Determinants of Entrepreneurial Activities and Returns: Evidence from The Gambia

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Abstract

Small, non-farm enterprises have long been considered an important source of income for poor households and therefore potentially very important for reducing poverty and contributing to economic growth. However, their poverty-reduction role depends critically on their generation of high returns. Using two nationally representative household surveys from The Gambia, this paper investigates the determinants of entrepreneurship and investment and also estimates the returns to capital for enterprises. I find that household wealth is a significant determinant of entrepreneurship and investment, suggesting the poor functioning of credit markets in the country. I also found that the returns to investments are very low. Rates of returns are negatively correlated with weather risk. This is consistent with the view that a significant motivation for owning small enterprises for most households is to help them mitigate risk inherent in their main livelihood, which is rain-fed agriculture. Households are apparently willing to tolerate low returns in enterprises in exchange for low income variability.

Introduction

Small enterprises have been regarded for a while now as holding significant potential in development for poor countries. Several studies have pointed to their roles in income generation and employment. They therefore provide potentially important avenues for households to climb out of poverty. Some of these small enterprises may even grow into medium and large enterprises and contribute to growth. There are, however, significant obstacles that poor households face in this sector. Starting a small enterprise may entail significant costs, many of which may be insurmountable in light of the numerous market failures, especially within the rural environments inhabited by the poorest households. Even conditional on starting a small enterprise, the generation of high returns from investments is not guaranteed. And this is a necessary condition if small enterprises are to hold potential for reducing poverty and contributing to growth. Therefore, the issue of what determines or constrains high enterprise returns/profitability is quite important.

The literature on small enterprises in Africa is full of studies that treat them as small firms - separate from households without taking into account that livelihood diversification is the norm especially in the rural parts of the continent. As such, both the likelihood of starting an enterprise and its profitability are affected by other livelihood activities of the household. In this paper, I setup a simple two-period model of household livelihood diversification strategy that gives predictions about the determinants of entry, investment and returns of small enterprises. The model explicitly shows how the other livelihood activity (farming) can affect enterprise returns especially in an environment characterized by significant weather risk (e.g. rainfall). The presence of significant aggregate weather risk can prompt households into starting an enterprise to mitigate risk

that cannot be addressed through local risk-sharing arrangements. As a result, the primary benefit of small enterprises for some households may be its role in reducing risk rather than primarily generating income.

I use two nationally representative household surveys from The Gambia to test predictions from the model. I find that household wealth is a significant determinant of entrepreneurship and investment, suggesting the poor functioning of credit markets in the country. I also found that the returns to investments are very low. The variability of rainfall at the district level (proxy for aggregate risk) is associated with 11% reduction per month in enterprise returns. The low rate of return suggests that a significant reason for starting small enterprises for most household is to help them mitigate risk inherent in their main livelihood, which is rain-fed agriculture. The fear of income and consumption uncertainty is apparently so high that households are willing to tolerate low returns from their investment as long as it helps them to cope with risk.

The rest of the paper proceeds as follows. In Section II, I provide a brief review of the relevant literature, which shows how this paper contributes to it. The theoretical framework that guides the analysis is presented in Section III. I describe the data set in section IV while Section V presents the results of the determinants of entry into entrepreneurship and investment. Section VI shows the determinants of enterprise returns and provides evidence on the role played by risk. The major points and implications of the results are summarized in the conclusion in Section VII.

I. Literature Review

Quite a number of papers have been written on small enterprises in Africa. The literature originally started with a focus on the role of non-farm income in rural areas since most households are small-scale farmers. But a significant part of this non-farm income comes from small and medium enterprises . The early part of the literature seem to be motivated by early development theories in the middle of the twentieth century that gave a very small and diminishing role to small enterprises in the process of development (Hymer and Resnick (1969)). Many of the earlier studies were focused on emphasizing the importance of the enterprises in rural areas (for example, Chuta and Liedhom (1979) and Liedholm and Kilby (1989)). These and subsequent research showed that small enterprises were not only significant, but also that there was no indication of their diminishing importance over time. Chuta and Liedholm (1979) found that in four countries across Africa and Asia, rural enterprises employ 11% to 20% of males. The same authors found that non-farm income accounted for 36% of rural income in Sierra Leone. In their analysis of small enterprises in Kenya, Daniels and Mead (1998) found that enterprises contribute up to 50% of household income for some households. However, the household's dependence on enterprise income is positively correlated with poverty. While there are returns to education and within certain industries (for example, retail trade), they estimated zero returns to capital investment.

The consequence of the published results from these earlier set of papers is to establish, as an empirical regularity, the importance of the contributions of small enterprises in poor countries in terms of income generation and employment.

In the more recent literature, some studies have focused on the dynamics of enterprises in developing countries. McPherson (1996) looked at enterprises in five countries in Southern Africa (Bostwana, Lesotho, South Africa, Swaziland and Zimbabwe) and found that few relationships held true for all countries, suggesting the importance of economy-specific characteristics. For example, retail trade enterprises grew faster in South Africa than those in processing while the opposite held in Swaziland. Even within each country, many industry-specific factors were at work. In general, there was an inverse relationship between firm size and growth of enterprises, and human capital of the manager of the enterprise (training received) had a positive effect on the growth rate of enterprises.

What the above lacked is the acknowledgement of the fact that enterprises are operated by households in environment with many missing or incomplete markets. Small enterprises represent just one activity for a household that may have diversified its livelihood into several. As Reardon (1997) and Barrett and Reardon (2000) show, livelihood diversification is ubiquitous in sub-Saharan Africa. The determinants of diversification can be categorized into two broad groups: "push" and "pull" factors. "Push" factors refer to the household desire to overcome the various market imperfections that plague most households in developing countries such as insurance, land, labor and credit market failures. "Pull" factors refer to the desire by the household to take advantage of income-generating opportunities (Barrett, Reardon and Webb, 2001).

Risk is a major "push" factor. The absence of insurance market and the presence of aggregate agro-climatic risk that cannot be addressed through risk sharing induce households to diversify into non-agricultural activities (Alderman and Paxson, 1992).

Incomplete markets in land, labor, credit and insurance are also major "push" factors. For example, individuals or households with special expertise in some craft will still continue farming because imperfections in land market and problems of monitoring will preclude the renting-out of farmland and the hiring of outside agricultural workers respectively. Another type of market failure could be that of product market failure of essential agricultural produce that forces households to diversify irrespective of where they comparative advantage lies (Barrett, Reardon and Webb, 2001). Credit market failure is also ubiquitous. A farm household may venture into non-farm activities to raise funds needed for agricultural investments, assuming the non-farm activity itself does not require substantial start-up cost.

Entrepreneurial individuals can always spot opportunities with the potential to generate higher income, despite (or because of) existing market failures. A household may realize that there are economies of scope to be exploited by combining off-farm activities with farm work. Of course, the malfunctioning of a market can influence "pull" factors as well. Lack of credit may prevent a household from taking advantage of a new, high-return activity if a substantial fixed cost is required. Imperfections in the labor market or high monitoring cost can prevent a household from hiring the optimal number of workers even if it manages to start an enterprise.

Given the pervasiveness of these market failures in developing countries, it is no surprise that livelihood diversification is so common, especially in rural areas. And the

literature has provided ample evidence for the phenomenon. Lanjow, Quizon and Sparrow (2001) examined income diversification in peri-urban areas of Tanzania. Non-farm incomes rise with per capita consumption levels but there does not seem to be much difference between rural and peri-urban areas in terms of non-farm income shares. Unlike other developing countries, non-farm income shares are low and do not seem to increase over time. The probability of participating in non-farm activities increases with education and age but decreases in the size of landholding.

A significant short-coming of the literature on livelihood diversification is that many papers lump all non-farm activities and incomes together. This classification is understandable since part of the goal of many of the earlier papers is to show how misleading it can be to think of the typical household in developing countries as a purely subsistent farming unit that work exclusively in agriculture (Reardon, 1997 & Reardon, Delgado and Matlon, 1992). However, this broad category of non-farm activity and income necessarily involves combining activities with vastly different requirements of entry and also returns. Entrepreneurship or self-employment involves making a long-term investment that is usually absent when an individual decides to participate in off-farm wage employment. An exogenous start-up cost is usually needed, which requires long-term saving since credit markets may not be present. On the other hand, the decision to enter the labor market requires relatively little time. Because of this time difference, entrepreneurship is more likely to be an *ex-ante* risk management strategy while labor market participation is relatively likely to arise as an *ex-post* risk-coping strategy. The return from entrepreneurship depends a lot on the entrepreneur's talent, effort and capital

while the wage rate in the labor market are largely fixed and a worker hardly ever needs to provide the capital he works with.

One of the few papers that avoided this problematic categorization is Woldenhanna and Oskam (2001). In their analysis of income diversification in northern Ethiopia, they separated non-farm income into wage income and self-employment (entrepreneurship). They found that different variables determine participations in off-farm wage work and self-employment. They also found that off-farm wage work is determined positively by household size, number of dependents and ownership of non-farm equipment. The authors interpret this to mean that "push" factors are the main reason behind off-farm wage activities. On the other hand, "pull" factors are identified by the authors to be the main determinant of self-employment. They reached this conclusion by observing that while household variables such as household size and number of dependents have no effect on the likelihood of self-employment, farm output is positively correlated with self-employment while the area of cultivated land reduces it. This paper, however, makes no mention of how risk plays a role in shaping or motivating livelihood diversification. This is a particularly important omission considering the agro-climatic uncertainties in a place such as Ethiopia that frequently experiences severe droughts.

This paper adds to the literature by treating entrepreneurship as a livelihood activity and therefore underscoring the “non-separability” from other household variables and activities. The paper also provides reasons as to why the mere ownership of a small enterprise may not be sufficient to generate enough income to pull households out of poverty since the risk-mitigating role of enterprises is likely to come at the expense of their profitability.

II. Theoretical Framework

In light of realities in a poor developing country such as The Gambia, I use a simple model that captures some of the basic realities that are important in determining activity choice. The economic environment is one with a missing credit market. As a result, saving/investment (*k*) must come from the household's own wealth (*w*). The model also assumes that households live for two periods. In period one, there is no production and the only activities are consumption (c_1) and saving. The decision to save is constrained by current wealth and motivated by expected high returns (higher consumption) and decreased income variability. There is also a missing land market, which means that households must work with their given endowment of land $\bar{A}$. I assume that households have a main livelihood activity (e.g. agriculture), which is represented by the production function, $f(l_f, \bar{A} | \varepsilon_f)$. This is their main livelihood activity that they can always engage in even when wealth is extremely low. As before, $\psi g(k, l_g | \varepsilon_g)$ represents the production function of the enterprise that a household can create if it has sufficient wealth (ψ stands for entrepreneurial talent of household). Period two consumption (c_2) comes from the household's returns to savings (either from enterprise or safe asset) and agriculture output. As an alternative to investment in an enterprise, the household also has the option of investing in a safe asset with a gross return of *R*. Even though in this setting I assume two livelihood activities, there can be others such as working in the labor market. Nevertheless, this setting with two activity choices will still capture the key features of the problem. In addition to missing credit market, I also assume missing labor (for now) and land markets. The outputs of both the enterprise and the farm have random components.

Formally, a typical household's problem is:

$$\underset{k,l_f,l_g}{Max}: E_1[U(c_1,c_2)] = u(c_1) + \beta E_1\{u(c_2)\} \tag{1}$$

subject to

$$c_1 + k = w \tag{2}$$

and

$$c_2 = \begin{cases} f(l_f, \bar{A}\,|\,\varepsilon_f) + Rk & without \quad enterprise \\ \psi g(k, l_g\,|\,\varepsilon_g) + Rk + f(l_f, \bar{A}\,|\,\varepsilon_f) & with \quad enterprise \end{cases} \tag{3}$$

where

$$l_f + l_g \le \bar{L}; \tag{4}$$

$$f(0, \bar{A}\,|\,\varepsilon_f) = f(l_f, 0\,|\,\varepsilon_f) = g(0, l_g\,|\,\varepsilon_g) = g(k, 0\,|\,\varepsilon_g) = 0$$

where E_1 stands for the mathematical expectation, ε_f and ε_g are random variables with non-zero covariance that denote the risks in the entrepreneurial and agriculture activities respectively. I assume that ε_f and ε_g have a bivariate normal distribution:

$$\begin{pmatrix} \varepsilon_f \\ \varepsilon_g \end{pmatrix} \sim N\left(\begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} \sigma_f^2 & \sigma_{fg} \\ \sigma_{gf} & \sigma_g^2 \end{pmatrix} \right) \tag{5}$$

A denotes land[1] used in agriculture and $\bar{A}$ represents the household's stock of land. Household leisure is not explicitly model here, so the stock of available labor is net of

[1] Land here is shorthand for household variables that contribute to the production in $g(\cdot)$.

household leisure. With no labor market (and labor constraint binding for now), this means that the second period budget constraint can be expressed as:

$$c_2 = \psi g(k, l_g \,|\, \varepsilon_g) + Rk + f(l_f, \bar{A} \,|\, \varepsilon_f) = \psi g(k, l_g \,|\, \varepsilon_g) + Rk + f(L - l_g, \bar{A} \,|\, \varepsilon_f) \quad (6)$$

I assume that $u(c)$ is concave and twice continuously differentiable and that:

$$\lim_{c_1 \to 0} u'(c_1) = \infty \quad (7)$$

and that both $f(\cdot)$ and $g(\cdot)$ are differentiable and concave in each factor.

The key variables that determine corner solutions (whether the household specializes into farming or entrepreneurship) or an interior solution (diversification) are wealth level, entrepreneurial ability, labor constraints and the covariance between ε_f and ε_g.

Proposition 1 looks at the optimal investment in enterprise made by the household. Since the farm production function is not a direct function of saving, this proposition focuses only on the enterprise side. To focus on the role of investment and wealth, I fix the household's labor allocation for now. Therefore, l_g (and consequently, l_f) is fixed for now.

Proposition 1: *Fix* l_f *and* $\bar{A}$.

a) For all ψ, *there is a low level of wealth,* $\underset{\sim}{w}$ *such that for all* $w \le \underset{\sim}{w}$, $k = 0$,

$$g(0, l_g \,|\, \varepsilon_g) = 0$$

and

$$c_2 = f(l_f, \bar{A} \,|\, \varepsilon_f) = f(\bar{L}, \bar{A} \,|\, \varepsilon_f)$$

b) Let k^{**} *be such that for all* $k > k^{**}$,

$$\frac{\partial g(k, l_f \,|\, \varepsilon_f)}{\partial k} \le 0$$

and let the associated wealth be $\tilde{w}$. *Then for* $w \in (\underset{\sim}{w}, \tilde{w}]$, *the first order condition with respect to optimal investment, k, is:*

$$-u'(c_1) + \max\left\{ \mathrm{E}_1\left[u'(c_2)\right] R, \mathrm{E}_1\left[u'(c_2)\psi \frac{\partial g(k, l_g \,|\, \varepsilon_g)}{\partial k} \right] \right\} = 0 \tag{8}$$

c) And for a given ψ *and for all* $w > \tilde{w}$,

$$\psi \frac{\mathrm{E}_1\left\{\partial g(k, l_f \,|\, \varepsilon_f)\right\}}{\partial k} - R = 0 \tag{9}$$

To prove this proposition, I categorize wealth in three different levels. To find the first order conditions, I substituted equations (2) and (3) into (1) to turn the problem from a constrained optimization to an unconstrained one. By equation (7), the household will consume first before saving in period one at very low level of wealth. That is, as $w \to 0$,

$$u'(c_1) = u'(w - k) > R \tag{10}$$

$$u'(c_1) = u'(w - k) > \frac{\partial g(k, l_f \,|\, \varepsilon_f)}{\partial k} \tag{11}$$

Because $u(c_1)$ is concave, $u'(c_1)$ is decreasing in c_1. Assume (for now) that the household can only invest in *R*. Since *R* is constant in *k*, then the curve, $u'(w-k)$, must intercept *R* from above. The marginal utility of consumption is higher than the expected return from saving at very low levels of consumption. In other words, a minimum level of consumption must be reached in the first period before the household will invest in second period asset.

To prove part (b) of proposition 1, we must recall that the household has the choice of investing in the enterprise or the safe asset, assuming it has sufficient wealth (think of this group as those with "medium" level of wealth. While the marginal return of the safe assets is constant in *k*, the marginal return on investing in the enterprise is a random variable that depends on the covariance between ε_f and ε_g. A priori, it is not clear which one the household will invest in, hence the *max{}* operator.

To prove part (c), we must recall that $g(k, l_f \,|\varepsilon_f)$ is concave in each factor. For a given l_f, $\dfrac{\partial g(k, l_f \,|\varepsilon_f)}{\partial k}$ is decreasing in *k* and eventually goes towards zero. Recall that k^{**} is the level of investment such that for all $k > k^{**}$, $\dfrac{\partial g(k, l_f \,|\varepsilon_f)}{\partial k} \leq 0$. Let's call the households that can save at least k^{**} the "wealthy". These households are obviously not constrained in enterprise investment. A household with wealth level above this will invest both in the enterprise and in the safe assets and thereby equalizing the marginal return from both (equation (8)).

The first condition (a) in proposition 1 means that households at the subsistence level do not have the required wealth to go into entrepreneurship. This corner solution characterizes the very poor households that depend completely on farming. Part (b) of proposition 1 presents the case of households with sufficient wealth to save for entrepreneurship but are liquidity-constrained (that is, their level of investment is constrained by wealth). This scenario also represents the households that could display livelihood diversification[2]. Whether the household invests in the entrepreneurial activity or in the safe asset depends on the expected covariance between enterprise return and farming return. Part (c) represents the case of the sufficiently wealthy households ($w > \tilde{w}$) where optimal investment is not a function of wealth but of the expected return and the risk-free rate (R), which is the opportunity cost of becoming an entrepreneur[3]. Whether this household specializes in entrepreneurship or diversifies depends on their entrepreneurial talent and their productivity in agriculture. Part (b) and (c) together imply that the need to diversify to mitigate risk is decreasing in wealth. So above a certain level of wealth, risk management becomes unimportant.

[2] k alone does not determine diversification.
[3] Of course there is a level of ψ so high that even the wealthy can be constrained. So in this setting, I assume that ψ is bounded and strictly under that level.

***Lemma 1**: Let* $\sigma_{ug} = \text{cov}\left(u'(c_2), \psi \frac{\partial g(\hat{k}, l_g \mid \varepsilon_g)}{\partial k} \right)$ *and* assume that

$\lim_{k \to 0} \text{E}_1 \left[\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial k} \right] > R - \left| \sigma_{ug} \right|$. *Then In part (b) of proposition 1,*

(i) *Household will diversify with enterprise if*

$$\text{E}_1 \left[\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial k} \right] > R - \frac{\sigma_{ug}}{\text{E}_1 \left[u'(c_2) \right]}. \tag{12}$$

(ii) *Conversely, the household will diversify with the safe asset if*

$$R > \text{E}_1 \left[\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial k} \right] + \frac{\sigma_{ug}}{\text{E}_1 \left[u'(c_2) \right]} \tag{13}$$

Lemma 1 shows the *ex-ante* risk management role of enterprise for the household. The marginal return to investing in the safe asset is $E_1 u'(c_2) R$, which is a positive constant. Recall that since l_f and $\overline{A}$ are given (for now), $c_2 = f(\overline{L} - l_g, \overline{A} \mid \varepsilon_f)$ is not a function of choice variables. By the assumption that

$$\lim_{k \to 0} \text{E}_1 \left[\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial k} \right] > R - \left| \sigma_{ug} \right| \tag{14}$$

then the marginal return to investing in enterprise at low levels of investment exceeds that of investing in the safe asset. The marginal return to investing in the enterprise is $E_1[u'(c_2)] E_1 \left(\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial k} \right) + \sigma_{ug}$ and it is decreasing in k because

both $E_1[u'(c_2)]$ and σ_{ug} are constants while $E_1\left(\psi\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right)$ is decreasing in *k* by the concavity of $g(\cdot)$.

Define a level of investment, k^{***}, such that $E_1\left(\frac{\partial g(k^{***},l_g|\varepsilon_g)}{\partial k}\right)=\frac{-|\sigma_{ug}|}{E_1[u'(c_2)]}$.

Therefore, on the domain $\left[0,k^{***}\right]$, $E_1[u'(c_2)]E_1\left(\psi\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right)+\sigma_{ug}$ crosses $E_1u'(c_2)R$ from above and only once. Hence, for a given *R*, there exists a $\hat{k}$ such that a household is indifferent between investing in the safe asset or the enterprise:

$$E_1u'(c_2)R=E_1\left(u'(c_2),\psi\frac{\partial g(\hat{k},l_g|\varepsilon_g)}{\partial k}\right)$$

$$E_1u'(c_2)R=E_1[u'(c_2)]\mathrm{E}_1\left[\psi\frac{\partial g(\hat{k},l_g|\varepsilon_g)}{\partial k}\right]+\mathrm{cov}\left(u'(c_2),\psi\frac{\partial g(\hat{k},l_g|\varepsilon_g)}{\partial k}\right)$$

$$E_1u'(c_2)R=E_1[u'(c_2)]E_1\left(\psi\frac{\partial g(\hat{k},l_g|\varepsilon_g)}{\partial k}\right)+\sigma_{ug} \qquad (15)$$

It follows that it becomes optimal for the household to choose enterprise over the safe investment for all $k\in(0,\hat{k}]$. That is, $\mathrm{E}_1\left[\psi\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right]\geq R-\frac{\sigma_{ug}}{\mathrm{E}_1[u'(c_2)]}$ when $k\in(0,\hat{k}]$.

Now, suppose that $k\in(0,\hat{k}]$ and $\sigma_{ug}>0$, meaning that it is optimal to invest in enterprise over the safe asset. This means that the household choose the enterprise even though the constant return from the safe asset (*R*) exceeds the expected marginal return from the enterprise. The reason why the household would rationally follow that course of

action is that the enterprise performs a risk-mitigating role. To show this clearly, notice that $\sigma_{ug} = \text{cov}\left(u'(c_2), \psi \frac{\partial g(\hat{k}, l_g \left| \varepsilon_g \right.)}{\partial k} \right)$ has the opposite sign of σ_{fg} because $u(c)$ is concave.

That is, when σ_{ug} is positive, the marginal return to enterprise investment is negatively correlated with farm output. The utility from this reduced risk for a risk-averse household outweighs the higher, alternative return from the safe asset.

Similarly, if $R > \text{E}_1\left[\psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right] + \frac{\sigma_{ug}}{\text{E}_1\left[u'(c_2) \right]}$ (because $k > k^{**}$) and $\sigma_{ug} < 0$,

the household will invest in the safe asset despite the higher marginal return from enterprise investment since the latter's relative higher return comes with higher second period volatility since $\sigma_{fg} > 0$. So in the presence of a risky environment, diversification has the price of decreasing the returns to investment in an enterprise.

The degree of risk aversion of the household will also affect its marginal return on enterprise investment. And since it is generally assume that risk aversion is increasing in wealth, the adverse effect of risk aversion on marginal return will be felt harder by poorer and more liquidity-constrained households.

Lemma 2: *The expected marginal return of enterprise investment is decreasing in the coefficient of relative risk aversion,* r_r $(i.e.\, r_r = -\frac{c_1 u''(c_1)}{u'(c_1)})$.

From the first order condition in part (b) of proposition 1 and assuming that the household invests in the enterprise, we have:

$$u'(c_1) = \beta \mathrm{E}_1 \left\{ u'(c_2) \psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right\} = \beta \mathrm{E}\left[u'(c_2) \right] \mathrm{E}_1 \left[\psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right] + \beta \sigma_{ug}$$

$$\Rightarrow \mathrm{E}_1 \left[\psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right] = \frac{u'(c_1)}{\beta \mathrm{E}_1 \left[u'(c_2) \right]} - \frac{\sigma_{ug}}{\mathrm{E}_1 \left[u'(c_2) \right]}$$

$$\Rightarrow \mathrm{E}\left[\psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right] = \frac{u'(c_1)}{c_1 u''(c_1)} \frac{c_1 u''(c_1)}{\beta \mathrm{E}\left[u'(c_2) \right]} - \frac{\sigma_{ug}}{\mathrm{E}\left[u'(c_2) \right]}$$

$$\Rightarrow \mathrm{E}\left[\psi \frac{\partial g(k, l_g \left| \varepsilon_g \right.)}{\partial k} \right] = -\frac{1}{r_r} \frac{c_1 u''(c_1)}{\beta \mathrm{E}\left[u'(c_2) \right]} - \frac{\sigma_{ug}}{\mathrm{E}\left[u'(c_2) \right]} \qquad (16)$$

As equation (16) shows, the expected marginal return to enterprise investment is decreasing in r_r.

The preceding Lemma 2 also gives us a relationship between enterprise return and the uncertainty associated with other livelihood activity – in this case, farming.

Corollary 1: *Marginal return to enterprise investment is decreasing in the variability of agriculture for the liquidity-constrained if risk mitigation is the primary reason for entrepreneurship.*

From equation (16), we have:

$$\mathrm{E}\left[\psi\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right]=-\frac{1}{r_r}\frac{c_1u''(c_1)}{\beta\mathrm{E}_1\left[u'(c_2)\right]}-\frac{\sigma_{ug}}{\mathrm{E}_1\left[u'(c_2)\right]}$$

For risk-mitigation to be primary motivation for starting an enterprise, σ_{ug} is positive.

$$\mathrm{E}_1\left[\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right]=-\frac{1}{r_r}\frac{c_1u''(c_1)}{\beta\mathrm{E}_1\left[u'(c_2)\right]}-\frac{\rho\sigma_u\sigma_g}{\mathrm{E}_1\left[u'(c_2)\right]} \tag{17}$$

$$\mathrm{E}_1\left[\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right]=-\frac{1}{r_r}\frac{c_1u''(c_1)}{\beta\mathrm{E}_1\left[u'(c_2)\right]}-\rho\sigma_g\frac{\sigma_u}{\mathrm{E}_1\left[u'(c_2)\right]}$$

$$\mathrm{E}_1\left[\frac{\partial g(k,l_g|\varepsilon_g)}{\partial k}\right]=-\frac{1}{r_r}\frac{c_1u''(c_1)}{\beta\mathrm{E}_1\left[u'(c_2)\right]}-\rho\sigma_g CV_u \tag{18}$$

where $CV_u=\dfrac{\sigma_u}{\mathrm{E}_1\left[u'(c_2)\right]}$ is the coefficient of variation of the marginal utility of farm output in the second period, σ_u is the standard deviation of marginal utility of the farm output, σ_g is the standard deviation of the marginal return to enterprise investment and ρ is the correlation coefficient ($0<\rho<1$). As can be seen from equation (18), the first order effect of CV_u on the expected marginal return to enterprise investment is negative. In other words, uncertainty in farm output adversely affects the expected return to enterprise if risk-mitigation is the primary motivation behind enterprise start-up.

The other important factor that directly links the enterprise with agriculture is labor. Since this set-up assumes labor markets are absent, this variable will be important in determining if the household specializes or diversifies.

Proposition 2: *Suppose* $k \in (0, \hat{k}]$. *With a given* $\overline{A}$, a *household will specialize into entrepreneurship by allocating all labor to that activity if*

$\psi > \frac{\partial f(\overline{L} - l_g, \overline{A} \mid \varepsilon_f)/\partial l_g}{\partial g(k, l_g \mid \varepsilon_g)/\partial l_g} \geq 0$ *for all* $l_f \in (0, \overline{L})$. *And if* $0 \leq \psi < \frac{\partial f(\overline{L} - l_g, \overline{A} \mid \varepsilon_f)/\partial l_g}{\partial g(k, l_g \mid \varepsilon_g)/\partial l_g}$ *for all* $l_g \in (0, \overline{L})$, *the household will specialize in farming. Diversification occurs if*

$\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial l_g} = \frac{\partial f(\overline{L} - l_g, \overline{A} \mid \varepsilon_f)}{\partial l_g}$, *meaning that* $0 < l_g < \overline{L}$.

This proposition comes from the first order condition of optimal labor allocation. A household that is endowed with high entrepreneurial talent will find it optimal to specialize in entrepreneurship. Furthermore, low productivity in agriculture means that a household does not have much to lose by turning their back on farming. Conversely, a low entrepreneurial talent makes specializations in entrepreneurship not worthwhile.

In a few papers on entrepreneurship, schooling is used as a proxy for entrepreneurial ability (Paulson and Townsend 2004). However, not only can schooling be a poor proxy but it can lead to a misleading association if another sector puts a high premium on schooling. In an economy with high returns to schooling in the formal wage sector because of low educational attainment in the economy, an individual's level of schooling will be a poor proxy for entrepreneurial ability. Let ξ represent the level of schooling attained. And instead of agriculture, let the wage sector be the alternative to

entrepreneurship. Let the equation for the wage income be $\varpi(l_{\varpi}, \xi)$,

where $l_{\varpi} = \bar{L} - l_{\mathrm{g}}$ represents the household's labor allocated to the wage sector,

$\partial\varpi(\bar{L} - l_{\mathrm{g}}, \xi)/\partial\xi > 0$, $\partial\varpi(\bar{L} - l_{\mathrm{g}}, \xi)/\partial l_{\mathrm{g}} < 0$.

Corollary 2: *Assume that* $k \in (0, \hat{k}]$. *Then for a given* ψ *and* ξ,

if $\dfrac{\partial\varpi(\bar{L} - l_g, \xi)}{\partial l_g} > \psi \dfrac{\mathrm{E}_1\left\{\partial g(k, l_g \left| \varepsilon_g \right.)\right\}}{\partial l_g}$, *the household will specialize in the wage sector*

and for $\dfrac{\partial\varpi(\bar{L} - l_g, \xi)}{\partial l_g} < \psi \dfrac{\mathrm{E}_1\left\{\partial g(k, l_g \left| \varepsilon_g \right.)\right\}}{\partial l_g}$, *the household will specialize in*

entrepreneurship.

This corollary follows from the fact that, with the wage-sector work as the alternative, the second period budget constraints becomes:

$$c_2 = \psi g(k, l_g \left| \varepsilon_g \right.) + Rk + \varpi(L - l_g, \xi) \tag{19}$$

In this setting, it would be misleading to proxy entrepreneurial ability with the level of schooling. With the high rate of return to education in the wage sector in The Gambia, highly educated households will specialize in the wage sector. This reality will induce a negative relationship between the level of schooling and the likelihood of going into entrepreneurship (for a given ψ).

The preceding discussion focuses only on *ex-ante* risk management. However, in reality, shocks arrive randomly and households are forced to cope with risk *ex-post*. The two are obviously related since the mechanism used by a household to cope with risk is likely to depend a great deal on the actions that were taken in anticipation of some future

adverse event. This would not be the case in the complete market case. A negative income shock would be smoothed with borrowing or through insurance. Even in the presence of local risk sharing arrangement, risk-coping with enterprises will be significant in the face of a rainfall shock since all households within the same area will be affected similarly (Czukas, Fafchamps and Udry, 1995).

In the incomplete market case of this setting, for an enterprise to help in risk-coping, it is necessary that the household already has started one. In other words, it is highly unlikely for a household to start an enterprise right after a shock to make up for the shortfall in income. This is because, as noted earlier, enterprises are quite different from other risk-coping devices. For instance, there is a significant intertemporal aspect to the entrepreneurial decision. If the household could start an enterprise right after a shock despite the likely credit problem (by relying solely on its sufficient savings), then the issue of income and consumption fluctuation would not have risen in the first place. Such a problem is unlikely to occur with other forms of risk coping such as going into the off-farm wage sector or temporarily reducing the dependency ratio of the household, which could be effected in a much shorter time.

So to look at risk-coping involving enterprises, it is much more plausible to assume that the household already owns an enterprise.

Proposition 3: *Suppose a household has diversified its livelihood between entrepreneurship and agriculture in the second period. Then a negative shock to agriculture (modeled as a fall in A) will induce more labor allocation or effort to enterprise operations to make up for the shortfall in income.*

The first order condition for optimal labor allocation (interior solution) is $\psi \frac{\partial g(k, l_g \mid \varepsilon_g)}{\partial l_g} = \frac{\partial f(\bar{L} - l_g, A \mid \varepsilon_f)}{\partial l_g}$. Totally differentiating this expression at a given level of entrepreneurial ability and capital ($d\psi = dk = 0$), we get the following expression:

$$\frac{dl_g}{dA} = \frac{\partial f(\bar{L} - l_g A \mid \varepsilon_f) / \partial A}{\psi \mathrm{E}_1 \partial^2 g(k, l_g \mid \varepsilon_g) / \partial l_g^{\,2}} < 0 \qquad (20)$$

When there is a negative shock to agriculture (that is, $f(\bar{L} - l_g A \mid \varepsilon_f)$ falls), optimal allocation of labor involves devoting more time to the enterprise. This is in effect, a risk-coping activity. A negative shock to agriculture at a given enterprise return or profit means less second period income and consumption. To counteract this drop in income, the household devotes more time to the enterprise to dampen the fluctuation in income. This effect is also shown graphically in figure 3, where a negative shock to agriculture causes the re-allocation of labor to the enterprise, which in turns results in higher enterprise revenue.

III. The Data

The data comes from two nationally representative surveys carried out in 1992 and 2003 by the Central Statistics Department in The Gambia. These surveys are part of a repeated cross-sectional surveys carried out approximately every five years. After data cleaning, the 1992 survey contains 1391 households while the 2003 survey contains 4942 (because not all households have observations for all variables, the number of observations in the actual estimations are lower than these numbers). Because the survey was not focused on only enterprises or households with enterprises, this data set does not have selection problems that can be expected for surveys with very selective focus.

Table 1 presents the summary statistics of several key household variables. The rural coverage is good since about 48% of the household are in rural areas. The average years of schooling of individuals per household is unsurprisingly low at 3.05 years, and the average for household heads is only slightly above this figure at 3.36 years.

About 44% of all household have at least one enterprise. Livelihood diversification is prevalent since there is a highly significant overlap between enterprises ownership and farming. In general, households with enterprises are similar to those without. For example, the percentage of female headship and the household owning its dwelling is identical for entrepreneurial and non-entrepreneurial households at 14% and 61% respectively. However, there are some significant differences. The average household size for those with enterprises is 9.7 versus 7.9 for those without. Households with enterprises have a lower average for years of schooling, probably because many non-entrepreneurial households are likely to be headed by highly educated, salaried individuals. The average total household income is higher for entrepreneurial households.

Tables 2A and 2B present the characteristics of enterprises and the individuals who manage them. Most of these enterprises are small in terms of capital and numbers of workers (the mean number of workers is 1.19, excluding the manager of the enterprise). Formal financial intermediation is not widespread, as only 11.5% of enterprises ever received a loan or have a bank account. The average enterprise has been in operation for about 6.5 years. The education level of enterprise manager (2.01) is lower than the sample average. 35% of enterprise managers are females, which is a much higher figure than female household heads. Table 2C some summary statistics indicative of significant credit constraints.

The enterprises in the sample cover wide range of industries but the modal enterprise industry is retail (food) trade. Because of the large number of industries, I categorized them into three sectors: primary (extractive activities, such as logging, fishing and charcoal making), secondary (processing and manufacturing activities, such as carpentry and craft-making) and services (retail trade in food and transportation). While these sectors are similar in terms of average monthly profit, there are several key differences. While primary sector and service enterprises are on average close to 7 years old, secondary sector enterprises are a little over 10 years old. The primary sector is concentrated in rural areas and most likely to have managers with low levels of schooling.

Table 1: Household (HH) Characteristics (standard deviations are in parentheses).

	Observations	All Households	Does not Operate an Enterprise	Operates an Enterprise
	1	2	3	4
Household Size	6273	8.668 (6.757)	7.865 (6.237)	9.698 (7.246)
Own Enterprise	5968	0.437 (0.496)		
Average Year of Schooling in Household Head	5917	3.049 (3.074)	3.333 (3.379)	2.764 (2.632)
Rural Dummy	6317	0.476 (0.499)	0.504 (0.500)	0.421 (0.494)
Own Dwelling	6253	0.618 (0.486)	0.613 (0.487)	0.613 (0.487)
Total Household* Income	3797	49881.970 (168500.800)	35940.190 (108406.300)	69677.760 (225187.900)
Years of School Of Household head	6184	3.355 (4.931)	3.849 (5.238)	2.821 (4.470)
Age of Household Head	6249	46.434 (14.181)	45.691 (14.488)	47.007 (13.568)
Female Household Head	6254	0.142 (0.349)	0.140 (0.347)	0.141 (0.348)

*in 2003 Dalasi ($1=27Dalasi)

Table 2A: Enterprise Characteristics (standard deviations are in parentheses).

	Observations	All Enterprises	Primary Sector	Secondary Sector	Service Sector	no sector reported
	1	2	3	4	5	6
Workers	2561	1.193 (2.523)	1.529 (2.890)	1.824 (4.493)	1.135 (2.391)	0.986 (1.561)
Enterprise Age (months)	2976	80.111 (99.266)	89.472 (98.632)	129.817 (129.075)	85.005 (98.649)	59.571 (87.214)
Have Bank Acct. or Loan?	2975	0.116 (0.320)	0.078 (0.269)	0.128 (0.335)	0.146 (0.353)	0.080 (0.271)
Capital*	2794	31951.71 (389764.5)	18729.14 (132439.8)	26806.55 (223434.0)	50420.74 (542946.5)	10284.74 (74632.89)
Rural Dummy	6317	0.476 (0.499)	0.677 (0.469)	0.330 (0.471)	0.319 (0.466)	0.525 (0.499)
Monthly Net Income (log)*	2308	6.863 (1.434)	6.500 (1.524)	6.575 (1.331)	6.998 (1.397)	6.826 (1.458)
Manager Characteristics						
Schooling	2254	2.013 (3.875)	1.070 (2.682)	2.928 (4.413)	2.417 (4.171)	1.508 (3.475)
Female	2666	0.353 (0.478)	0.551 (0.498)	0.194 (0.396)	0.357 (0.479)	0.320 (0.467)
Age	2666	40.169 (12.871)	39.935 (11.753)	40.060 (12.846)	40.065 (12.625)	40.488 (13.729)

*in 2003 Dalasi ($1=27Dalasi)

*Capital is the value of the assets owned by enterprises. Among the assets listed are building, land, equipment/tools/machinery, stock of goods and raw materials, bicycles, carts, automobile and boats.

Table 2B: Enterprise Characteristics (standard deviations are in parentheses).

	Observations	All Enterprises	Enterprises with only 1 worker	more than 1 worker	Enterprises with ≤10 workers
	1	2	3	4	5
Workers	2561	1.193 (2.523)	0	2.374 (3.140)	1.045 (1.495)
Enterprise Age (months)	2976	80.111 (99.266)	87.699 (104.537)	74.461 (94.793)	86.158 (99.876)
Have Bank Acct. or Loan?	2975	0.116 (0.320)	0.091 (0.288)	0.135 (0.341)	0.123 (0.328)
Capital*	2794	31951.710 (389764.500)	13403.480 (99541.160)	46099.850 (509914.200)	36624.280 (421754.700)
Rural Dummy	6317	0.476 (0.499)	0.396 (0.489)	0.482 (0.500)	0.424 (0.494)
Monthly Net Enterprise Income	2834	3508.155 (34003.24)	2445.77 (4950.03)	5702.61 (53441.65)	3890.77 (36864.44)
Manager Characteristics					
Schooling	2254	2.013 (3.875)	1.604 (3.444)	2.298 (4.131)	2.045 (3.884)
Female	2666	0.353 (0.478)	0.406 (0.491)	0.312 (0.463)	0.363 (0.481)
Age	2666	40.169 (12.871)	40.305 (13.300)	40.137 (12.526)	40.054 (12.728)

Table 2C: Proportion of enterprises that had unmet needs in the previous year. Standard deviations are in parenthesis.

	At Least Once	Frequently
	1	2
Hired Labor	0.237	0.041
	(0.425)	(0.199)
Raw material	0.265	0.074
	(0.441)	(0.261)
Land Rental	0.231	0.030
	(0.422)	(0.170)
Machinery	0.222	0.016
	(0.415)	(0.124)
Required License	0.248	0.055
	(0.432)	(0.229)
Others Items	0.248	0.056
	(0.432)	(0.230)

IV. Determinants of entrepreneurship & Investment

The paucity of enterprises that obtained loans and the proportion of enterprises that had unmet needs (Table 2C) are suggestive of credit constraints. So as the theoretical model suggests, one of the key determinants of enterprise ownership should be household wealth (w). One ideal way to test if wealth determines enterprise ownership is to use househod wealth at the start of the enterprise as an independent variable. However with cross-sectional data, this is not possible and I use household income as proxy for household wealth. To test whether wealth determines enterprise ownership, the following equation is estimated:

$$E_{ij} = X_{ij}^{'}\beta + \gamma w_{ij} + \upsilon_{ij} \tag{21}$$

$$E_{ij} = 1(E_{ij}^{*} > 0)$$

where X_{ij} is a vector of relevant household variables for household i in district j, E_{ij}^{*} is a latent variable and υ_{ij} is the error term. However since household income (I) is being used as proxy for wealth and enterprise income may be part of household income, estimating the above equation becomes problematic.

To address this problem, I instrument household income with rainfall shocks (RF). I use three measures of rainfall shock. The first component of RF is the difference between current rainfall and average rainfall over the past five years in district in district. This serves as a good instruments since positive rainfall shocks should be positively correlated with household income as majority of households derive part of their income from farm-related activities (the dependence of crop yield - and therefore agricultural income - on total rainfall in district is shown in Figure 1). Since current rainfall shock is an exogenous variable, I do not expect it directly affect enterprise ownership outside of

its wealth/income effect. Additionally, the decision to become an enterprise would have been made before the current rainy season started. The second component of rainfall shock is the quantity of rainfall in district in May and June of current year, and the third component is a dummy variable indicating whether the combined amount (in millimeters) of rainfall in May and June exceeded 100mm. I included these two variables to capture the unset of the rainy season since a delay in the arrival of the first rain could adversely affect yield (the rainy season in The Gambia generally lasts from July to October). To address the endogeneity of income, I estimate the following equation:

$$E_{ij} = X_{ij}^{'}\beta + \gamma I_{ij} + \upsilon_{ij}$$

$$I_{ij} = RF_{j}^{'}\lambda + X_{ij}^{'}\beta + \upsilon_{ij}^{1} \qquad (22)$$

$$E_{ij} = 1(E_{ij}^{*} > 0)$$

I estimated equation (22) jointly using a maximum likelihood model (*IVProbit*). Table 3 presents both the *Probit* estimates of equation (21) and the joint estimation of equation (22). The *Probit* estimates show that income has a positive effect on enterprise ownership, though the coefficient is insignificant. The coefficient becomes significant once we allow for the endogeneity of income in the *IVProbit* estimation. Furthermore, the test of exogeneity (Wald's) shows that we can reject the null hypothesis that household income is not correlated with υ_{ij}.

While establishing the dependence of enterprise ownership on household income, the preceding estimation does not tell us how this dependence varies over the income range in the sample. To address this missing analysis, I re-estimate the effect of total household income on enterprise ownership semi-parametrically. The following

estimation equation allows income to vary flexibly with no functional form assumption and also allows other variables to enter linearly:

$$E_{ij} = \varphi(I_{ij}) + X_{ij}^{'}\beta + \hat{\upsilon}_{ij} \tag{23}$$

X continuous to be a vector of household variables, $\varphi(I_{ij})$ is flexible function of household income and $\hat{\upsilon}_{ij}$ is zero-mean error term. Following Yatchew (1997) and Lokshin (2005), the parametric and non-parametric components can be estimated separately. The differencing method of Yatchew (1997) can be used to estimate $\varphi(I_{ij})$ after which the non-parametric component can be estimated:

$$E_{ij} - X_{ij}^{'}\hat{\beta} = X_{ij}^{'}(\beta - \hat{\beta}) + \varphi(I_{ij}) + \upsilon_{ij} \cong \varphi(I_{ij}) + \upsilon_{ij} \tag{24}$$

The approximation in equation (16) follows because the estimator is consistent and converges quickly (Lokshin (2005)). I use the locally weighted scatterplot smoothing (LOWESS) to estimate the non-parametric equation above. LOWESS essentially runs a regression on each observation of the independent variable. It is particularly useful when there are outliers since larger weights are put on neighboring observations thereby nullifying the effects of outliers. Figure 2 shows the result of the non-parametric component of equation (15). The wealth effect on the likelihood of being an entrepreneur is positive but clearly nonlinear. The function $\varphi(I_{ij})$ is increasing for lower levels of wealth but flat (no wealth effect) at higher wealth level. In other words, the dependence of the likelihood of starting an enterprise on wealth holds mostly for the non-wealthy. There seems to be no relationship between household income and likelihood of enterprise ownership for the wealthy. This is consistent with proposition 1.

Looking at other determinants, household size positively and significantly predicts entrepreneurship. This may by the result of economies of scope since smaller households may be less positioned to diversify into multiple livelihoods. Both the average years of schooling within the household and the educational attainment of the household head are negatively associated with entrepreneurship. The low level of educational attainment and the high rate of return to education in the wage sector in The Gambia is the likely explanation for the negative association between education and entrepreneurship. In other words, the relatively highly educated households depend primarily on wage income.

Figure 1: The co-movement of rainfall and ground nut yield (the main agricultural crop in the country.

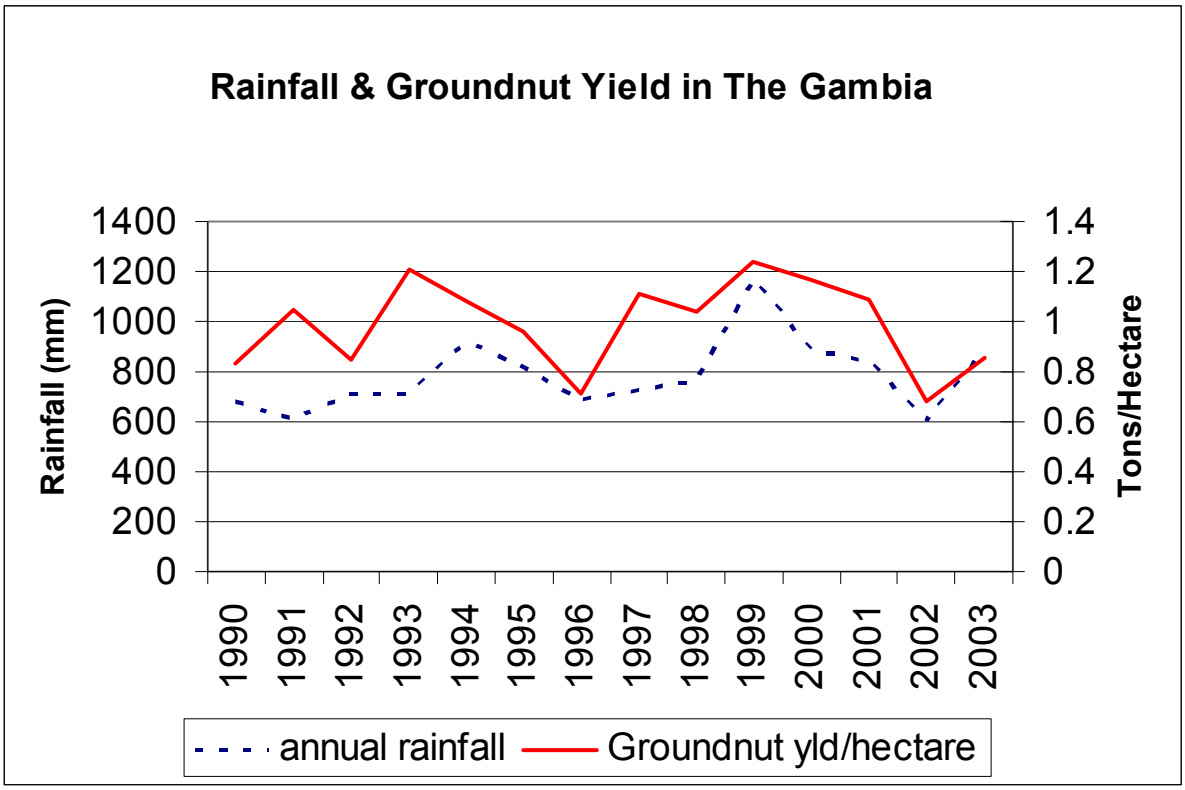
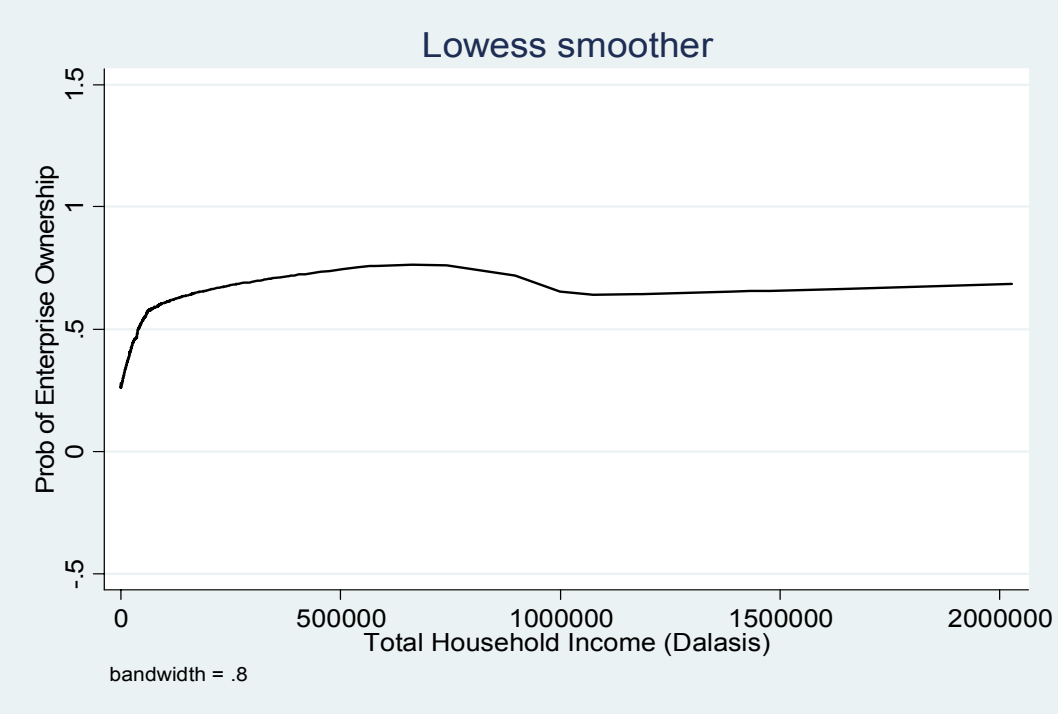


Table 3: Likelihood of owning an enterprise. The dependent variable is dummy indicating whether household has an enterprise.

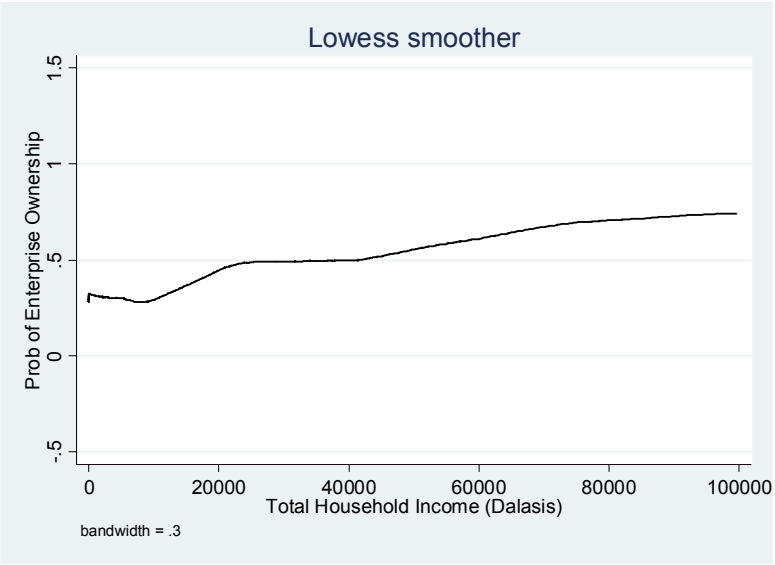
	Probit	OLS	IV-Probit
	1	2	3
Total Household Income	0.000001	0.0000002***	0.000006***
	(0.000)	(0.000)	(0.000)
Household Size	0.044***	0.016***	-0.004
	(0.005)	(0.002)	(0.005)
Rural Dummy	-0.654***	-0.237***	-0.103*
	(0.079)	(0.027)	(0.064)
Age of Household Head	-0.006**	-0.002**	-0.003**
	(0.002)	(0.001)	(0.001)
Year of Schooling of household head	-0.028***	-0.010***	-0.013**
	(0.007)	(0.003)	(0.005)
Average Years of Schooling in Household	-0.038***	-0.013***	-0.005
	(0.012)	(0.004)	(0.005)
2003 Dummy	-0.131**	-0.048**	0.045
	(0.051)	(0.018)	(0.047)
Constant	0.004	0.499***	-0.114
	(0.116)	(0.041)	(0.081)
Observations	3424	3424	3222
Wald test of exogeneity:			
$\chi(1) =$ 77.80			77.80
P-value			0.000
R^2	0.09	0.11	

***significant at 1%, **significant at 5%, *significant at 10%
In all regressions, 1992 is the excluded year dummy

Figure 2: Non-parametric effect of income on enterprise ownership. Variables that enter parametrically (linearly) are the same as the independent variables in Table 3.



Enlargement of the above in the income range: 0-100000



The theoretical section also predicts the dependence of investment on wealth for the non-wealthy, liquidity-constrained households. In this section, I test the effect of wealth on investment. k_{ij} is the amount of investment made by household in its enterprise in the previous 12 months. In equation (25), *X* and *Y* represent the vector of household and enterprise variables respectively, I continues to represent household income and ν_{ij} is the error term.

$$k_{ij} = X_{ij}^{'}\beta + Y_{ij}^{'}\delta + \gamma I_{ij} + \nu_{ij} \qquad (25)$$

Table 4A presents the results of estimation of equations (25). Because many households made no investments in their enterprise and we only observe non-negative levels of investments, the above equation was also estimated with a *Tobit* model to control for the censoring of the observations at zero. Household income, as expected, has a significant and positive effect on investment.

The estimation of equation (25) is complicated by the possibility that the positive coefficient on household income could be the result of reverse-causality. That is, the enterprise could have experienced some profitability a while back and this could have increased household income and part of which could be re-invested back in the enterprise. To see if this is the main reason behind the estimated positive coefficient on income, I re-estimate equation (25) by age-cohort of enterprises. The reason for doing this is that the possibility of reverse causality is unlikely for the very young enterprises since there could not have been sufficient time for their profit to significantly augment household income. The results are presented in Table 4B. Even enterprises less than a year old show the same positive relationship between income and investment, thereby

giving strong indication that the direction of causality runs from income to investment, not vice-versa.

Table 4A: Determinants of Investment. The dependent variable is the value of investment made in the previous 12 months.

	OLS	Tobit
	1	2
Total Household Income	0.29***	0.37***
	(0.03)	(0.05)
Year of Schooling Of Manager	-5419.81**	26.74
	(2132.75)	(3496.72)
Household Size	-617.47	-886.58
	(1186.71)	(2019.77)
Capital	0.81**	0.92***
	(0.05)	(0.08)
Enterprise Age	-112.61	-254.62
	(191.56)	(337.09)
Enterprise Age Squared	0.06	-0.25
	(0.41)	(0.74)
Age of Manager	297.44	-867.27
	(2998.66)	(4861.94)
Age of Manager Squared	-3.52	16.95
	(32.38)	(52.18)
Rural Dummy	7614.69	-46681.73
	(20573.40)	(34132.50)
Female Dummy	-6355.62	-31515.78
	(17008.91)	(28634.73)
Year 2003 Dummy	37520.41*	226520.60**
	(20225.36)	(36967.67)
Primary Sector	-9051.61	9515.10
	(26799.66)	(44017.83)
Secondary Sector	-16700.81	75163.47
	(30911.65)	(50241.67)
Constant	-10573.81	-362903.00***
	(69054.23)	(113814.00)
Observation	1258	1258
R Squared	0.23	

Regional dummies were included in regression.
***significant at 1%, **significant at 5%, *significant at 10%

Table 4B: Determinants of Investment by age cohorts. The dependent variable is the value of investment made in the previous 12 months. This investment is not double counted in capital of enterprise.

	< 1 Year Old		Between1 and 5 Years Old (inclusive)		> 5 Years Old	
	OLS	Tobit	OLS	Tobit	OLS	Tobit
	1	2	3	4	5	6
Total Household income	0.14***	0.14***	0.19***	0.26***	0.22***	0.27***
	(0.00)	(0.00)	(0.05)	(0.07)	(0.02)	(0.04)
Household Size	-796.66***	-1315.17***	-1811.20	-2399.38	-462.81	300.83
	(143.42)	(270.98)	(2046.00)	(3288.48)	(590.54)	(1038.28)
Year of Schooling Of Manager	-239.46	126.66	-4138.67	2922.55	-348.50	1247.60
	(212.41)	(379.85)	(3624.74)	(5385.92)	(1137.48)	(1967.87)
Capital	0.02	0.03	3.76***	3.85***	0.10***	0.12***
	(0.01)	(0.02)	(0.12)	(0.13)	(0.02)	(0.03)
Enterprise Age	559.82	643.86	-387.93	-8732.72	-92.68	-242.41
	(935.89)	(1750.71)	(11794.16)	(17460.45)	(112.23)	(203.46)
Enterprise Age Squared	-52.97	-70.62	32.72	164.41	0.11	0.19
	(67.66)	(126.01)	(169.19)	(250.92)	(0.19)	(0.34)
Age of Manager	-146.00	35.82	-9872.63	-12689.73	1062.98	-1492.76
	(324.44)	(580.96)	(6846.39)	(10630.08)	(1470.46)	(2444.56)
Age of Manager Squared	2.04	1.90	105.65	134.15	-6.29	19.29
	(3.86)	(6.75)	(78.99)	(122.88)	(14.40)	(23.58)
Rural Dummy	1742.17	-2455.60	18944.70	-39784.79	2982.48	-11941.45
	(2248.28)	(3933.70)	(35332.38)	(53969.25)	(10553.20)	(18598.70)
Female Dummy	-1871.18	-886.89	-10715.98	-36282.90	2263.59	-9030.84
	(1771.97)	(3231.23)	(28810.35)	(44197.71)	(9057.61)	(16435.35)
Year 2003 Dummy	7083.66**	12390.22**	34464.47	146439.60**	20581.01**	106157.30***
	(2533.18)	(5039.07)	(35085.46)	(56829.74)	(9644.59)	(19334.04)
Primary Sector	-2036.39	-4398.86	22631.35	74915.17	-19433.57	-38252.90
	(2917.95)	(5466.58)	(44868.52)	(65903.48)	(14415.98)	(26615.88)
Secondary Sector	-1123.90	2923.66	5372.65	100141.70	-5279.22	37453.76
	(3476.65)	(5999.67)	(63040.90)	(92380.83)	(13576.62)	(23525.07)
Constant	3010.51	-17648.93	122557.50	4179.17	-29317.97	-105134.60*
	(7156.36)	(13257.62)	(232124.10)	(352001.60)	(36396.81)	(61568.70)
R Squared	0.95		0.73		0.23	
Observations	230		434		482	

***significant at 1%, **significant at 5%, *significant at 10%

Regional dummies were included in regression.

Enterprise Returns & The Role of Risk

This section investigates the determinants of net enterprise income (profit) and also the rate of return to capital. Monthly net enterprise income was obtained by taking the difference between monthly revenue and cost. Figure 3 shows the distribution of net enterprise income, which is bi-modal. Most enterprises received positive profit but a significant percentage also earned zero or negative profit. To assess the determinants of enterprise profitability, I estimate the following equation with OLS (*i* indexes enterprise and *j* indexes district):

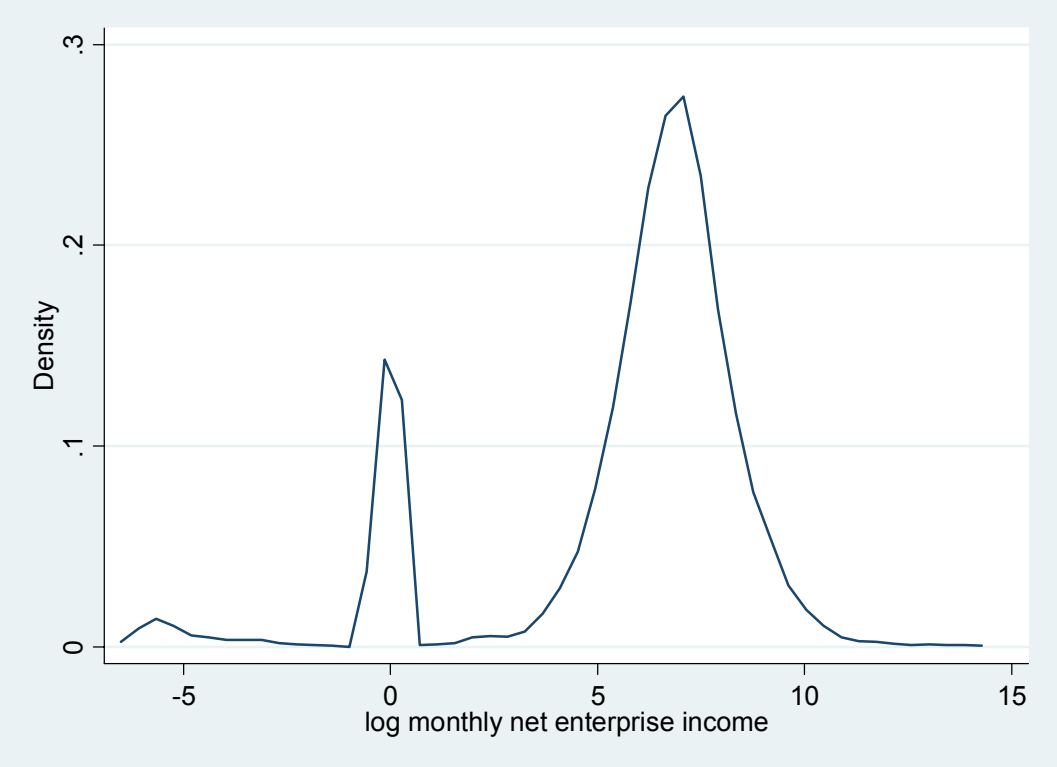
$$\pi_{ij} = Y_{ij}^{'}\theta + M_{ij}^{'}\gamma + \alpha K_{ij} + \lambda CV_{j} + \mu_{ij} \tag{26}$$

where *M* is a vector of manager and household characteristics, *Y* is a vector of enterprise variables, *K* is the value of enterprise assets (capital) and *CV* is the coefficient of variation of rainfall in district over the previous ten years. The inclusion of *CV* is a direct test of corollary 1 because it allows us to test whether the agro-climatic uncertainty in district affects enterprise profitability. The components of *Y* are the following: enterprise age and sector (primary, secondary and services - in all estimations, the service sector is the excluded dummy)) dummies. The components of *M* are years of schooling, sex, age and the number of adults over the age of fifteen in households. I include the adult measure to capture the effect of labor constraints. Additionally, all regressions included year, rural and regional dummies (these are not reported in Tables). Column 1 in Table 5 presents the results while column 2 calculates the rates of return (in the form ((dln y)/(dx))).

While the coefficient on capital is positive and significant, its rate of return is surprisingly low. Specifically, the return to capital is only 0.002% per month. And

importantly, the coefficient of variation of rainfall in district has a significant and negative effect, as predicted by corollary 1. Specifically, a percentage point increase in the coefficient of variation of rainfall in district decreases the rate of return by 11% per month. The low return on capital and the negative effect of agro-climatic risk together suggest that the existence of small enterprises is an outcome of an *ex-ante* risk management strategy by poor households with diversified livelihoods. This result is similar to the finding by Rosenzweig and Binswanger (1993) where households' return on investments were negatively correlated with weather risk.

Figure 3: Kernel Density of log of Net Enterprise Income per Month



To get a visual depiction of the distribution of profit and using all observations, the natural log of net monthly enterprise income (*NEI*) was calculated as follows:

$$\ln(NEI_i) = \begin{cases} \ln(NEI_i) & if \quad NEI_i > 0 \\ 0 & if \quad NEI_i = 0 \\ -\ln(-NEI_i) & if \quad NEI_i < 0 \end{cases}$$

There was only one observation in $[-1,0) \cup (0,1]$ and I dropped it from this figure.

Table 5A: Rates of Return and Determinants of Net Enterprise Income. The dependent variable is monthly net enterprise income (standard errors, which are clustered at the district level, are in parentheses).

	OLS	Marginal rate of return
	1	2
Years of Schooling Of Manager	-443.73** (194.15)	-11.19%
Capital	0.09*** (0.01)	0.002%
Capital Squared	-0.000000004 (0.00)	
Enterprise Age	-10.18 (17.42)	-0.26*
Enterprise Age Squared	0.01 (0.04)	
Age of Manager	-253.47 (273.38)	-6.39%
Age of Manager Squared	2.71 (2.96)	
Rural Dummy	437.06 (1829.80)	11.02%
Female Dummy	-1381.40 (1535.19)	-34.83%
Year 2003 Dummy	8413.44*** (2464.87)	212.16%
Primary Sector	-1223.35 (2320.47)	-30.85%
Secondary Sector	434.03 (2825.52)	11%
CV of District Rainfall	-439.55*** (116.13)	-11.08%
Adult (>15 years Old)	278.44 (486.83)	7.02%
Adult Squared	-14.77 (24.64)	
Constant	21804.59** (7605.45)	
Observations	1984	
R Squared	0.12	

***significant at 1%, **significant at 5%, *significant at 10%
Regional dummies were included in regression.

The estimation of equation (26) overlooks several econometric problems. The amount of assets owned by enterprise is likely to be correlated with ability of the enterprise manager or the average ability within the household. Since ability is not controlled, the preceding estimation is likely to suffer from omitted variable bias and the estimated rate of return may be too low. Another problem related to ability is that the education attained by enterprise manager is also likely to be correlated with ability and could also result in bias. The other major potential problem is that the estimation of the determinants of net enterprise income did not take into account the self-selection of households into entrepreneurship. We only observe the net enterprise incomes for households that decided to go into entrepreneurship. The estimated coefficients could therefore be potentially biased and inconsistent without correcting for self-selection.

To address the omitted variable problems, I instrument the education of manager with the number of schools (primary (*psch*) and secondary (*ssch*)) in district when manager was born. These two variables are correlated with the likelihood of going to school but have no direct relationship with enterprise profit today. I also instrument enterprise capital with an indicator variable that denotes whether the enterprise had been taxed. Tax collection rates in developing countries are notoriously low and therefore only the most visible (large) enterprises are likely to be taxed. The size of an enterprise is reflected in the size of its assets, among others. So the likelihood of being taxed should be correlated with enterprise size. And the likelihood of paying tax should have very little or no direct relation to the ability of the enterprise owners.

To address the selection problem, I estimated a slightly altered version of equation (21):

$$E_{ij} = 1\left(X_{ij}^{'}\beta + \varepsilon_{ij} > 0 \right) \tag{27}$$

where X is a vector of relevant household variables. The identifying selection variables are household size, age of household head, education of household head, average schooling within household and a dummy for female headed households . From equation (19), I calculated the inverse mills ratio (*mills*), which was included in equation (20a). ξ_{ij} denotes education, $\tilde{M}$ is manager and household variables excluding education and τ_{ij} is a dummy variable indicating if the enterprise was taxed in the previous 12 months.

$$\pi_{ij} = Y_{ij}^{'}\theta + \tilde{M}_{ij}^{'}\gamma + \delta_1\xi_{ij} + \alpha K_{ij} + \lambda CV_j + \delta_2 mills + \mu_{ij} \tag{28a}$$

$$K_{ij} = Y_{ij}^{'}\theta + \tilde{M}_{ij}^{'}\gamma + \delta_1\xi_{ij} + \delta_3\tau_{ij} + \varepsilon_{ij} \tag{28b}$$

$$\xi_{ij} = \vartheta_1 + \vartheta_1 pschi_{ij} + \vartheta_2 sschi_{ij} + \iota_{ij} \tag{28c}$$

Equation (28) is estimated with GMM. The results from the estimation of equation (28) are presented in Table 5B. The inverse mills ratio (*mills*) turns out to be not significant, suggesting that the selection effect may not be a huge factor. While the coefficient on capital increased significantly, its estimated rate of returns is still minuscule. So there seems to no returns to capital invested in these small enterprises in The Gambia. The coefficient of variation in district continues to be significant and negative, as expected.

Education is another important variable in the regression. Foltz and Gajigo (2007) found high rates of return to education in the wage sector in The Gambia. From the results in Table 5, the returns to education are actually negative in both the OLS and GMM estimations. This result is likely driven by educated households that depend on

other sources of income apart from enterprises or agriculture. Hence, they are likely to own small enterprises characterized by little investment and profitability.

Table 5B: Determinants of Net Enterprise Income (IV and selection). The dependent variable is monthly net enterprise income in 2003 Dalasi. Standard errors (clustered at the district level) are in parentheses.

	OLS	Marginal Rate of Return
	1	2
Capital	0.31*** (0.09)	0.008%
Years of Schooling Of Manager	-731.86** (391.58)	18.84%
Adult (>15 years Old)	-637.46 (826.81)	-13.53%
Adult Squared	7.91 (35.39)	
Enterprise Age	-15.75 (25.12)	-0.38%
Enterprise Age Squared	0.003 (0.06)	
Age of Manager	-916.49* (496.79)	-21.79%
Age of Manager Squared	10.40* (5.56)	
Rural Dummy	8545.67 (5467.43)	207.13%
Female Dummy	2016.72 (2605.79)	48.88%
Year 2003 Dummy	6251.46 (4591.76)	151.53%
Primary Sector	-1348.08 (3131.65)	-32.68%
Secondary Sector	-1842.87 (4084.07)	-45.67%
Inverse Mills Ratio	-13606.90 (11925.25)	-329.81%
CV of District Rainfall	-363.73* (218.55)	-8.82%
Constant	45762.49** (20836.15)	
Observations	1780	
F-test[†] stat	6.15	
p-value	(0.000)	
Hansen-Sagan[‡] stat	1.728	
p-value	(0.422)	

***significant at 1%, **significant at 5%, *significant at 10%

Regional dummies were included in regression. [†]This is the test of the joint significance of the excluded instruments. [‡]The null hypothesis is that instruments are valid.

As proposition 3 shows, small enterprise can also play a role in risk-coping. There are other documented forms of risk-coping such as taking children out of school, temporary reduction of household sizes, liquidation of assets, etc. but there does not seem to have been any studies of the risk-coping role of small enterprises in the literature.

To show evidence of risk-coping, I show that the expansion of enterprises (in terms of increase in revenue) in the past twelve months relative to the previous year is negatively correlated with the previous year's rainfall shocks. Expansion in revenue (not in profit) is most likely the result of reallocation of effort since other factors of production (such as capital) cannot be easily altered in a short time period in an environment with non-functioning credit markets.

Panels A and B of Table 6 show that there is a negative covariance between revenue growth and last year's rainfall shocks. This means that households re-allocate more effort to their enterprises when they experience bad shocks to agriculture and less effort if the preceding period witnessed a good shock. Panel C of Table 6 replicates the same result in the regression of enterprise revenue growth on rainfall shock of the preceding year. This shows that small enterprises can serve both as *ex-ante* risk management and *ex-post* risk coping mechanisms.

Table 6: Negative Covariance between revenue expansion and rainfall shock. The rainfall shock variable is calculated by subtracting from a year before the survey the average rainfall of the previous five year.

A. Variance-Covariance Matrix (the off-center entry is the covariance while the diagonal entries represent the variance).

	Expansion of Revenue	Rainfall Shock
Expansion of Revenue	0.197546	
Rainfall Shock Preceding the Change in Revenue	-3.71365	23397.7

B.

	No Contraction in Revenue	Rainfall Shock
No Contraction in Revenue	0.249881	
Rainfall Shock Preceding the Change in Revenue	-4.53255	23397.7

C. Regression

	The dependent Variable is a Dummy Variable Indicating that the Enterprise Experienced a Revenue Expansion the Previous Year		The Dependent Variable is a Dummy Variable Indicating that the Enterprise Experienced no Contraction in Revenue the Previous Year	
	OLS	Probit	OLS	Probit
	1	2	3	4
Rainfall Shock Preceding the Change in Revenue	-0.0002***	-0.0005***	-0.0002***	-0.0005***
	(0.000052)	(0.0002)	(0.0001)	(0.0001)
Constant	0.237***	-0.71787***	0.444***	-0.140***
	(0.014)	(0.043)	(0.015)	(0.039)
Observations	3120	3120	3120	3120
% of Enterprises Experiencing Revenue Expansion	27.04%			
% of Enterprises Experiencing No contraction in revenue	48.50%			

***significance at the 1% level.

Conclusion

Small-scale enterprises are valuable sources of income for households in developing countries. Income from these enterprises has the potential to enable households to climb out of poverty and also reduce uncertainties in consumption. Unfortunately, not all households are capable of taking advantage of these opportunities because of numerous market failures. Because of poorly functioning credit markets, liquidity-constrained households are severely limited in their capacity to start enterprises. I find evidence that both the likelihood of starting an enterprise and investment in enterprises are positively dependent on household income -- a relationship that should not exist if credit markets functioned well.

The evidence also suggests that risk mitigation is a major reason behind the decision of households to venture into entrepreneurial activities. The riskiness of rain-fed agriculture makes small enterprises very valuable since they can allow households to reduce the variability of their income *ex-ante*. This risk management role of enterprises is very important since agro-climatic risk cannot be adequately addressed with informal risk-sharing within the village. Enterprises can also play a role in risk-coping by supplementing income when bad shocks occur, which they almost always do. The evidence in the paper supports this claim by showing that rainfall shocks are negatively correlated with the growth of revenue of enterprises in the subsequent year.

An important implication of the adverse effect of rainfall shock on enterprise is that policies aimed at increasing the productivity of small entrepreneurs cannot only focus on the enterprise but rather, on all the major livelihood activities of the households. In the case of farm households with enterprises, any policies aimed at increasing

enterprise profitability should be aware that results will be limited if the agricultural risks are not addressed. Therefore, the evidence suggests that it is far from certain that small enterprises can pull households out of poverty in the presence of insurance and credit market failures since a major reason for the existence of small enterprises is to allow households to reduce risk and not to exclusively generate income.

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