences) is if the in-kind treatment cannot be liquidated immediately and the firm has already reached its steady-state. In this case, profits and capital should rise above their steady state levels after the in-kind treatment, but only until the illiquid capital can be divested.

Before empirically testing this, we note that it does not appear likely from a practical standpoint in our study. There is a relatively long lag between treatment and the ex post surveys. The time lag between receiving a grant and the immediately subsequent survey is nearly 3 months. For those who received the grant after round 2, there is an interval of nearly 12 months between receiving the grant and the last survey round. For those receiving the grant after round 3, the

time interval is 9 months. Given that recipients of in-kind grants invest in raw materials, inventories, or simple equipment, it would be easy to decapitalize in-kind grants between treatment and the next survey round, especially since people got to choose the specific form of the in-kind grant so if the added capital was taking them above their desired level, they could have chosen capital that was particularly easy to liquidate.

From an empirical standpoint, the prediction of the standard model is that any difference in treatment effects should be very short-lived. In contrast, appendix Table A3 shows that the in-kind treatment effect remains positive and significant for both females and males 9 and 12 months after treatment, while, for females at least, the cash treatment effect is small and insignificant. Likewise, as we will see, the same is true for capital stock, with the in-kind grants remaining in the firm. As a result, standard models with asset integration cannot explain the difference in treatment effects.

6.2 Explaining the difference through a lack of asset integration

We therefore must turn to models of business decision-making that feature a lack of asset integration, as set out in the conceptual section. This lack of asset integration and the presence of a flypaper effect may arise because of internal pressure (a lack of self-control) or external pressure to share, and should only lead to a sustained difference in the impacts of the in-kind and cash treatments for firms that are below their efficient size.

Our surveys contain various proxies for both the degree of self-control of the owner, and the degree of external pressure to share facing them. We have four proxies for self-control and the ability to save cash, all of which were measured pre-treatment. These are whether the respondent used a susu collector, whether they agree with the statement "I save regularly", whether they are above or below the median discount rate when asked a standard hypothetical discounting question about the amount today that would leave them indifferent between that and 100 cedis one month from now; and a standard measure of hyperbolicity, based on whether their preferences switch to be more patient when asked to choose between amounts at 5 and 6 months. Since each of these proxies is binary and are likely interrelated, we extract the common signal from them by taking their first principal component. Appendix Table 4 shows the weights on each variable, with this component loading most strongly on the discount rate and hyperbolicity variables.[11] We call the resulting index our "lack of self-control" measure.

[11] As a result, the results are very similar when we just use the discount rate and hyperbolicity variables in

Our surveys also contain a number of proxies for external pressure to share. We begin with four self-assessed measures: whether the firm owner says they feel a lot or some pressure to share extra business income with other household members rather than invest in the business; whether they agree that whenever they have money on hand, their spouse or other family members always end up requesting some; whether they agree that people who do well in their business are likely to receive additional requests from family and friends to help out; and whether they agree that machines and equipment held in their business are a good way of saving money so others don't take it. We call the first principal component of these variables our "narrow external pressure" index, which loads most strongly on the second and third variables listed here – which are those which were used to construct the "high capture" measure we stratified the randomization on.

We also consider a broader measure of external pressure which additionally adds whether or not the individual is married, their household size, and the number of siblings in Accra/Tema in forming the principal component. The presumption is that, all else equal, people who are married, who have larger households, and who have more siblings in the area will have more demands to share. However, they may also confer advantages on the business owner such as larger networks or more support for the business. We denote this index "broad external pressure".[12]

We then re-estimate our treatment model, allowing for heterogeneity in the treatment effects by these measures of internal and external pressure. There are several caveats to interpreting these results. First, with the exception of the "high capture" dummy which we examine in Table 4, treatment randomization was not stratified on any of the underlying variables, nor on the indices formed. Our analysis should therefore be viewed as exploratory in nature, examining mechanisms for the behavior observed. Second, one may worry about the extent to which the variables are truly capturing the underlying theoretical concepts. For example, people may use a susu collector to keep money away from others (as in Anderson and Baland, 2002), or to overcome their own self-control issues. Likewise, people who know that others will exert pressure on them to share if they have cash on hand may respond by exhibiting high discount rates. The use of principal components helps overcome this concern to some extent, by drawing out the common signal in interrelated variables. Moreover, the indices are not very highly correlated:

constructing the principal component. Results available upon request.

[12] We also tried additional measures of external pressure measured in terms of proxies for bargaining power differences among married couples (such as age and education differences, share of assets brought to marriage, and whether they could spend money without the spouse's consent). These variables are only available for the subset of married individuals, and did not explain the difference between cash and in-kind treatments.

the lack of self-control index has a correlation of 0.043 with the narrow external pressure index and 0.065 with the broader index. Empirically the lack of self-control index therefore appears to be capturing a different concept than the external pressure index is.

Table 7 then presents the results. First, pooling men and women in columns 1 and 2, we see that there is a strong negative and significant interaction between lacking self-control and receiving the cash treatment. Since the lack of self-control index varies from -1.68 to +2.26, someone with the most self-control has a cash treatment effect in column 1 which is approximately the same as their in-kind treatment effect. In contrast, the interaction of cash with either the narrow or broad measure of external pressure is positive (the opposite of what we would predict if pressure to share is the reason for lack of growth from cash) and insignificant.

The remaining columns of table 7 then split the sample into the initially high profit women, the initially low profit women, and men. For initially high profit women, we see a strong and significant interaction between the cash treatment and a lack of self-control. The point estimate is large enough to explain away the gap in impact between the cash and in-kind treatment for those women with high levels of self-control. In contrast, there is a small and insignificant interaction of the cash treatment with the narrow measure of external pressure, and the interaction is actually positive and weakly significant for the broader measure of external pressure. This appears to be coming from the household size and sibling components, and is consistent with Grimm et al. (2010) who find a positive impact of nearby networks on firm growth. In contrast, for initially low profit women, we see no significant interactions with either self-control or external pressure measures, which is consistent with them already being at their technically efficient firm size, and having no scope to grow. Finally, for men we get a relatively large negative point estimate on the interaction of lack of self-control with cash that is similar in scale to that for women, but less precise and statistically insignificant. Appendix Table 5 presents the treatment interactions when treatments are interacted one at a time with each individual proxy variable used in forming these principal components. The results are less precise given the lower signal in binary variables, but overall give a similar picture to the indices.

Finally, we also investigate whether cash and in-kind grants have a differentiated effect on capital retention depending on self-control. Figure 5 presents the evolution of capital stock after treatment, contrasting between cash and in-kind grants for entrepreneurs with and without self-control. The figure shows that in-kind grants are retained in the firm and lead to further accumulation of capital whether the entrepreneur lacks self-control or not – although the effect

on capital accumulation is strongest for those with low self-control. In contrast cash grants have, if anything, a negative effect on capital accumulation among low self-control entrepreneurs while the effect is positive and growing for those with high self-control. These results are consistent with those for profits: high self-control individuals invest cash in the business and reap the gains in profits in a similar way to the in-kind treatment, whereas the cash treatment does not stay in the business for low self-control individuals and as a result does not increase profits.

Taken together, these results suggest that self-control rather than external pressure is the main form of lack of asset integration that generates a difference in the effects of in-kind and cash grants. Subsistence women already seem to be at their (low) technically efficient frontier, so regardless of the form of capital, they get the capital out of the business and spend it on non-business items. Women who initially had higher profits have more scope to grow their business, and appear to have capital below their efficient level. If capital is forced into the business through in-kind grants, this appears to be sufficiently sticky to overcome any self-control issues and leads to an increase in profits. In contrast, only high initial profit women with strong levels of self-control end up investing and keeping cash grants in the business and experiencing the same growth. Males also seem to have scope for growth regardless of their size, but we can neither reject that they benefit equally from the cash and in-kind grants nor that they are subject to the same heterogeneity with respect to self-control as the high-profit women are.

6.3 Contrasting with the Sri Lankan results

A superficial reading of our results might suggest that they question the external validity of the results of the similar experiment in Sri Lanka, where de Mel et al. (2008) find no increase in business profits when female business owners received a grant, and no significant difference between the cash and in-kind treatments. However, we view our results as showing the Sri Lankan results do generalize for subsistence businesses, as well as giving new findings for high profitability women, a group that was not in the Sri Lankan study.

As shown in section 5.2, the initially low profit Ghanaian female business owners look very similar to the entire sample of female business owners in the Sri Lankan study. Our results for this subsample mirror those in Sri Lanka: namely no return to either cash or in-kind grants for these women. In contrast, the high returns to the in-kind grants for women are found for women operating above subsistence, at a larger scale than seen in the female business owners in Sri Lanka. The difference in cash and in-kind grants occurs most strongly for this group as well

- for which there is no direct comparison group in Sri Lanka.

What then about the men? The point estimates in Ghana show lower returns to the cash treatment than the in-kind treatment. However, like the previous experiments in Sri Lanka and Mexico (McKenzie and Woodruff, 2008), we cannot reject equality of impacts of the cash and in-kind grants for males. Nevertheless, we should note that the power for testing this has been low in the previous studies. Thus, in Sri Lanka, although the point estimate for the return on the cash treatment is slightly larger than that on the in-kind treatment, we can also not reject that the in-kind treatment has twice the effect of the cash treatment at conventional significance levels. There is thus insufficient evidence to either reject that the males in Ghana are different in their responses to cash versus in-kind treatments to the males in Sri Lanka or Mexico, but also neither can we reject that they respond similarly to the female high initial profit Ghanaian women.

7 Conclusions

We find evidence of a flypaper effect among Ghanaian microenterprises. This finding is difficult to reconcile with models of accumulation that take either a standard Ramsey form or incorporate a present bias but maintain the assumption of asset integration. 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 that inventories and equipment serve as a self-commitment device against impulse purchases – or that entrepreneurs evade a social solidarity tax, by household members and relatives, on the cash flow of the firm but not its equipment and inventories.

The evidence of a flypaper effect is most significant for certain 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 cash grants is less robust – we find large positive and significant effects when we don't condition on baseline profits, but smaller and insignificant effects when we do. The difference between cash and in-kind treatments is strongest among successful female entrepreneurs, that is, those with high pre-treatment profits.

We seek to identify the reason for the flypaper effect, i.e., whether it originates in self-control

difficulties or in pressure from household and family members. The fact that the difference in treatment effects is only statistically significant among female entrepreneurs is suggestive of external pressure: given the social context, women entrepreneurs are expected to be subjected to pressure from husband and children. However, we fail to find confirmatory evidence for this hypothesis when interact treatment with proxies for external pressure. In contrast, we find that individuals with more self-control difficulties respond better to the cash treatment in terms of profits. There is no evidence that female entrepreneurs lack self-control more than men, a finding that is consistent with the evidence reported by Schaner (2011) for rural Kenya.

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 been argued as allowing individuals to overcome present-bias by providing self-discipline and encouragement through regular payments and group meetings (Bauer et al, 2010). If this is true, the effectiveness of micro loans in improving business outcomes is likely to resemble the effect of in-kind grants in our experiment.

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. This suggests that microfinance programs that focus primarily on women may be ignoring a large group of enterprises with a need for more capital.

Finally, our results suggest that loans and grants intended to help female enterprises grow would work better if disbursed in kind, not in cash. If their objective is to foster enterprise development, and not just saving, microfinance organizations may want to adopt similar practices.

References

Andersen, Stephen, Glenn W. Harrison, Morten I. Lau, and E. Elisabeth Rutstrom (2008) "Risk Aversion in Game Shows", *Research in Experimental Economics*, 12: 361-406

Anderson, Siwan, and Jean-Marie Baland (2002). "The Economics of Roscas and Intra-household Resource Allocation", *Quarterly Journal of Economics*, 117(3): 963-95, August

Ashraf, Nava, Dean Karlan, and Wesley Yin (2006). "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines", *Quarterly Journal of Economics*, 121(2): 635-672, May.

Besley, Timothy (1995) "Savings, credit and insurance", pp. 2123-2207 in Jere Behrman and T.N. Srinivasan (eds.) *Handbook of Development Economics Volume III*, Elsevier: Amsterdam.

Baland, Jean-Marie, Catherine Guirkinger and Charlotte Mali (2007) "Pretending to be Poor: borrowing to escape forced solidarity in credit cooperatives in Cameroon", Mimeo. University of Namur.

Banerjee, Abhijit and Esther Duflo (2009) "The Experimental Approach to Development Economics", *Annual Review of Economics* 1:151-78.

Banerjee, Abhijit, Esther Duflo, Rachel Glennester and Cynthia Kinnan (2010) "The Miracle of Microfinance? Evidence from a Randomized Evaluation", BREAD Working Paper no. 278.

Banerjee, Abhijit and Sendhil Mullanaithan (2010) "The Shape of Temptation: Implications for the Economic Lives of the Poor", MIT Working Paper no 10-9.

Bauer, Michal, Julie Chytilova and Jonathan Morduch (2010) "Behavioral Foundations of Microcredit: Experimental and Survey Evidence from Rural India", IZA Working Paper no. 4901.

Bigsten, Arne, Paul Collier, Stefan Dercon, Marcel Fafchamps, Bernard Gauthier, Jan-Willem Gunning, Anders Isaksson, Abena Oduro, Remco Oostendorp, Cathy Patillo, Mans Soderbom, Francis Teal, Albert Zeufack, and Simon Appleton (2000) "Rates of Return on Physical and Human Capital in Africa's Manufacturing Sector", *Economic Development and Cultural Change*, 48(4): 801-27.

Bjorvatn, Kjetil, Lars Ivar Oppedal Berge, and Bertil Tungodden (2011) "Human and financial capital for microenterprise development: Evidence from a field and lab experiment", NHH and CMI (mimeograph)

Bruhn, Miriam and David McKenzie (2009) "In Pursuit of Balance: Randomization in Practice in Development Field Experiments", *American Economic Journal: Applied Economics* 1(4):

200-32.

Brune, Lasse, Xavier Gine, Jessica Goldberg, and Dean Yang (2011). "Commitments to Save: A Field Experiment in Rural Malawi", University of Michigan, May (mimeograph).

Camerer, Colin, Linda Babcock, George Loewenstein, and Richard Thaler (1997). "Labor Supply of New York City Cabdrivers: One Day at a Time", *Quarterly Journal of Economics*, 112: 407-41.

Charlier, Florence (1999) "Saving or Sharing: The African Households' Dilemma", Stanford Department of Economics Ph.D. Dissertation.

Deaton, Angus (2010) "Instruments, Randomization, and Learning about Development", *Journal of Economic Literature*, 48(2): 424–55

De Mel, Suresh, David McKenzie, and Christopher Woodruff (2008). "Returns to Capital: Results from a Randomized Experiment." *Quarterly Journal of Economics* 123(4): 1329–72.

De Mel, Suresh, David McKenzie, and Christopher Woodruff (2009a) "Are Women more Credit Constrained? Experimental Evidence on Gender and Microenterprise Returns." *American Economic Journal: Applied Economics* 1(3): 1-32.

De Mel, Suresh, David McKenzie and Christopher Woodruff (2009b) "Measuring microenterprise profits: Must we ask how the sausage is made?", *Journal of Development Economics* 88(1): 19-31

Di Falco, Salvatore and Erwin Bulte (2009) "The Dark Side of Social Capital: Kinship, Consumption, and Investment", Mimeo. University of Kent.

Duflo, Esther, Michael Kremer and Jonathan Robinson (2010) "Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya", *American Economic Review* forthcoming.

Duflo, Esther and Christopher Udry (2004) "Intrahousehold Resource Allocation in Côte d'Ivoire: Social norms, separate accounts, and consumption choices" , NBER Working Paper no. 10498.

Emran, M. Shahe, AKM Mahbub Morshed and Joseph Stiglitz (2007) "Microfinance and Missing Markets", Mimeo. George Washington University.

Fafchamps, Marcel (2003). "Ethnicity and Networks in African Trade", *Contributions to Economic Analysis and Policy*, Berkeley Electronic Press at www.bepress.com, 2(1): article 14

Fafchamps, Marcel, Christopher Udry, and Katherine Czukas (1998). "Drought and Saving in West Africa: Are Livestock a Buffer Stock?", *Journal of Development Economics*, 55(2):

273-305, April

Fafchamps, Marcel, David McKenzie, Simon Quinn and Christopher Woodruff (2010) "Using PDA consistency checks to increase the precision of profits and sales measurement in panels", *Journal of Development Economics*, forthcoming.

Grimm, Michael, Flore Gubert, Ousman Koriko, Jann Lay and Christophe Nordman (2010) "Does forced solidarity hamper entrepreneurial activity? Evidence from seven West-African countries", Mimeo. International Institute of Social Studies, Eramus University Rotterdam.

Harrison, Glenn, Morten I. Lau, and E. Elisabeth Rutstrom (2007). "Estimating Risk Attitudes in Denmark: A Field Experiment", *Scandinavian Journal of Economics*, 109(2): 341-68.

Hill, Polly. 1984. *Indigenous trade and market places in Ghana 1962-64.* Department of History, University of Jos, Jos, Nigeria

Jakiela, Pamela and Owen Ozier (2011) "Does Africa need a rotten kin theorem? Experimental evidence from village economies", Mimeo. University of Washington, St Louis.

Karlan, Dean and Jonathan Zinman (2010) "Expanding Microenterprise Credit Access: Using Randomized Supply Decisions to Estimate the Impacts in Manila", Mimeo. Yale University.

Laibson, David (1997) "Golden Eggs and Hyperbolic discounting", *Quarterly Journal of Economics* 112(2): 443-77.

Lee, David (2009) "Training, Wages, and Sample Selection: Estimating Sharp Bounds on Treatment Effects", *Review of Economic Studies* 76(3): 1071-1102.

McKenzie, David (2011) "Beyond baseline and follow-up: The case for more T in experiments", World Bank Policy Research Working Paper no. 5639.

McKenzie, David and Christopher Woodruff (2008) "Experimental Evidence on Returns to Capital and Access to Finance in Mexico", *World Bank Economic Review* 22(3): 457-82

Platteau, Jean-Philippe (2000) *Institutions, Social Norms and Economic Development.* Harwood Academic Publishers: Amsterdam.

Ravallion, Martin (2009) "Should the Randomistas Rule?", *The Economists Voice* 6(2).

Schaner, Simone G. (2011). "Intrahousehold Preference Heterogeneity, Commitment, and Strategic Savings: Theory and Evidence from Kenya", Department of Economics, Dartmouth University (mimeograph)

Schündeln, Mathias (2006) "Modeling Firm Dynamics to Identify the Cost of Financing Constraints in Ghanaian Manufacturing", Mimeo. Harvard University.

Somville, Vincent (2011). "Daily Collectors, Public Good Provision, and Private Consump-

tion: Theory and Evidence from Urban Benin", Department of Economics, Namur University (mimeograph)

Spears, Dean (2009) "Dosas by the Dozen: Theory and Evidence of Present Bias in Microentrepreneurs", Institute for Financial Management and Research Working Paper no. 27

Udry, Christopher (1996). "Gender, Agricultural Production and the Theory of the Household", *Journal of Political Economy*, 104(5): 1010-1046, October

Udry, Christopher and Santosh Anagol (2006) "The Return to Capital in Ghana", *American Economic Review Papers and Proceedings* 96(2): 388-93.

Appendix 1: Theoretical response to treatment with asset integration

7.1 The Ramsey model

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

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

$$c_t = \pi(k_t,\theta) + rw_t - (k_{t+1} - k_t) - (w_{t+1} - w_t) \tag{9}$$

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.[13] 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 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.[14]

There are two possible treatments: a cash transfer M_t and an in-kind transfer E_t at an arbitrary time t. Both can be turned into more capital k but it takes time to liquidate grant E_t that comes in the form of equipment or inventories. In contrast, M_t is liquid and 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:

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

[13] 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 the entrepreneur's labor.

[14] 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.

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:

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

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 in-kind treatments are predicted to increase capital and profits by the same amount.[15] 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 in firms that have already reached their optimal size; it should be saved instead. If the in-kind 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 in-kind 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

[15] In the interest of space, we do not discuss the case where $k_t + M > \min\{k^*, k^{**}\} > k_t$. This case is effectively a weighted average of the two cases we describe.

$r > \rho$, 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.

7.2 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:

$$\max_{\{c_s, w_s, k_s\}} u(c_t) + \beta \sum_{s=t+1}^{\infty} \delta^s u(c_s) \text{ subject to (9)} \tag{10}$$

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

$$\max_{\{c_{s+1}, w_{s+1}, k_{s+1}\}} u(c_{t+1}) + \beta \sum_{s=t+2}^{\infty} \delta^s u(c_s) \text{ subject to (9).} \tag{11}$$

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.

We now 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^*. Let τ denote the one period-ahead discount rate:[16]

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

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 (11) 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:

$$1 + \pi'(k_{t+1}, \theta) = \frac{1}{\beta\delta} \cdot \frac{u_t'(c_t)}{u_{t+1}'(c_{t+1}^P)} \tag{12}$$

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 (10). If

[16] 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.

the household is sophisticate, it is the correctly anticipated decision taken at time $t+1$ as given by the solution to (11).

First note that if $c^P_{t+1} = c_t$, then $u'_t(c_t) = u'_{t+1}(c^P_{t+1})$ 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 $c^P_{t+1} = c_t$. 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^M_{t+1} denote the consumption level she sets for $t+1$, not realizing that at $t+1$ she will want to increase consumption beyond c^M_{t+1}. At $k_t = k^s$ the entrepreneur expects $c^M_{t+1} < c_t$, which implies that $u'_{t+1}(c^P_{t+1}) > u'_t(c_t)$. Hence k^s does not satisfy the Euler equation (12) 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 $c^M_{t+1} = c^M_{t+2}$. Since $c^M_{t+1} < c_{t+1}$, it follows that $\frac{u'_t(c_t)}{u'_{t+1}(c^M_{t+1})} < 1$, which in turn implies that $k^s < k^m$ and

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

It follows that 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 in-kind grant E will be divested as quickly as is feasible. If $k_t < k^s$ or k^m, then the additional cash M or inventories E will remain in the business and increase future profits.

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 3 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 in-kind 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

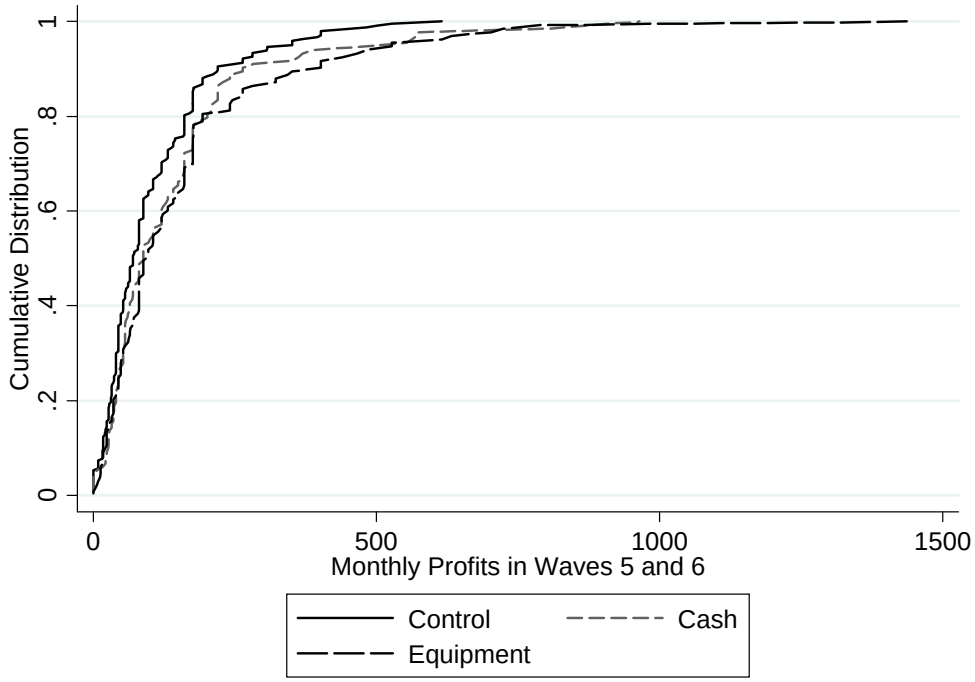

Figure 2: Post-treatment CDFs of Monthly Profits for Females by Treatment Group

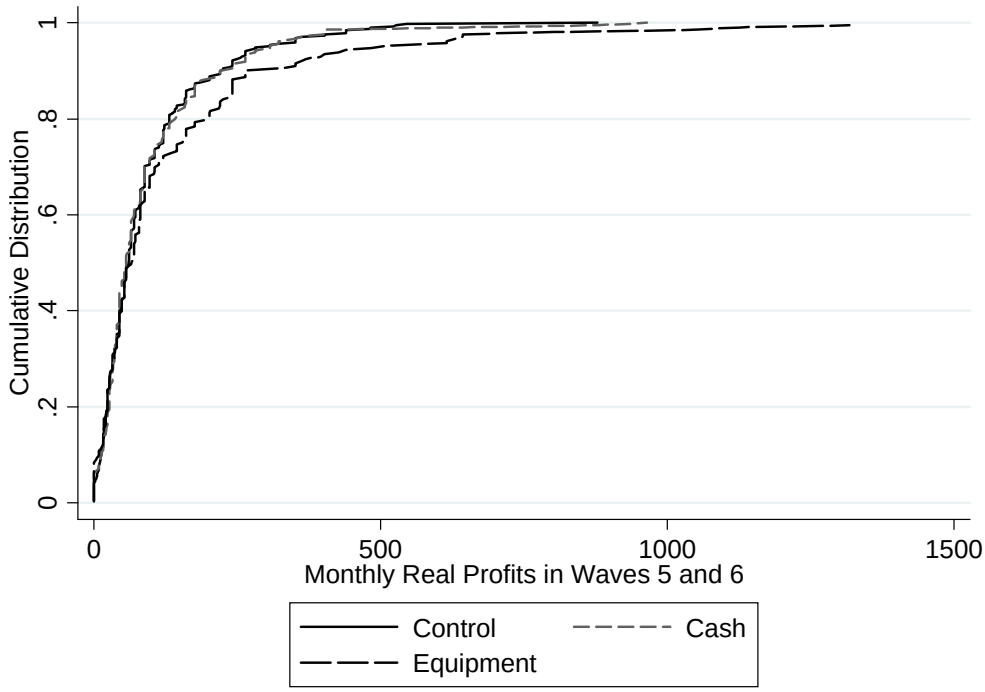

Figure 3: Post-treatment CDFs of Capital Stock for Males by Treatment Group

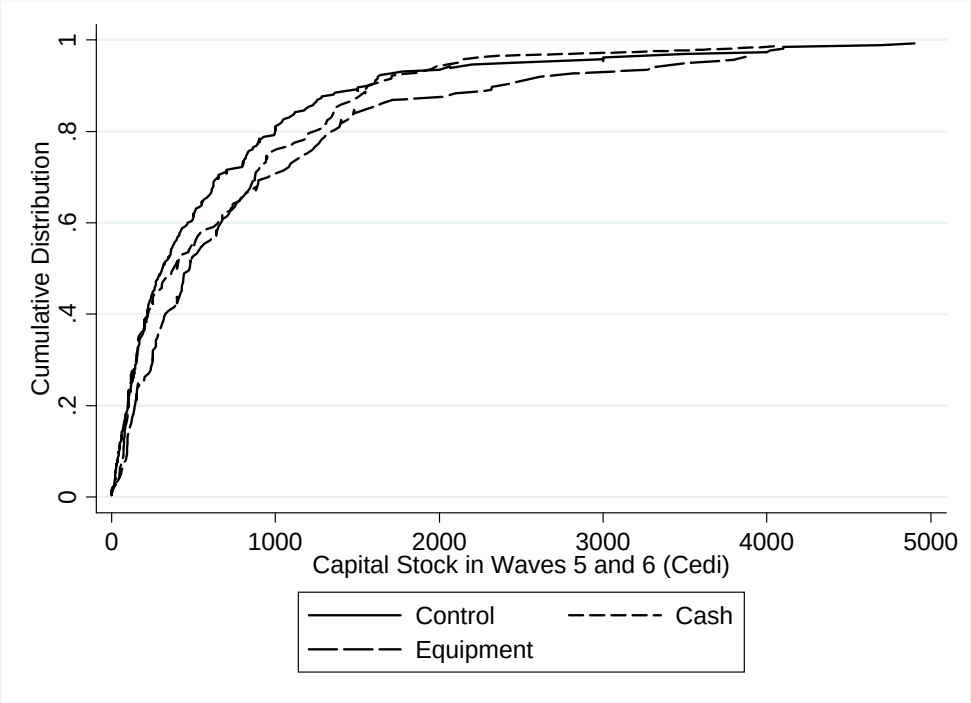

Figure 4: Post-treatment CDFs of Capital Stock for Females by Treatment Group

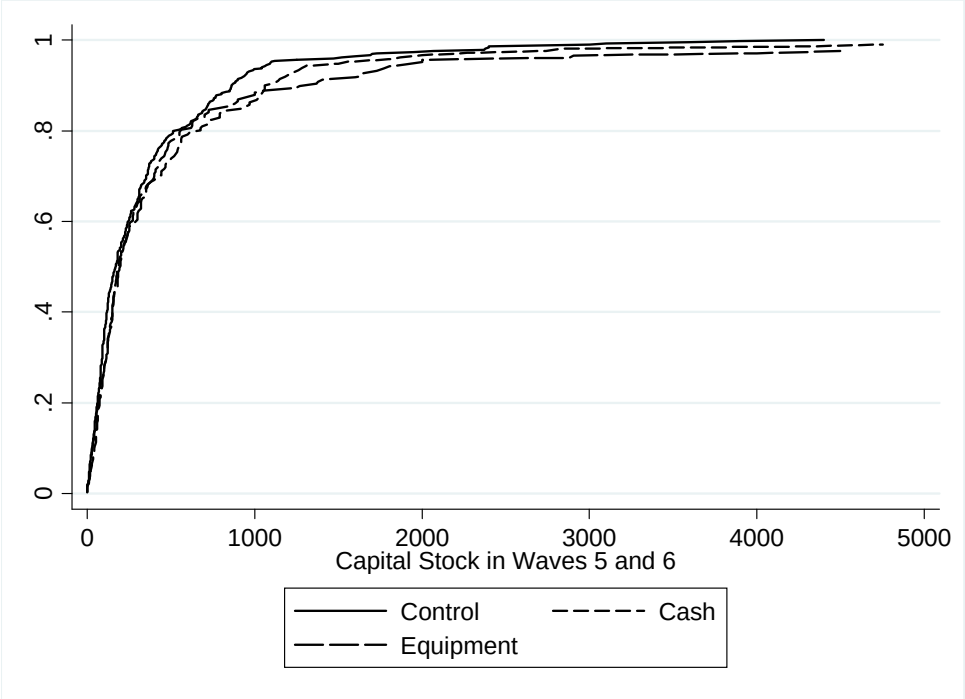

Figure 5: Heterogeneity of Treatment Effect on Capital Stock by Treatment Status and Self-Control Level.

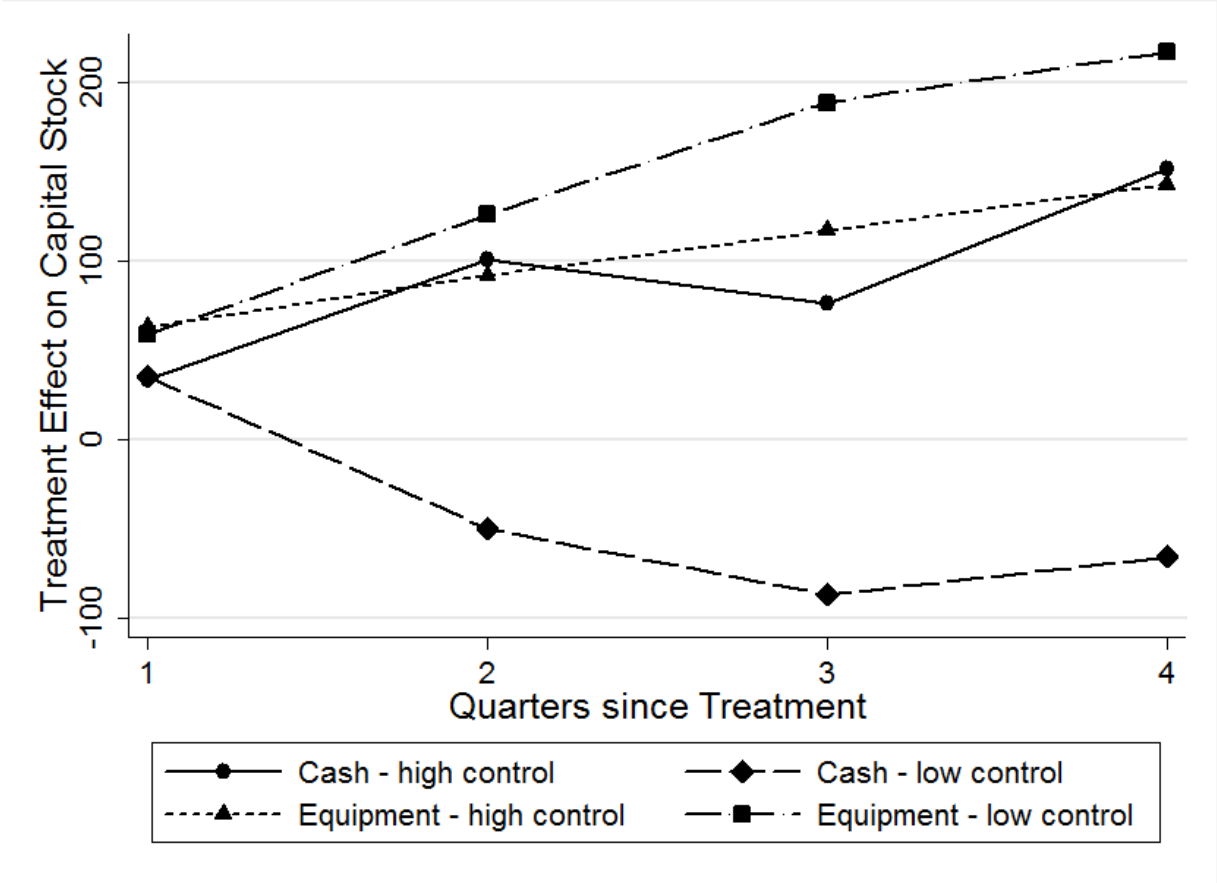

Table 1: Timeline

Date	*Surveys*	*Treatments*
Oct-Nov 2008	Survey round 1	
Feb 2009	Survey round 2	
March 2009		198 firms treated
May 2009	Survey round 3	
June 2009		181 firms treated
August 2009	Survey round 4	
September 2009		18 firms treated
November 2009	Survey round 5	
February 2010	Survey round 6	

Table 2: Characteristics of Microenterprises and Verification of Randomization

	Full Sample				Trimmed Sample			
	N	Control	Cash	In-kind	N	Control	Cash	In-kind
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 cedis 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 3: Main Treatment Effects

Dependent Variable: Real Monthly Profits (Cedi)

	(1) OLS	(2) OLS	(3) FE	(4) FE	(5) OLS	(6) OLS	(7) FE	(8) FE	(9) OLS	(10) OLS
Cash Treatment	14.50*	9.59	3.96	0.48						
	(8.68)	(7.32)	(13.89)	(8.23)						
In-kind 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)
In-kind 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)
In-kind 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 firms	792	764	792	764	792	764	792	764	736	710
P-values for testing:										
Cash = In-kind	0.0668	0.0306	0.0128	0.0156						
Cash = In-kind for Females					0.0725	0.0565	0.0205	0.0187	0.0736	0.058
Cash = In-kind 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
In-kind Male = In-kind 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 cedis 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 4: 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)
In-kind 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)
In-kind 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
In-kind Treatments equal	0.456	0.584	0.457	0.873	0.124	0.142	0.013	0.023
Cash=In-kind	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)
In-kind 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)
In-kind 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 Firms	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
In-kind Treatments equal	0.569	0.786	0.677	0.226	0.458	0.952	0.994	0.776
Cash=In-kind	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 5: Where do the grants go?

	Capital Stock FE	Truncated Capital Stock FE	Made a Transfer Out OLS	Amount Transferred Out OLS	Weekly Food Spending FE	Quarterly Clothing Spending FE	Quarterly Health & Education Spending FE	Quarterly Ceremonies Spending FE	Total Quarterly Spending FE	Log Quarterly Spending 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)
In-kind 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)
In-kind 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 = In-kind Females	0.573	0.107	0.294	0.137	0.198	0.478	0.776	0.817	0.172	0.054
Cash = In-kind 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	-6.77	-6.78	0.07**	6.13**	7.26**	4.66	15.39	2.94	197.84***	0.16**
	(29.67)	(29.69)	(0.03)	(2.80)	(3.32)	(4.24)	(18.93)	(4.11)	(58.16)	(0.06)
Cash Treatment*High Profits	238.00	145.84*	0.02	11.54	-2.13	8.29	-25.71	-8.05	-53.38	-0.07
	(185.23)	(85.70)	(0.04)	(8.35)	(4.27)	(8.08)	(18.79)	(5.48)	(81.92)	(0.06)
In-kind Treatment*Low Profits	59.17**	59.17**	0.01	-0.40	1.11	4.10	3.83	-2.38	32.92	-0.02
	(28.45)	(28.46)	(0.03)	(2.02)	(3.93)	(5.20)	(18.81)	(3.09)	(63.98)	(0.06)
In-kind Treatment*High Profits	262.60	223.24***	0.03	5.12	-1.99	-2.43	-18.48	3.11	18.07	-0.04
	(166.25)	(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
In-kind 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 6: 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 requirements	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 7: Heterogeneity according to self-control and external pressure

Dependent variable: Real monthly profits

	Pooled							
	Men & Women		High Profit Women		Low Profit Women		Men	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cash Treatment	3.864	4.204	16.18	18.44	-5.537	-8.763	5.845	3.828
	(8.887)	(9.139)	(20.78)	(20.01)	(8.819)	(9.886)	(16.93)	(17.86)
In-kind Treatment	23.85**	24.72**	66.60**	64.44**	4.832	4.273	15.55	11.29
	(10.15)	(10.54)	(27.08)	(26.06)	(7.562)	(8.049)	(16.77)	(16.88)
Cash Treatment * Lack of Self-control	-16.75**	-17.10**	-32.18**	-31.17**	0.917	1.228	-25.98	-26.58
	(8.252)	(8.364)	(15.63)	(15.21)	(7.771)	(8.098)	(18.66)	(18.60)
In-kind Treatment*Lack of Self-control	-3.697	-2.713	-3.676	6.510	-0.932	-1.407	-8.287	-10.07
	(6.341)	(6.598)	(17.33)	(19.32)	(6.488)	(6.706)	(11.82)	(12.10)
Cash Treatment * Narrow External Pressure	4.301		-7.658		13.12		-3.683	
	(7.056)		(12.14)		(9.720)		(14.03)	
In-kind Treatment * Narrow External Pressure	-12.23		-29.93		2.870		-14.53	
	(10.92)		(32.54)		(7.424)		(13.67)	
Cash Treatment * Broad External Pressure		9.586		26.79*		9.773		-3.695
		(7.492)		(13.67)		(9.028)		(14.41)
In-kind Treatment * Broad External Pressure		-10.70		-22.50		3.228		-10.60
		(11.80)		(32.93)		(6.281)		(14.90)
Observations	3,822	3,691	903	880	1,465	1,412	1,454	1,399
Number of firms	664	641	156	152	256	247	252	242

Notes: results from fixed effects estimation on trimmed sample.

Robust standard errors clustered at the firm level in parentheses.

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

All regressions also include survey wave effects, which vary with the interaction.

Appendix Table A1: Attrition Rates by Round

	All firms	Control	Cash	In-kind	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 (Cedis)

	(1) OLS	(2) FE	(3) OLS	(4) OLS	(5) FE	(6) 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)
In-kind 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)
In-kind 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)
In-kind 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)
In-kind 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)
In-kind 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)
In-kind 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 In-kind 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 cedis per month in wave 1 or 2.

OLS estimation includes dummies for the matched quadruplets.

Appendix Table 4: Principal Component Weights on each variable

Variables	Lacks Self-control index	Broad External Pressure index	Narrow External Pressure index
Used a Susu at Baseline	**-0.30**		
Said they save regularly	-0.28		
Discount rate above median	**0.65**		
Hyperbolic Discounter	**0.64**		
Says there is pressure to share extra profits with other household members		**0.38**	0.25
Whenever there is money on hand, spouse or other family members request some		**0.38**	**0.66**
People who do well in business receive additional requests for money from family/friends		**0.38**	**0.69**
Machines and equipment in business are good way to save money so others don't take it		0.04	0.15
Household Size		**0.53**	
Number of siblings in Accra/Tema area		0.12	
Individual is married		**0.52**	

Appendix Table 5: Treatment Interactions with Individual Variables Proxying for Self-Control and External Pressure

	Female High Profit Group			Female Low Profit Group			Males		
		Interaction with			Interaction with			Interaction with	
	N	Cash	In-kind	N	Cash	In-kind	N	Cash	In-kind
Variables Proxying for Self-Control									
Used a Susu at Baseline	179	25.25	-30.34	295	-8.161	-6.006	290	9.684	-11.96
		(27.77)	(55.13)		(13.73)	(10.09)		(23.75)	(25.29)
Said they save regularly	177	31.10	91.43**	293	23.75	19.21	285	98.93***	44.97
		(28.50)	(44.85)		(24.17)	(14.07)		(30.91)	(32.12)
Discount rate above median	178	-73.60**	67.32	293	9.849	9.963	287	-25.10	22.18
		(34.04)	(55.04)		(20.66)	(15.45)		(33.18)	(35.57)
Hyperbolic Discounter	176	-42.04	-95.56*	293	11.84	-2.493	286	-32.45	-47.82*
		(37.11)	(54.41)		(20.58)	(16.05)		(32.03)	(28.86)
Variables Proxying for External Pressure									
Says there is pressure to share extra profits	159	43.05	29.61	259	0.622	-20.76	257	-27.36	-45.01
with other household members		(33.38)	(59.25)		(17.58)	(14.93)		(36.41)	(35.93)
Whenever there is money on hand, spouse or	179	14.26	21.04	295	40.35**	8.073	290	-26.86	-60.00
other family members request some		(33.71)	(67.21)		(20.38)	(15.94)		(34.01)	(43.54)
People who do well in business receive additional	179	-27.69	-109.6	295	18.47	6.167	290	48.35*	-63.85
requests for money from family/friends		(33.22)	(103.1)		(24.42)	(17.04)		(28.33)	(60.58)
Machines and equipment in business are good way to	179	-30.20	44.44	295	16.80	2.346	290	-63.21*	-74.40
save money so others don't take it		(33.37)	(62.62)		(20.22)	(15.61)		(37.60)	(54.14)
Household Size	177	29.48*	-6.989	294	3.673	1.825	286	-0.358	3.360
		(14.95)	(18.41)		(3.864)	(3.143)		(8.609)	(8.438)
Number of siblings in Accra/Tema area	155	12.25*	5.382	249	3.231	5.355*	248	-6.184	4.575
		(6.936)	(13.35)		(4.268)	(2.792)		(5.751)	(5.992)
Individual is married	179	63.09*	-21.42	294	-14.08	2.903	289	-17.11	-12.19
		(35.93)	(78.14)		(18.14)	(14.56)		(33.14)	(34.08)