

# Non-Farm Enterprises in Rural Africa

## New Empirical Evidence

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## Abstract

Although non-farm enterprises are ubiquitous in rural Sub-Saharan Africa, little is yet known about them. The motivation for households to operate enterprises, how productive they are, and why they exit the market are neglected questions. Drawing on the Living Standards Measurement Study—Integrated Surveys on Agriculture and using discrete choice, selection model and panel data estimators, this paper provide answers using data from Ethiopia, Niger, Nigeria, Malawi, Tanzania, and Uganda. The necessity to cope following shocks, seasonality in agriculture, and household size can push rural households into operating a non-farm enterprise. Households are also pulled into entrepreneurship to exploit opportunities. Access to credit and markets, household wealth, and the education and age of the house-

hold head are positively associated with the likelihood of operating an enterprise. The characteristics are also associated with the type of business activity a household operates. Rural and female-headed enterprises and enterprises with young enterprise owners are less productive than urban and male-owned enterprises and enterprises with older owners. Shocks have a negative association with enterprise operation and productivity and a large share of rural enterprises does not operate continuously over a year. Enterprises cease operations because of low profits, a lack of finance, or the effects of idiosyncratic shocks. Overall the findings are indicative that rural enterprises are “small businesses in a big continent” where large distances, rural isolation, low population density, and farming risks limit productivity and growth.

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# Non-Farm Enterprises in Rural Africa: New Empirical Evidence

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# 1 Introduction

Non-farm enterprises are ubiquitous in rural Africa. These enterprises tend to be small informal businesses providing a wide range of goods and services from or nearby the household residence, or on a village market (Nagler and Naudé, 2014). Although described as “non-farm”, many are linked to agriculture and are often located on a farm (Rijkers and Costa, 2012). Almost one-in-two rural households (42 percent) operate such an enterprise <sup>1</sup> and the income from these enterprises contributes between 8 percent (as in Malawi) and 36 percent (as in Niger) of household average income (Nagler and Naudé, 2014). Over time this share has shown a tendency to increase, rather than decrease as some development economists of the 1960s and 1970s had expected (Lanjouw and Lanjouw, 2001; Reardon et al., 2006; Davis et al., 2010; Haggblade et al., 2010; Rijkers and Costa, 2012). It is estimated that 15 percent of Africa’s labor force works in non-farm enterprises (Fox and Pimhidzai, 2013).

Although these small, informal enterprises are an important feature of the rural non-farm economy, a lack of knowledge remains with regard to (i) determinants of enterprise operation, (ii) productivity, and (iii) exit and survival of these rural enterprises. Providing answers to these questions will give insight into the *birth, life and death* of African rural household enterprises and their economic roles that have been largely neglected in the scholarly literature. Around a decade ago Wiggins (2000) lamented that “little is known” about Africa’s rural non-farm economy, beyond an “embryonic set of ideas”. Today, although we know more about the magnitude and contribution of rural non-farm enterprises to household income, most empirical evidence is based on one-period, single-country, and rather limited survey data. The majority of studies have focused on urban areas, neglecting rural entrepreneurship (Naudé, 2011).

These knowledge gaps about rural entrepreneurship constrain policy making. According to Fox et al. (2013) enterprises in rural Africa may have to absorb at least 65 million new labor market entrants by 2020. As only the more productive enterprises survive and provide better jobs, policies to support rural employment creation would ideally need to raise the productivity of enterprises and reduce obstacles preventing households from utilizing productive business opportunities (Wennberg and Lindqvist, 2010; Owoo and Naudé, 2014). Given the informality of rural non-farm enterprises (between 91 and almost 100 percent are informal) we expect *a priori* that most non-farm enterprises have low productivity, short life-spans, and do not contribute significantly to job creation. If non-farm entrepreneurship should be effectively supported by policy makers, then a better understanding of these aspects is warranted.

The contribution of this paper is to provide new and comparative empirical evidence to fill some of these knowledge gaps. We use the recently available, nationally representative Living Standards Measurement Study - Integrated Surveys in Agriculture (LSMS-ISA). The LSMS-ISA covers six countries over the period 2005 to 2013, namely Ethiopia,

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<sup>1</sup> The figures reported here, based on the LSMS-ISA are consistent with the figures of between 40 and 50 percent of household income in rural Africa that were found to originate from rural non-farm activities by e.g. Lanjouw and Lanjouw (2001); Start (2001); Reardon et al. (2006); Davis et al. (2010); Rijkers and Costa (2012)

Malawi, Niger, Nigeria, Tanzania, and Uganda. It is the first time, to the best of our knowledge, that this data set has been used to provide an empirical overview of rural Africa's non-farm enterprises.

Our results are organized in three sections, where we analyze (i) the determinants of enterprise operation, (ii) enterprise productivity, and (iii) survival and exit of these non-farm enterprises. First, our results show that households operate enterprises due to both push and pull factors, and that most households operate a non-agricultural business, an agribusiness, or a trade business. Also, the likelihood of operating a specific type of business activity depends on individual, household and location characteristics. Second, we find that productivity differs by location and gender. Rural and female-owned enterprises are less productive compared to their urban and male-owned counterparts. We further find that region and distance matter, as well as age, education, and the experience of a shock. Third, we confirm that rural enterprises operate more intermittently throughout the year compared to urban enterprises. We also show that enterprises exit the market mainly due to a lack of profitability or finance, or due to idiosyncratic shocks. These results contribute to the literature by providing an up-to-date, empirical and cross-country picture of the prevalence and nature of non-farm entrepreneurship in rural Africa.

The paper is structured as follows. We first survey the literature on the determinants, productivity as well as exit and survival of rural non-farm enterprises in section 2. In section 3 we describe our data and outline the methodology used. In section 4 we organize our empirical findings in three subsections, each answering one of the knowledge gaps mentioned above. In section 5 we conclude the analysis with a brief summary, and make recommendations for policy and for further research and survey work.

## 2 Literature Review

In section 2.1 we survey the literature pertaining to the determinants of entrepreneurship in rural Africa, in section 2.2 we discuss the literature dealing with the productivity of African enterprises, and in section 2.3 we refer to the (relatively small) body of scholarly work on the survival and exit of African enterprises.

### 2.1 Determinants

There are three strands of theoretical literature that are helpful to understand the determinants of rural non-farm entrepreneurship. These are (i) occupational choice models (see e.g [Lucas, 1978](#); [Evans and Jovanovic, 1989](#); [Murphy et al., 1991](#); [Banerjee and Newman, 1993](#)), (ii) agricultural household models based on [Singh et al. \(1986\)](#), and (iii) non-unitary models of intra-household decision-making based on [Manser and Brown \(1980\)](#) and [Chiappori \(1992\)](#).

Occupational choice models describe the individual's probability to enter entrepreneurship dependent on a wide range of factors. Among them are the

individual's entrepreneurial skills, age and experience, the perceived relative rates of returns to self-employment, obstacles such as capital constraints (entry and start-up costs), and factors that influence the opportunity costs of choosing self-employment, including regulations and social protection. Standard occupational choice models deal with stylized developed economies. However, individuals in rural Africa must make their occupational choices across segmented labor markets. Generally the segmentation is between formal and informal labor markets. The large majority of non-farm enterprises in Africa are in the informal sector (Nagler and Naudé, 2014). From the point of view of this model a lack of education, skills and managerial experience can present important reasons for the informality and small size of these enterprises in rural Africa (see also Lucas, 1978).

In occupational choice models the focus is on the individual entrepreneur. However, in the context of rural enterprises in Africa the level of decision-making may not be on the individual level only, but also on the household level. In Africa (as elsewhere) most businesses are family businesses. Moreover, in rural Africa, most households are simultaneously involved in agriculture, leading to occupation choices that are furthermore intertwined with agricultural decisions and seasonality <sup>2</sup>. In such a context, we need to further take the implications from agricultural household models into consideration.

Following Singh et al. (1986), agricultural household models treat households in rural Africa as both consumers and producers. As producers (farmers) they aim to maximize their profits, that are taken as income into their consumption decisions. Under the assumption of complete markets and information, the production decision was initially modeled separately from the consumption decision (Taylor and Adelman, 2003). Rural markets are however far from perfect (Janvry and Sadoulet, 2006). In addition to missing, incomplete or imperfect markets, households face many types of external shocks, such as climatic shocks, diseases, economic shocks and conflicts (Sabates-Wheeler et al., 2013). Once market failures and risks are considered the separation between consumption and production decisions of rural households can no longer be held.

The households' desire to maintain consumption in the face of risks and incomplete insurance and credit markets can motivate them to reduce their exposure to shocks (Janvry and Sadoulet, 2006; Dercon, 2009). For instance when facing missing markets for insurance, households may prefer to enter less risky non-farm activities (Rosenzweig and Binswanger, 1993; Janvry and Sadoulet, 2006). Furthermore households might not operate their non-farm enterprises continuously over the year, exiting from the market once the need or crisis has passed (Loening et al., 2008). This implies that we expect to see more enterprises in rural areas operating for shorter periods during the year compared to urban areas, where farms risks are smaller.

Lack of or imperfections in insurance markets can partly explain the prevalence of family ties. According to Bridges et al. (2013) family ties provide informal insurance to households given limited social protection and a high risk environment. If one household

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<sup>2</sup> The broader entrepreneurship literature has neglected the fact of household-level decision-making in case of family firms, focusing most of the time on the individual entrepreneur as the agent. As Alsos et al. (2013) recognize, household level decisions are “influential on how businesses are started and managed, but rarely garner attention within the entrepreneurship research literature” (p.10)

member loses employment, the other members adjust their labor market occupations as a result. Household members who lose their jobs are often absorbed into a household enterprise (Bridges et al., 2013). Over the longer-run such family ties can push household members into non-farm entrepreneurship, as growing families (i.e. “surplus labor”) put pressure on fixed farmland (Reardon, 1997; Reardon et al., 2006; Babatunde and Qaim, 2010). Growing families may also leverage more resources, such as labor and finance, that could facilitate entrepreneurship (Alsos et al., 2013).

Failures in credit and financial markets similarly cause interdependence between the agricultural households’ production and consumption decisions. Rural households often accumulate liquid assets (e.g. livestock) as a buffer against shocks (Janvry and Sadoulet, 2006; McPeak, 2006) and suffer from asset-depletion during and after a shock (Ackah, 2013; Sabates-Wheeler et al., 2013). They also draw on accumulated liquid assets during the low season to smooth consumption in the face of inadequate facilities for inter-temporal arbitrage (Lanjouw and Lanjouw, 2001). With less assets poor households may resort to operate low-risk and easy to entry enterprises, e.g. in trade, as only wealthier households can afford the sunk costs required for accessing more difficult to enter, but perhaps also more profitable and productive informal businesses (see e.g Dercon, 1998, 2009).

There is a recognized distinction between entrepreneurship started out of “necessity” or out of “opportunity”. From the above discussion we might conclude that non-farm enterprises are operated in their majority out of necessity (Herrington and Kelly, 2012). However, households in rural areas also face a range of opportunities. For “opportunity” motivated enterprises, households make use of their capabilities and assets, as well as individual characteristics (Barrett et al., 2001). Capabilities and assets include gender, age (also a proxy for experience), education, marital status (Abdulai and Delgado, 1999), as well as financial assets (Bhaumik et al., 2011; Ackah, 2013), and the size of the household itself. Education has been found to be relatively more important for individuals to enter wage employment than for starting a new business (Elbers and Lanjouw, 2001; Davis and Bezemer, 2004; Reardon et al., 2006; Bayene, 2008).

Although decision-making on the household level is accounted for in agricultural household models, we need to keep in mind that households in rural Africa are not unitary households maximizing a single, joint utility function (Ngenzebuke et al., 2014). Instead the decision-making takes place collectively (Chiappori, 1992), either in a cooperative or non-cooperative way (Manser and Brown, 1980). This means that full cooperation is actually limited within a household, and that complete pooling of resources does not always take place (Serra, 2009). With collective decision-making biases against women can be predicted in rural entrepreneurship (Serra, 2009). This is due to the fact that female labor market participation, including in non-farm enterprises, is often determined by their bargaining position within the household, instead of own preferences or abilities (Udry, 1996). Female participation in rural labor markets is not only constrained by discrimination in financial and labor markets, but also due to “rigid social norms” that influence their time-use (Minitti and Naudé, 2010). The presence of children in a household may present one such factor that limits the choices of women within the non-farm economy (Havnevik et al., 2003). Women may not be able to spend time to own or operate enterprises outside of agriculture, and when they do it may be restricted

to certain types of businesses (Serra, 2009). As a consequence Cramer et al. (2008, p. 4) claim that “the great mass of female workers in rural areas exercise little real choice in their employment”. Bridges et al. (2013) find that if a family member loses employment, women often have to change their occupational status as a result. Using data from the Tanzanian Household Urban Panel Survey (THUPS) spanning 2004 to 2006, they find that women tend to move in and out of labor (and self-employment in a household enterprise) as a response to labor market shocks, while men more often change the nature of the work they do. This is a major reason why women in Africa have been found to be more likely to engage in the non-farm economy (Canagarajah et al., 2001; Loening et al., 2008; Rijkers and Costa, 2012; Ackah, 2013) or to migrate (Shi et al., 2007) compared to men, and why we expect their enterprises to be less productive.

Finally, scholarly work has recognized the importance of first and second nature geography for development (Krugman, 1998; Venables, 2005). First nature geography, referring to the impact of natural features such as ruggedness and fertility of the terrain, climate, and altitude, will have an impact on agriculture (Reardon, 1997) and hence on rural non-farm enterprises to the extent of the farm to non-farm linkages that exist. Second nature geography, referring to the location of an enterprise and its distance from markets and other agglomerations, will determine access to demand, scale economies, competition, and spillovers. Fafchamps and Shilpi (2003) find that the share of non-farm wage employment declines the further a household is located from a urban center. Moreover they find that there is a U-shaped relationship between distance from a urban center and the share of income from self-employment. This suggests a possible protection effect of deep rural isolation on non-farm enterprises, perhaps most pertinently for enterprises dealing in tradable goods. Generally distance, but also other determinants of market access such as the quality of roads and utilities, can be important determinants of development in both the farm and non-farm economy of Africa and of the linkages between the two. For the specific impact of geographic dimensions, more empirical evidence is however needed (Wiggins, 2000; Roepstorff and Wiggins, 2011; Zezza et al., 2011).

## 2.2 Productivity

Syverson (2011) provides a comprehensive literature review on enterprise productivity. This literature is largely concerned with enterprise performance in developed economies, where the most important determinants of enterprise productivity are identified as education, experience, and market structure (Moretti, 2004; van Bieseboeck, 2005; Bloom and Reenen, 2010). The literature also finds that female-headed enterprises are less productive than male-headed enterprises (Amin, 2011; Kinda et al., 2011; Saliola and Seker, 2011; Rijkers and Costa, 2012). Furthermore enterprises clustered together are more productive, because of localization and urbanization economies due to knowledge and technology spill-overs (Martin et al., 2011; Bloom et al., 2013), horizontal linkages (Nichter and Goldmark, 2009) and more competition (Foster et al., 2008; Ali and Peerlings, 2011). It thus stands to reason that the geographical location of an enterprise, and in particular its proximity to other productive enterprises affects its productivity.

We expect many of these general factors to also be applicable in the present case. The empirical literature on enterprise productivity in Sub-Saharan Africa is however scant. The literature analyzes mostly the productivity of formal African enterprises. [Rijkers et al. \(2010\)](#) find that non-farm *manufacturing* enterprises in rural Ethiopia are less productive than urban ones. [Söderbom et al. \(2006\)](#) and [Söderbom and Teal \(2004\)](#) find, analyzing manufacturing enterprises, that more productive enterprises tend to survive longer in Africa. [Frazer \(2005\)](#) finds, using Ghanaian enterprise-level data, that more productive enterprises are also more likely to survive compared to less productive enterprises. These and other studies also find that a poor business environment reduces enterprise productivity in Africa, e.g. [Dollar et al. \(2005\)](#), [Arnold et al. \(2006\)](#), [Eifert et al. \(2008\)](#) and [Dethier et al. \(2010\)](#).

From the review in this section we expect that the determinants of the labor productivity of rural enterprises in Africa are also related to the motivation for their existence, reflecting factors such as economic geography (demand and competition), geographical and idiosyncratic shocks (push factors), type of business activity, and facilitating characteristics on both individual and household level such as age, education, access to credit, and household size.

### 2.3 Survival and Exit

While starting an informal enterprise in rural Africa is relatively uncomplicated ([Shiferaw, 2009](#)), it is more challenging for existing enterprises to raise their productivity, grow and survive ([Bekele and Worku, 2008](#)). To date there have been few empirical studies that examine the survival and exit of these enterprises in rural Africa. The literature on enterprise survival largely deals with urban-based enterprises in developed countries. In this literature a number of salient facts have been established such as that larger, older and more productive enterprises have a higher probability of survival (see for instance [Geroski, 1995](#); [Sutton, 1997](#); [Caves, 1998](#)). Managerial capabilities are important, and as per [Mincer \(1974\)](#) often seen as an indicator of enterprise productivity (see also [Variyam and Kraybill, 1994](#); [Key and Roberts, 2007](#)). Firm age and size can reflect an enterprise's ability to overcome financial constraints.

In Africa only a few studies have dealt with enterprise survival and exit. One of the first studies uses firm-level data and proportional hazards regression models ([McPherson, 1995](#)). The data cover approximately 21,000 firms across Botswana, Malawi, Swaziland, and Zimbabwe. The author finds that enterprise size does not significantly affect the survival of enterprises in Botswana and Swaziland, but that larger firms are less likely to survive in Zimbabwe. These results are in contrast to those found in developed countries. [McPherson \(1995\)](#) also finds that rural enterprises are more likely to fail than urban ones and that enterprises based in and around the household also face a higher likelihood of exiting operations. Female-owned enterprises also show a higher likelihood of failure compared to male-owned enterprises in Malawi and Zimbabwe.

Since [McPherson's \(1995\)](#) study, the determinants of enterprise survival, growth and exit in Africa have also been investigated by [Frazer \(2005\)](#), [Bekele and Worku \(2008\)](#),

Loening et al. (2008), Shiferaw (2009) and Klapper and Richmond (2011). These studies establish that managerial and technical skills, finance and social networks, the macroeconomic and business environment, as well as firm age and size are significant factors of enterprise survival. Furthermore, a significant proportion of enterprises do not exit the rural market because of economic or business reasons, but due to personal reasons “such as bad health or retirement, while others closed because better options became available” (Frazer, 2005, p. 590). Loening et al. (2008) also suggest that non-business factors can influence the time in operation or the exit of rural enterprises. Seasonality in agriculture, for example, can restrict enterprise operation throughout the year and force these enterprises to temporarily stop due to agriculturally-determined reasons. These studies have focused on urban-based and formal enterprises in Africa, hence a large gap remains in our understanding of the survival dynamics of informal household enterprises in rural Africa.

## 3 Data and Methodology

In this section we first describe the LSMS-ISA database and present in the second part our estimation strategies for the empirical analysis.

### 3.1 Data

The LSMS-ISA database is the result of nationally representative, cross-sectional and longitudinal surveys conducted by the World Bank in collaboration with national statistical offices in various countries in Sub-Saharan Africa.<sup>3</sup> The surveys cover six countries at the time of writing: Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda. Cross-sectional data is currently available for all countries, and panel data for Nigeria, Tanzania and Uganda.

The surveys consist of three parts: a community questionnaire, an agricultural questionnaire and a household questionnaire. The community questionnaire collects community-level information including the communities’ access to public services and infrastructure, social networks, governance, and retail prices. The agricultural questionnaire collects information on crop production, storage and sales, land holdings, farming practices, input use and technology adaption, access to and use of services, infrastructure and natural resources, livestock, and fishery. Finally, the household questionnaire captures household demographics, migration, education, health and nutrition, food consumption and expenditure, non-food expenditure, employment, non-farm enterprises and further income sources, dwelling conditions, durable assets, and participation in projects and programs. The location of households has been geo-referenced.

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<sup>3</sup> For additional information on the LSMS-ISA, see also the World Bank’s website [www.worldbank.org/lsms-isa](http://www.worldbank.org/lsms-isa)

Overall, our sample comprises 11,064 enterprises in 8,115 rural households, implying an average of 1.36 enterprises per household. The share of households operating a non-farm enterprise in rural Africa varies widely: from a relatively low share of 17 percent of households in rural Malawi, to almost 62 percent in rural Niger.<sup>4</sup>

Despite the usefulness and strengths of the data, it is also subject to a number of limitations for our present purposes. First, a comprehensive analysis of enterprise survival and failure has to be cursorily due to a lack of data on failed enterprises. Second, enterprises are not explicitly tracked over the survey rounds in Tanzania and Uganda. Therefore we cannot follow the enterprises over each survey round to study their individual performance over time. Duration analysis is therefore not possible to conduct at present, and instead we have to accept less precise estimations at different aggregation levels. Third, we can only calculate labor productivity, and not total factor productivity. The reason is that information to estimate production functions and technical efficiency is not available. Fourth, we do not have information of time-use of each household member, which can lead to biased estimates. For example in the case of female-owned enterprises, we may underestimate their enterprises productivity, as the unpaid household work of women is not accounted for.

Given these limitations we propose a number of modifications and additions to the questionnaires. A full elaboration of these fall outside the scope of the present paper, however we want to briefly mention them as an illustration of the type of current shortcomings we face. Apart from clearly tracking individual enterprises over various survey rounds, discontinued enterprises should equally be registered and information collected. We suggest to add specific questions to know more about these discontinued enterprises, e.g. when exactly the enterprise was discontinued (year and month), and the reason for stopping enterprise operations. Adding modules to the questionnaires to collect information that allow to estimate production functions and technical efficiency, including price information, information about the final product(s) and their prices, wages paid per worker, input costs (intermediate inputs), overhead (transport, security), fixed and working assets employed in the enterprise (to know more about the capital intensity), would greatly facilitate future analyses of the rural non-farm enterprise sector.

## 3.2 Methodology

In addition to various descriptive statistics, including kernel density estimates of labor productivity, we employ a number of regression techniques to provide answers for the first two questions. To identify the determinants of rural household choice to operate a non-farm enterprise, we use a discrete-choice estimator, a probit model (see section 3.2.1), and to analyze the type of business activity that a household operates we use a multinomial logit model (see section 3.2.2). To estimate the determinants of the labor productivity in rural enterprises we use both a Heckman selection model, and fixed and random-effects panel-data regression estimators (see sections 3.2.3 and 3.2.4). The variables are selected from the LSMS-ISA database and are based on the literature review.

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<sup>4</sup> See Tables 10 and 11 in Appendix B.1 for the prevalence of non-farm entrepreneurship in both rural and urban Africa.

For the probit model, the MNLM, and the Heckman selection model we use a cross-sectional sample, where we include data from the six countries (depending on the regression), and take the last rounds available as of fall 2013.

For the panel data analysis we have data for Nigeria for four survey rounds: post-planting and post-harvest data for the years 2010/11 and 2012/13. Due to a limited questionnaire for the post-harvest interviews, we use the data of the post-planting round only.<sup>5</sup> In the case of Uganda, we have data for three survey rounds: 2009/10, 2010/11, and 2011/12.

### 3.2.1 Probit Model

To answer the first question on the determinants of enterprise operation, we use a discrete choice model for our analysis, and estimate a probit model.

Formally we estimate,

$$\Pr(Y_i | \mathbf{v}_i, \mathbf{w}_i, \mathbf{x}_i, \mathbf{z}_i) = \Phi(\mathbf{v}'_i \boldsymbol{\alpha} + \mathbf{w}'_i \boldsymbol{\beta} + \mathbf{x}'_i \boldsymbol{\gamma} + \mathbf{z}'_i \boldsymbol{\delta}) \quad (1)$$

where the dependent variable  $Y_i$  is a binary variable equal to one if a household operates a non-farm enterprise, and zero if not.  $\mathbf{v}'_i$  is a vector of individual characteristics including a constant, and comprises the variables gender, age, the marital status, and education (proxied with the ability to read & write) of the household head.  $\mathbf{w}'_i$  is a vector of household characteristics including the number of adult household members, annual net household income, the number of rooms in the dwelling, and a binary variable if a household member has taken out credit over the past 12 months, indicating the possibility of accessing financial support.  $\mathbf{x}'_i$  records whether or not the household has experienced food shortage or a shock over the last 12 months. Finally  $\mathbf{z}'_i$  is a set of location variables (geo-variables), including the household's distance to the next population center and annual precipitation.<sup>6</sup>

### 3.2.2 Multinomial Logit Model

We use a multinomial logit model (MNLM) to estimate determinants of the type of business activity that households operate.

Formally we estimate,

$$\ln \Omega_{m|b}(x) = \ln \frac{\Pr(y = m|x)}{\Pr(y = b|x)} = x\beta_{m|b} \quad \text{for } m = 1 \text{ to } J \quad (2)$$

where  $b$  is the base category or comparison group. The log odds of an outcome compared

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<sup>5</sup> The shock variables are taken from the post-harvest questionnaires due to data availability.

<sup>6</sup> See Appendix B.2 for summary statistics and a detailed definition of the variables used in the probit model.

with itself are always 0, as  $\ln \Omega_{m|b}(x) = \ln(1) = 0$ .

In the above equation,  $x\beta_{m|b}$  is a vector containing our independent variables of interest.

The  $J$  equations are solved as follows, to compute the predicted probabilities:

$$\Pr(y = m|x) = \frac{\exp(x\beta_{m|b})}{\sum_{j=1}^J \exp(x\beta_{j|b})} \quad (3)$$

The predicted probabilities will be the same regardless of the base outcome. While the estimated parameters are different, only the parameterizations are different (Long and Freese, 2006).

In the MNLM the dependent variable is a categorical variable, corresponding to the different types of business activities reported in two of the surveys (Ethiopia and Malawi). As the base category we take the households that are not operating a non-farm enterprise.  $x\beta_{m|b}$  contains individual, household, and location characteristics. As individual characteristics we take the gender, age, and education of the household head. As household characteristics access to credit and shock variables, and as location characteristics the distance to the next population center.<sup>7</sup>

### 3.2.3 Heckman Selection Model

To estimate the determinants of labor productivity in non-farm enterprises we account for possible sample selection effects, and use a two-step Heckmann selection model. As the determinants of labor productivity can be subject to selection effects, we might get biased estimates as a result if we do not control for this selection effect when estimating the determinants of labor productivity.

Formally we estimate,

$$z_i^* = w_i\gamma + u_i \quad (4)$$

representing the selection stage of the model, where  $z_i^*$  is a latent variable corresponding to the “outcome” productivity level, which will only be observed once a household operates a non-farm enterprise, thus  $z_i = 1$  if  $z_i^* > 0$  and  $z_i = 0$  if  $z_i^* \leq 0$ .  $w_i$  is a vector containing the possible determinants of enterprise operation.

Once  $z_i$  is known, the outcome stage, the dependent variable is the log of labor

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<sup>7</sup> See Appendix B.3 for summary statistics and a detailed definition of the variables used in the MNLM model.

productivity, and can be modeled as,

$$y_i^* = x_i \beta + \varepsilon_i \quad (5)$$

with  $y_i = y_i^*$  if  $z_i = 1$  and  $y_i$  not observed if  $y_i = 0$ .

$x_i$  is a vector including the individual, household, and location characteristics. In the selection stage take the individual characteristics of the household head, and include the variables gender, age, and education. In the outcome stage we take the individual characteristics of the enterprise owner, and include the same variables as in the selection stage. The households characteristics, access to credit and shocks, remain equal in both stages, as well as the location characteristics distance to the next population center.<sup>8</sup>

### 3.2.4 Panel Data Analysis

Finally, we can make use of the panel properties for Nigeria and Uganda to estimate panel regressions.

Formally we estimate,

$$Y_{eht} = \mathbf{x}'_{eht} \boldsymbol{\beta}^1 + \mathbf{w}'_{ht} \boldsymbol{\gamma}^1 + \mathbf{z}'_{eht} \boldsymbol{\delta}^1 + \lambda_t^1 + u_{eht}^1 \quad (6)$$

$$\bar{Y}_{eht} = \bar{\mathbf{x}}'_{eht} \boldsymbol{\beta}^2 + \bar{\mathbf{w}}'_{ht} \boldsymbol{\gamma}^2 + \bar{\mathbf{z}}'_{eht} \boldsymbol{\delta}^2 + \lambda_t^2 + \mu_h + u_{eht}^2 \quad (7)$$

$$\bar{\bar{Y}}_{eht} = \bar{\bar{\mathbf{x}}}'_{eht} \boldsymbol{\beta}^3 + \bar{\bar{\mathbf{w}}}'_{ht} \boldsymbol{\gamma}^3 + \bar{\bar{\mathbf{z}}}'_{eht} \boldsymbol{\delta}^3 + \lambda_t^3 + \nu_h + u_{eht}^3 \quad (8)$$

where  $\{Y_{eht}, \bar{Y}_{eht}, \bar{\bar{Y}}_{eht}\}$  is labor productivity at the enterprise level. The set  $\{\mathbf{x}'_{eht}, \bar{\mathbf{x}}'_{eht}, \bar{\bar{\mathbf{x}}}'_{eht}\}$  contains vectors of individual characteristics of the enterprise owner at the enterprise level. The set  $\{\mathbf{w}'_{ht}, \bar{\mathbf{w}}'_{ht}, \bar{\bar{\mathbf{w}}}'_{ht}\}$  contains vectors of household characteristics observed at the household level. Finally,  $\{\mathbf{z}'_{eht}, \bar{\mathbf{z}}'_{eht}, \bar{\bar{\mathbf{z}}}'_{eht}\}$  is a set of vectors of enterprise characteristics at the enterprise level. Let  $\{\boldsymbol{\beta}^j, \boldsymbol{\gamma}^j, \boldsymbol{\delta}^j\}$  denote the associated vectors of coefficients for equation  $j$ , where  $j = 1, 2, 3$ . The  $\lambda_t^j$  are time effects for equation  $j$ ,  $\mu_h$  are fixed effects at level  $k \in \{h\}$ ,  $\nu_h$  are random effects at level  $k \in \{h\}$ , and  $u_{eht}^j$  are idiosyncratic errors for equation  $j$ .

As individual characteristics we include the gender, age, education of the enterprise owner, and the information if the owner is a migrant. As household characteristics we include the number of adults, shocks, and access to credit. As location characteristics we include firm size and months of enterprise operation.<sup>9</sup>

<sup>8</sup> See Appendix B.4 for summary statistics and a detailed definition of the variables used in the Heckman selection model.

<sup>9</sup> See Appendix B.5 for summary statistics and a detailed definition of the variables used in the panel data analysis.

## 4 Empirical Findings

We present our empirical evidence in four subsections. First, we report our results on the determinants of enterprise operation, second on the determinants of the type of business activity, third on labor productivity, and fourth on survival and exit.

### 4.1 Determinants

#### 4.1.1 Determinants of Enterprise Operation

As described in the methodology section we estimate a probit model to identify the determinants of rural household choice to operate a non-farm enterprise. First, we estimate the model for the aggregated sample, with binary variables included for the different countries, taking Ethiopia as the base category. Second, we estimate separate probit regressions for the six countries of our sample to identify country-level heterogeneity.

Table 1 reports the coefficients and average marginal effects of the aggregated data. The first and second column contain the results for all households, the third and fourth column for rural households, and the fifth and sixth column contain the results for urban households.

We note that significant results can be found both on the individual and the household level. On the individual level significant associations are age, marital status, and education of the household head. On the household level the number of adults, as well as household wealth (proxied by income and number of rooms), access to credit, and some shock types (food shortage, idiosyncratic and other shocks). In the case of the aggregated sample and the sample containing rural households only, shocks are positively associated with the operation of a non-farm enterprise. This is consistent with the expectation that operating an enterprise provides a coping mechanism for households in the absence of social security or failures in insurance and credit markets.

We further note that rural households in Africa are on average 17 percentage points less likely compared to urban households to operate a non-farm enterprise. Cities are more likely places to find enterprises in Africa, as they are across the world (see e.g. [Glaeser, 2007](#)). There are also notable differences with regard to significant determinants for the rural or urban sub-sample. For example educational attainment (“read & write”) is significant and positive only for rural areas. This result could be interpreted as an indication that educated individuals may not find wage employment easily in the rural non-farm economy, and may allocation their labor into self-employment. Finally, we find significant country-level heterogeneity. For instance, the probability of a household operating an enterprise is 9 percentage points lower in Malawi than in Ethiopia, but over 30 percentage points higher in Niger or Nigeria than in Ethiopia.

To refine our results in Table 2, where we report average marginal effects (AME) for rural

**Table 1:** Probit Regressions - Complete Sample

Dependent NFE	(1) All Countries	(2) AME	(3) Rural	(4) AME	(5) Urban	(6) AME
Rural	-0.484*** (0.05)	-0.165*** (0.02)				
Female	0.035 (0.05)	0.012 (0.02)	-0.007 (0.06)	-0.002 (0.02)	0.128 (0.10)	0.045 (0.04)
Age	0.007 (0.01)	-0.003*** (0.00)	0.008 (0.01)	-0.003*** (0.00)	0.004 (0.01)	-0.002** (0.00)
Age <sup>2</sup>	-0.000*** (0.00)		-0.000*** (0.00)		-0.000 (0.00)	
Married	0.068 (0.05)	0.023 (0.02)	-0.028 (0.05)	-0.009 (0.02)	0.347*** (0.10)	0.126*** (0.04)
Read & Write	0.116*** (0.04)	0.040*** (0.01)	0.145*** (0.04)	0.049*** (0.01)	-0.098 (0.10)	-0.034 (0.03)
Number of Adults	0.100*** (0.02)	0.024*** (0.00)	0.089*** (0.02)	0.022*** (0.01)	0.144*** (0.05)	0.034*** (0.01)
Number of Adults <sup>2</sup>	-0.005*** (0.00)		-0.004** (0.00)		-0.008** (0.00)	
Rooms	0.046*** (0.01)	0.016*** (0.00)	0.052*** (0.01)	0.018*** (0.00)	0.018 (0.02)	0.006 (0.01)
Credit	0.235*** (0.05)	0.081*** (0.02)	0.241*** (0.05)	0.083*** (0.02)	0.221** (0.11)	0.075** (0.04)
Food Shortage	0.077** (0.04)	0.026** (0.01)	0.053 (0.04)	0.018 (0.01)	0.123 (0.09)	0.043 (0.03)
Shock (idiosyn.)	0.066* (0.03)	0.023* (0.01)	0.085** (0.04)	0.029** (0.01)	-0.019 (0.07)	-0.007 (0.02)
Shock (price)	0.041 (0.05)	0.014 (0.02)	0.031 (0.05)	0.011 (0.02)	0.060 (0.10)	0.021 (0.03)
Shock (geogr.)	-0.042 (0.04)	-0.014 (0.01)	-0.031 (0.05)	-0.010 (0.02)	-0.110 (0.11)	-0.039 (0.04)
Shock (other)	0.226** (0.09)	0.079** (0.03)	0.306*** (0.09)	0.107*** (0.03)	-0.004 (0.21)	-0.002 (0.07)
Distance	-0.018 (0.16)	-0.012 (0.04)	-0.112 (0.18)	-0.036 (0.04)	-0.031 (0.45)	0.002 (0.13)
Dist to Popcenter <sup>2</sup>	-0.027 (0.09)		0.006 (0.10)		0.135 (0.35)	
Precipitation	-0.056 (0.05)	-0.019 (0.02)	-0.059 (0.06)	-0.020 (0.02)	-0.065 (0.13)	-0.023 (0.05)
Malawi	-0.252*** (0.06)	-0.086*** (0.02)	-0.258*** (0.06)	-0.087*** (0.02)	-0.600*** (0.12)	-0.212*** (0.04)
Niger	0.945*** (0.09)	0.323*** (0.03)	1.025*** (0.10)	0.345*** (0.03)	0.201 (0.18)	0.071 (0.06)
Nigeria	0.907*** (0.08)	0.310*** (0.02)	0.904*** (0.08)	0.304*** (0.03)	0.505*** (0.17)	0.179*** (0.06)
Tanzania	0.457*** (0.06)	0.156*** (0.02)	0.419*** (0.07)	0.141*** (0.02)	0.192 (0.12)	0.068 (0.04)
Uganda	0.553*** (0.07)	0.189*** (0.02)	0.542*** (0.07)	0.182*** (0.02)	0.154 (0.15)	0.054 (0.05)
Constant	-0.677*** (0.17)		-1.049*** (0.19)		-0.297 (0.34)	
N	27,659	27,659	21,255	21,255	6,404	6,404

Notes: Standard errors in parentheses; Survey weights included.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

households by country. In the regressions we include similar variables as in the aggregate sample, but add annual net household income for the countries where this variable is available.

The results show that both individual and household level characteristics are significant at the country level. Individual characteristics that are significant are age, marital status, education, and the number of adults in a household. We note again country-heterogeneity, where coefficients are not significant for all countries, or where the direction of the effect can be positive or negative, for example in the case of the marital status. While it is positive in rural Malawi, we find the opposite effect in rural Tanzania.

One of the salient determinants of entrepreneurship in the literature is credit, or access to finance. Most studies on entrepreneurship determinants concur that entrepreneurs often face liquidity constraints (Evans and Jovanovic, 1989; Hurst and Lusardi, 2004). In this respect our results are consistent with the literature and confirm that liquidity constraints are significant. In our estimations various measures of liquidity are available. In Table 2 we include annual net household income where the results indicate that income is positively associated with the likelihood of operating a non-farm enterprise in Niger, Tanzania, and Uganda. For example by 15 percentage points per 1,000 USD of additional net income per year in Niger. Measuring liquidity access through household wealth proxies (such as the number of rooms in a household dwelling) similarly confirms a positive and significant association in Ethiopia, Malawi, and Tanzania. A more direct measure from the survey, access to credit, is positive and significant in Ethiopia and Malawi. Although these findings are consistent with the literature on the importance of finance for entrepreneurship, we have to be careful in assigning a causal relationship since our proxies for liquidity may well be endogenous.

The results further indicate that households experiencing food shortage over the past 12 months are more likely to operate a non-farm household enterprise in Uganda, but are less likely to do so in Malawi and Niger. Furthermore, being subject to idiosyncratic shocks is positively associated with operating a non-farm enterprise in Malawi. We also note that price shocks have a significant and negative association with the likelihood of enterprise operation in Uganda, and that geographical shocks are positively and significantly associated with the likelihood of enterprise operation in Malawi, as well as a positive association with other shocks in Niger. The conclusion from this diversity of associations between risk and the likelihood of enterprise operation is that external risk factors have different and even opposing effects depending on country circumstances. These findings reflect that household risk-coping and risk-management strategies adjust to local circumstances.

Finally we consider the local business environment and agglomeration, as proxies for access to markets (demand), as well as rainfall to account for agricultural conditions (Zezza et al., 2011). The results provide significant evidence that pull factors, or opportunity motives, are indeed applicable to attract households into entrepreneurship. The regression results indicate that our proxies for local business environment, the effect of a household's distance to the next population center, is negative and significant in Malawi and Uganda. In Malawi it is associated with a decrease in the likelihood of enterprise operation by 11 percentage points, and in Uganda by 21 percentage points

per 100 km from a population center. Rainfall, a proxy for agricultural productivity and hence demand from farming, is significant and negative in Malawi and Nigeria, and significant and positive in Niger. Better rainfall, resulting in improved agricultural conditions, decreases the likelihood of enterprise operation in Malawi and Nigeria, as more household members are perhaps required to provide (wage) labor on farms. Interestingly, increased rainfall is associated with a higher likelihood of enterprise operation in Niger, maybe as a result of different farming practices. These results confirm that agglomeration and infrastructure, measuring potential market access, as well as agricultural conditions, are significant determinants of non-farm enterprise operation. Overall, these findings are similar to the aggregate sample in Table 1 and provide a useful robustness check.

**Table 2:** Probit Regressions - by Country

Dependent NFE	(1) Ethiopia	(2) Malawi	(3) Niger	(4) Nigeria	(5) Tanzania	(6) Uganda
Female	-0.029 (0.04)	0.005 (0.02)	-0.051 (0.06)	0.045 (0.10)	0.037 (0.03)	0.001 (0.04)
Age	-0.002*** (0.00)	-0.001** (0.00)	0.001 (0.00)	-0.003** (0.00)	-0.004*** (0.00)	-0.004*** (0.00)
Married	-0.041 (0.04)	0.039*** (0.01)	-0.036 (0.06)	0.083 (0.08)	-0.061** (0.03)	0.047 (0.04)
Read & Write	0.031 (0.02)	0.040*** (0.01)	0.030 (0.04)	0.126*** (0.04)	0.054* (0.03)	-0.010 (0.03)
Number of Adults	-0.011 (0.01)	0.008 (0.01)	-0.021 (0.01)	0.055*** (0.01)	0.032*** (0.01)	0.028*** (0.01)
Income in USD			0.151*** (0.02)	-0.017** (0.01)	0.039*** (0.01)	0.101*** (0.02)
Rooms	0.033*** (0.01)	0.009** (0.00)	0.007 (0.01)		0.023*** (0.01)	-0.002 (0.01)
Credit	0.088*** (0.02)	0.071*** (0.01)			0.021 (0.04)	
Food Shortage	0.039 (0.03)	-0.028*** (0.01)	-0.077*** (0.02)	0.032 (0.04)	-0.005 (0.03)	0.078** (0.04)
Shock (idiosyn.)	0.033 (0.02)	0.062*** (0.01)	0.003 (0.04)	-0.035 (0.04)	0.048 (0.03)	0.044 (0.03)
Shock (price)	0.013 (0.03)	0.002 (0.01)	0.023 (0.03)	0.022 (0.04)	-0.044 (0.03)	-0.187*** (0.07)
Shock (geogr.)	-0.023 (0.03)	0.021** (0.01)	-0.016 (0.03)	-0.070 (0.04)	0.003 (0.03)	0.049 (0.03)
Shock (other)	0.126* (0.08)	0.019 (0.04)	0.097*** (0.03)	0.028 (0.10)	-0.020 (0.15)	0.058 (0.08)
Distance	-0.034 (0.07)	-0.107*** (0.03)	-0.074 (0.07)	-0.164 (0.13)	-0.019 (0.04)	-0.214* (0.12)
Precipitation	0.024 (0.04)	-0.035* (0.02)	0.612** (0.29)	-0.064* (0.03)	-0.011 (0.03)	0.039 (0.08)
N	3,366	10,017	2,430	1,074	2,579	1,789

*Notes:* Standard errors in parentheses; Survey weights included; Average marginal effects reported; Rural households only.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

As an additional consistency check we run a set of additional regressions that include a number of country-specific variables that are not available for the majority of the countries, or are differently coded across countries. While we do not report the detailed

tables here,<sup>10</sup> these results are consistent with the picture that has so far emerged. Two interesting additional findings are that a household's ownership of a plot of land is associated with a lower probability of operating an enterprise by 26 percentage points in Nigeria, and 30 percent in Uganda. And that nomadic households in Niger are 42 percentage points less likely than non-nomadic households to operate a non-farm enterprise. This finding again underscores the importance of country-level heterogeneity in the determinants of entrepreneurship.

#### 4.1.2 Determinants of Type of Business Activity

Once households enter the non-farm economy and operate an enterprise, they have to decide what type of business to operate. As this decision may depend on the motivation to operate a non-farm enterprise in the first place, we address this shortcoming by estimating a MNLM for Ethiopia and Malawi due to data availability. We take the households that do not operate an enterprise as the base category, comparing them to eight alternative choices of business activity: agricultural business, non-agricultural business, trade, sales, professional services, transportation, bars and restaurants, and others.

Table 3 summarizes the number of enterprises (absolute number and in percent weighted) for the various types of business activity, as well as the number of households that do not operate an enterprise using the rural sample. Note that in the sectors professional services, transport, and bar and restaurants we have very few observations compared to other sectors in both countries. Most enterprises resorted into non-agricultural business, agribusiness, trade, and sales.

**Table 3:** Type of Business Activity

Type of Business Activity	Ethiopia		Malawi	
	N	In %	N	In %
No Enterprise	2,620	78.86	8,290	80.71
Non-Agric. Business	200	5.45	385	3.48
Agribusiness	221	5.54	406	3.88
Trade	156	4.73	378	3.69
Sales	143	1.92	370	3.19
Professional Services	12	0.24	10	0.10
Transport	11	0.26	46	0.49
Bars and Restaurants	9	0.08	39	0.46
Other	142	2.92	407	4.00
Total	3,514	100.00	10,331	100.00

*Notes:* Survey weights included; Rural areas only.

In the MNLM we include similar variables as before, namely individual characteristics (gender, age, education), household characteristics (number of adults, access to credit), shock variables, and location characteristics.

<sup>10</sup> Available upon request.

Tables 4 and 5 contain the regression results for Ethiopia and Malawi, respectively, where we report relative risk ratios. The results are largely consistent with the results of the probit regressions, but provide additional information with regard to the types of business activities.<sup>11</sup> The results confirm that the motivation to operate an enterprise also influences the type of business activity.

**Table 4:** Multinomial Logit Model - Ethiopia

	Non-Ag.	Agrib.	Trade	Sales	Prof. Serv.	Transp.	Bars & Res.	Other
Female	0.535** (0.15)	1.343 (0.30)	0.861 (0.26)	0.408** (0.17)	0.561 (0.39)	0.948 (0.81)	2.424 (2.13)	0.682 (0.24)
Age	0.953*** (0.01)	0.952*** (0.01)	0.964*** (0.01)	0.950*** (0.01)	0.932*** (0.02)	0.916*** (0.03)	0.857*** (0.05)	0.945*** (0.01)
Read & Write	0.912 (0.17)	0.702** (0.12)	0.908 (0.21)	0.363*** (0.11)	0.427 (0.34)	0.559 (0.33)	0.505 (0.25)	1.340 (0.29)
Number of Adults	0.976 (0.10)	0.856 (0.08)	0.856 (0.09)	0.902 (0.16)	0.265*** (0.13)	0.914 (0.32)	0.989 (0.50)	0.894 (0.09)
Credit	1.145 (0.24)	1.935*** (0.36)	2.078*** (0.45)	0.928 (0.30)	0.015*** (0.02)	0.973 (0.69)	1.276 (1.39)	0.952 (0.29)
Shock (idiosyn.)	1.021 (0.27)	1.685** (0.39)	1.123 (0.34)	1.138 (0.48)	6.073*** (3.44)	0.013*** (0.01)	0.775 (0.89)	0.962 (0.32)
Shock (price)	0.757 (0.17)	0.710* (0.15)	1.228 (0.30)	1.000 (0.32)	3.612*** (1.49)	0.174* (0.18)	0.167** (0.13)	1.059 (0.30)
Shock (geogr.)	0.711 (0.19)	0.640** (0.14)	0.843 (0.25)	1.066 (0.38)	0.146** (0.13)	1.012 (1.22)	0.421 (0.34)	0.640 (0.25)
Shock (other)	1.938 (1.47)	1.376 (0.85)	3.560** (1.93)	4.455** (2.66)	0.000*** (0.00)	8.634* (9.88)	0.000*** (0.00)	1.282 (1.00)
Distance	0.549** (0.14)	0.550** (0.16)	0.017*** (0.01)	0.103*** (0.08)	0.603 (0.84)	0.023** (0.04)	0.187 (0.34)	0.144*** (0.08)
N	3,450							

*Notes:* Standard errors in parentheses; Household weights included; Exponentiated coefficients; Rural areas only.  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

In Ethiopia we find that the effect of education is significant for agribusiness and sales only, and that the effect of the number of adults is only significant for entry into professional services. Further that the effect of credit increases the probability of households to operate an enterprise in the agribusiness or trade sector, but decreases it in the case of entry into professional services. We also note that the effect of age is significant and smaller than 1 for all types of business activities, confirming the results of the probit regression, implying that household heads from households operating a non-farm enterprise are on average younger. While we could not find any significance of gender as a determinant earlier, we now find that households with female heads have a lower likelihood of operating a non-agricultural or sales business. While women may not be constrained from operating a non-farm enterprise, they can be constrained in the choice of enterprise activity. To the extent that certain types of businesses require more capital, collateral, or prior education, this may reflect discrimination, as well as different cultural roles and expectations within the household, with more varied demands on a woman's time that may hinder them from operating more time-consuming businesses (see also [Palacios-López and López, 2014](#)).

<sup>11</sup> If the results in the regression tables report a value of 0.000, no observation are available in this category. Individual characteristics are selected from the household head, and not necessarily from the enterprise owner or manager.

The results further shows that the shock variables are significant. The results confirm that easier to enter businesses, such as trade or agribusiness, are more likely to be operated by households that experienced a shock (with the exception of geographical shocks in the case of agribusiness), while the transport sector or food services generally require higher investment and have more substantial barriers to entry for households in times of economic hardship. The effect of distance is in all categories smaller than 1 and confirms the importance of access to markets. The types of business activities where distance is not significant are professional services and bars & restaurants, activities that can accommodate clients in the immediate surroundings of the business.

**Table 5:** Multinomial Logit Model - Malawi

	Non-Ag.	Agrib.	Trade	Sales	Prof. Serv.	Transp.	Bars & Res.	Other
Female	0.203*** (0.05)	1.175 (0.15)	0.617*** (0.11)	0.288*** (0.05)	0.242*** (0.07)	0.061*** (0.04)	0.526 (0.26)	0.673*** (0.10)
Age	0.953*** (0.01)	0.967*** (0.00)	0.947*** (0.00)	0.973*** (0.00)	0.975 (0.02)	0.941*** (0.02)	0.928*** (0.02)	0.958*** (0.00)
Read & Write	0.991 (0.12)	0.607*** (0.06)	1.059 (0.12)	0.536*** (0.06)	0.257*** (0.08)	0.648 (0.19)	0.612* (0.16)	0.913 (0.11)
Number of Adults	1.000 (0.09)	0.883* (0.06)	1.009 (0.07)	0.755*** (0.06)	0.132*** (0.08)	0.557** (0.15)	0.743 (0.25)	0.983 (0.07)
Credit	1.058 (0.18)	1.805*** (0.27)	1.892*** (0.29)	1.181 (0.22)	2.721 (1.92)	0.905 (0.42)	2.365** (0.96)	1.891*** (0.29)
Shock (idiosyn.)	1.472*** (0.19)	1.310** (0.16)	1.072 (0.14)	1.608*** (0.20)	3.333*** (1.45)	1.908* (0.66)	0.867 (0.28)	1.384** (0.18)
Shock (price)	0.787* (0.10)	0.847 (0.10)	0.709*** (0.09)	1.102 (0.13)	0.854 (0.47)	0.810 (0.28)	0.725 (0.23)	0.560*** (0.07)
Shock (geogr.)	0.862 (0.10)	0.817* (0.09)	0.821* (0.10)	1.208 (0.14)	0.642 (0.35)	0.795 (0.29)	0.527* (0.18)	0.675*** (0.08)
Shock (other)	0.818 (0.45)	0.390* (0.21)	0.457 (0.23)	0.877 (0.37)	0.000*** (0.00)	0.000*** (0.00)	2.243 (2.25)	1.373 (0.50)
Distance	0.096*** (0.03)	0.064*** (0.02)	0.135*** (0.04)	0.051*** (0.02)	0.080 (0.13)	0.096** (0.09)	0.100*** (0.09)	0.092*** (0.03)
N	10,331							

*Notes:* Standard errors in parentheses; Household weights included; Exponentiated coefficients; Rural areas only.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The case of rural Malawi is broadly similar, with some notable differences. First, the effect of gender is significant for more types of business activities than in Ethiopia. Female entrepreneurs seem to be less present in transport businesses or professional services. Second, while credit is equally significant for agribusiness and trade, it is not significant for professional services, but for bars & restaurants instead. Third, the shock variables report more significant coefficients (in both directions), suggesting that shocks have a larger effect in the choice of business activity. These differences between Ethiopia and Malawi, while not extensive, illustrate again the salience of country-level heterogeneity in rural entrepreneurship.

## 4.2 Productivity

We start this section by defining our productivity measure, and continue by showing the productivity dispersal by locations and gender. We then identify the determinants of rural enterprise productivity using a Heckmann selection model and panel data analysis.

### 4.2.1 Productivity Measure

To study the productivity of non-farm enterprises, we calculate labor productivity, a partial productivity measure, defined as,

$$\text{labor productivity} = \frac{\text{average monthly sales}}{\text{number of workers}}$$

As average monthly sales is not available for all countries, we take total sales during the last month of operation in Malawi and Nigeria, and average gross revenues in Uganda. Once labor productivity is calculated, we take the log of labor productivity for our estimates.

We are aware that this productivity measure is an approximation, and imprecise for a number of reasons. First, we do not take into account output or profit due to a lack of data. Second, we do not have information about the time-use of workers, and do not know how many hours of work are allocated by each individual to the enterprise. And third, we assume that the self-reported variable itself is imprecise, as most enterprises are informal and do not always record sales or revenues, but provide rough estimates of the business volume. Due to data availability, this productivity measure is however the best approximation that is currently at hand for this study.

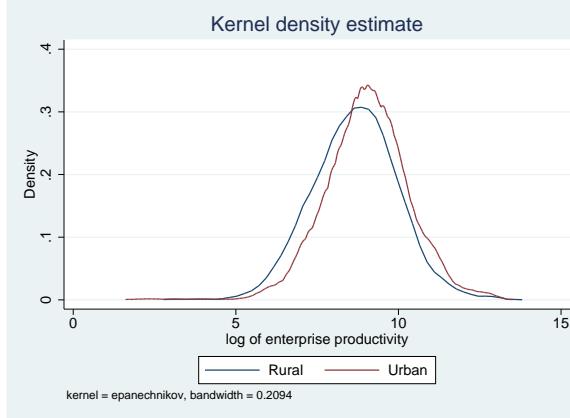
### 4.2.2 Dispersal

Figure 1 shows the dispersal of labor productivity by location and gender in Nigeria and Uganda. The kernel density estimates confirm our expectations that urban enterprises are more productive than rural enterprises, with a more pronounced productivity gap for Uganda, and that enterprises with a male owner are more productive than enterprises with a female owner.

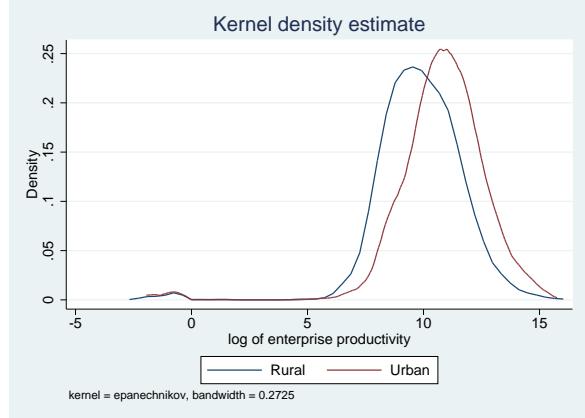
Although urban enterprises are on average more productive than rural enterprises, the simple dichotomy between rural and urban areas may be of limited usefulness for policy decisions due to a large variation in Africa's economic geography between deep rural, small towns, and major urban areas. The potential importance of secondary towns and rural agglomerations has generally been underestimated. As [Christiaensen et al. \(2013\)](#) point out, productivity might be higher in metropolitan areas, but not all inhabitants from rural areas are or will be able to access opportunities in these areas. Using data from Tanzania they find that only one in seven people who escaped from poverty did so

**Figure 1:** Productivity Dispersal - by Location and Gender

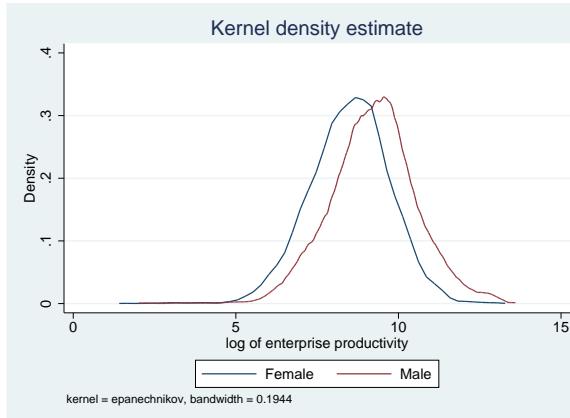
(a) Nigeria - by Location



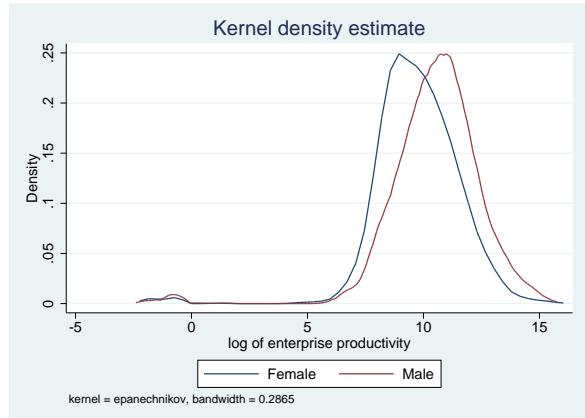
(b) Uganda - by Location



(c) Nigeria - by Gender



(d) Uganda - by Gender



by migrating to a large city, but that one in two did so by migrating to a secondary town.

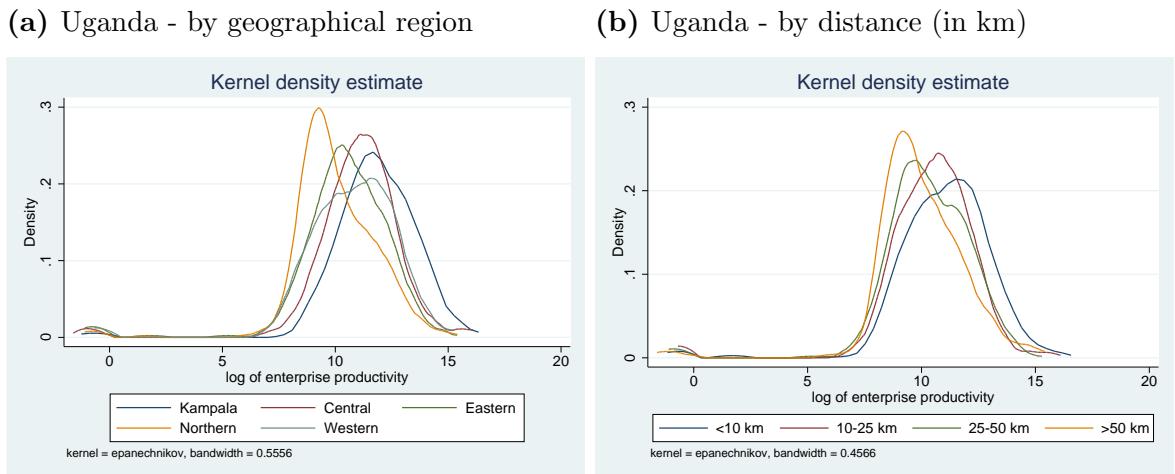
We are therefore interested in providing a finer analysis of how spatial location affects labor productivity. We use data from Uganda and analyze it with regard to the country's division into four main regions and the capital city: Central, Eastern, Northern, Western, and the capital Kampala. These four regions and the capital city are distinct in terms of population density, business environment and history. Over the past ten years economic growth has been largely concentrated in the Central region that includes the capital city, while violent conflict affected the Northern region between 1987 and 2006 (Blattmann et al., 2014). The Western region also has not escaped occasional (ethnic) conflicts (Espeland, 2007). This allows us to obtain some indication of how the local business environment may affect labor productivity, as regions that experienced a conflict are more likely to show a poorer business environment, as conflict destroys demand, markets and infrastructure (Brueck et al., 2013). We also expect that labor productivity is higher in the capital city, and the more densely populated and more peaceful regions (Eastern and Central regions) compared to the Northern region. Figure 2a confirms our expectations. Kampala reports the highest labor productivity, with the Central region following in terms of productivity level. The Northern region, with the lowest population density and a history of conflict, is home to the enterprises with the lowest productivity

level.

We next investigate whether distance to the closest population center has an effect on rural labor productivity. We use again data from Uganda and take different distances of the household enterprise to the closest population center. We compare the density of labor productivity by various distance categories from these population centers. We expect, following [Christiaensen et al. \(2013\)](#), that proximity to a population center is associated with higher productivity.

Figure 2b confirms again our expectations. Enterprises of households located up to 10 km from a population center are the most productive ones, followed by enterprises in households residing up to 25 km and 50 km away, respectively. If households are located more than 50 km away, the results show a significant decline in labor productivity. These findings support the idea that rural secondary towns and cities, by providing links between rural areas and major cities, may play an important role in the structural transformation and poverty reduction of agrarian societies like Uganda.

**Figure 2:** Productivity Dispersal - by Region and Distance



#### 4.2.3 Determinants of Non-Farm Enterprise Productivity

We use a Heckman selection model to estimate the determinants of labor productivity. We implement this model using data of the whole sample, and add a binary variable to account for the household's location in a rural or urban area. Table 6 reports the regression results, including the selection and outcome stage.

The first stage, the selection into non-farm entrepreneurship, is reported in the lower part of the table. For the selection stage we make the assumption that the number of adults in a household selects households into this sector, as surplus labor is allocated into these enterprises. The results of the second stage, the outcome stage, reported in the upper part of the table, can be interpreted as though we observed data for all households in the sample.

The individual characteristics in the selection stage are taken from the household head,

**Table 6:** Heckman Selection Model

	Ethiopia (1)	Malawi (2)	Nigeria (3)	Uganda (4)
<b>(In) Productivity</b>				
Rural	-0.012 (0.35)	-0.592*** (0.11)	-0.206*** (0.07)	0.352 (0.33)
Female	-0.631*** (0.14)	-0.579*** (0.07)	-0.309*** (0.05)	-0.239 (0.15)
Age: 25 to 34	-0.090 (0.19)	0.251** (0.10)	0.107 (0.10)	0.532* (0.27)
Age: 35 to 44	-0.051 (0.19)	0.307*** (0.12)	0.113 (0.10)	0.557** (0.27)
Age: 45 and older	0.234 (0.24)	0.210** (0.11)	0.105 (0.10)	0.528** (0.26)
Read & Write	0.343** (0.15)	0.337*** (0.08)	0.334*** (0.06)	0.627*** (0.17)
Credit	-0.012 (0.19)	-0.191* (0.11)		
Firm Size	-0.190** (0.08)	0.018 (0.02)	-0.148*** (0.03)	-0.018 (0.03)
Shock	-0.357** (0.15)	-0.403*** (0.08)	-0.132** (0.07)	-0.283 (0.20)
Distance	-0.228 (0.32)	0.522*** (0.17)	-0.246 (0.16)	-1.989*** (0.61)
<b>NFE</b>				
Number of Adults	0.035 (0.02)	0.114*** (0.01)	0.140*** (0.02)	0.065*** (0.01)
Rural	-1.025*** (0.09)	-0.434*** (0.06)	-0.478*** (0.05)	-0.384*** (0.09)
Female	0.110 (0.09)	-0.052 (0.04)	-0.163** (0.07)	-0.032 (0.06)
Age: 25 to 34	0.143 (0.15)	0.159*** (0.06)	0.357** (0.16)	0.382** (0.19)
Age: 35 to 44	0.066 (0.16)	0.140** (0.06)	0.551*** (0.16)	0.233 (0.19)
Age: 45 and older	-0.179 (0.15)	-0.135** (0.06)	0.283* (0.15)	0.006 (0.18)
Read & Write	0.206*** (0.08)	0.252*** (0.04)	0.195*** (0.05)	0.064 (0.05)
Credit	0.342*** (0.08)	0.257*** (0.05)		
Shock	0.068 (0.07)	0.080** (0.04)	-0.028 (0.05)	0.042 (0.07)
Distance	-0.369*** (0.13)	-0.315*** (0.09)	-0.080 (0.13)	0.324 (0.20)
Agro-Ecological Zones	Yes	Yes	Yes	Yes
N	3,892	12,496	5,859	2,477
rho	-0.289	-0.600	-0.421	-0.936
sigma	1.568	1.484	1.339	3.064
lambda	-0.453	-0.891	-0.563	-2.869
Prob > chi2	0.268	0.000	0.000	0.000

Notes: Standard errors in parentheses; Household weights included; Coefficients reported.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

as we include both households with and without an enterprise. The number of adults is significant and positive in Malawi, Nigeria, and Uganda. We further find a lower probability of entering the sector for households located in rural areas. The gender of the head is not significant for most countries, with the exception of Nigeria. The age categories are significant in Malawi, Nigeria, and Uganda, but do not have an effect on the likelihood of enterprise operation in Ethiopia. Compared to the reference group (young household heads below the age of 25), the middle age groups have a significantly higher probability of entering non-farm entrepreneurship. If heads are 45 and older, the coefficients are either negative, no longer significant, or positive, but with smaller coefficients compared to the middle age groups. Among the other variables in the selection stage, both the effects of the ability to read and write (in three countries) and access to credit (in Ethiopia and Malawi) are significant and positive.<sup>12</sup> The effect of shocks is only significant in Malawi and suggests that households can be pushed into entrepreneurship. The effect of distance is significant and negative in Ethiopia and Malawi.

In the outcome stage, the individual characteristics are taken from the enterprise owner. We find that the effect of location is significant and negative in Malawi and Nigeria, where rural households have a lower labor productivity compared to enterprises in urban areas. Female-owned enterprises are less productive than male-owned enterprises in three countries. The effect of the age categories is significant in Malawi and Uganda, and show that enterprises with older owners are significantly more productive than those with younger owners. However, the age variables are not significant in Ethiopia and Nigeria. We further find that the effect of education on labor productivity is generally positive and significant, and that general access to credit is not or only marginally significant. Firm size is associated with lower productivity in Ethiopia and Nigeria, possibly due to a lack of information of time-use of enterprise workers. Shocks (reflecting risk) have a negative impact in Ethiopia, Malawi, and Nigeria. While distance from a population center lowers the probability of households entering non-farm entrepreneurship, it is associated with higher labor productivity in case of Malawi, but with lower productivity in Ethiopia and Uganda.

In Table 7 we complement the section on labor productivity with a panel data analysis for Nigeria and Uganda. We estimate three regressions for each country. First an ordinary least squares (OLS) regression where we hold the wave constant, second we include fixed effects, and third random effects.

The results show that the effect of location is significant and negative for most regression results in both countries, and indicate that enterprises located in rural areas are less productive. Individual characteristics of the enterprise owner are highly significant and similar to our earlier findings. As before we find that women-owned enterprises are less productive compared to male-owned enterprises, and that the effect of age is significant and positive for almost all regressions and age categories. The ability to read and write, a proxy for education, is significant and positive in most cases. Finally, the effect of migration is significant and positive in the OLS and random effects regressions, and consistent with findings elsewhere in the literature that migrants are often more successful entrepreneurs (Marchetta, 2012).<sup>13</sup>

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<sup>12</sup> The credit variable is not available for Nigeria and Uganda.

<sup>13</sup> The variables migration and months in operation are available for Uganda only.

**Table 7:** Panel Data Analysis

(ln) Productivity	Nigeria			Uganda		
	OLS	FE	RE	OLS	FE	RE
Rural	-0.436*** (0.05)	-0.936*** (0.26)	-0.427*** (0.04)	-0.454*** (0.15)	-0.137 (0.48)	-0.661*** (0.08)
Female	-0.583*** (0.04)	-0.748*** (0.04)	-0.669*** (0.03)	-0.427*** (0.11)	-0.608*** (0.11)	-0.653*** (0.07)
Age: 25 to 34	0.220*** (0.07)	0.106* (0.06)	0.197*** (0.05)	0.484** (0.22)	0.620*** (0.19)	0.644*** (0.14)
Age: 35 to 44	0.373*** (0.07)	0.262*** (0.07)	0.328*** (0.05)	0.357 (0.23)	0.694*** (0.22)	0.636*** (0.14)
Age: 45 and older	0.404*** (0.07)	0.300*** (0.07)	0.350*** (0.05)	-0.002 (0.23)	0.519*** (0.17)	0.278** (0.14)
Read & Write	0.425*** (0.04)	0.115** (0.06)	0.306*** (0.04)	0.775*** (0.14)	-0.140 (0.14)	0.409*** (0.08)
Migration				0.233* (0.12)	0.149 (0.11)	0.234*** (0.07)
Number of Adults	0.027** (0.01)	-0.037 (0.04)	0.010 (0.01)	0.112*** (0.02)	0.088*** (0.03)	0.115*** (0.02)
Shock	-0.141*** (0.05)	0.122* (0.07)	-0.027 (0.04)	-0.192* (0.11)	-0.074 (0.08)	-0.228*** (0.06)
Credit	0.445*** (0.06)	0.243*** (0.07)	0.381*** (0.05)	0.814*** (0.10)	0.457*** (0.11)	0.676*** (0.07)
Firm Size	-0.110*** (0.03)	-0.124*** (0.04)	-0.094*** (0.03)	-0.016 (0.03)	-0.114*** (0.02)	-0.058*** (0.02)
Months in Operation				0.117*** (0.02)	0.059*** (0.02)	0.078*** (0.01)
Constant	8.417*** (0.12)	9.299*** (0.21)	8.586*** (0.11)	8.996*** (0.33)	10.028*** (0.45)	9.657*** (0.24)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
FE	No	Yes	No	No	Yes	No
RE	No	No	Yes	No	No	Yes
R <sup>2</sup>	0.163	0.115	0.147	0.165	0.108	0.173
N	7,755	7,755	7,786	4,501	4,501	4,506

*Notes:* Standard errors in parentheses; Household weights included.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

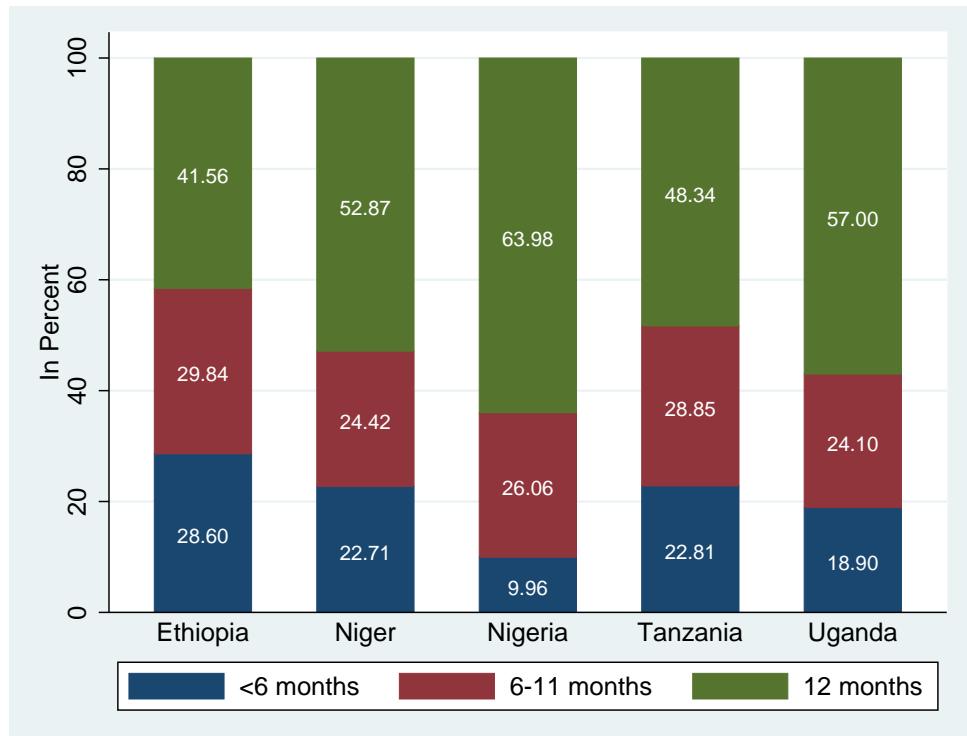
The significance of the effect of household characteristics varies. The number of adults in a household significantly increases labor productivity in Uganda per additional household member. In Nigeria, we only find a significant effect in the OLS regression. The effect of shocks is significant in some of the regressions, and the coefficients report in their majority a negative effect, where significant. Finally, we report the effects of enterprise characteristics on productivity. The effect of credit to expand the enterprise is significant and positive on labor productivity in all cases, and suggests that credit helps to improve the business performance. The variable months in operation, indicating how many months an enterprise was in operation during the past 12 months, reports a positive and significant association, and increases labor productivity per additional month in operation, possibly indicating improved capacity utilization.

### 4.3 Survival and Exit

Our interest in the productivity of non-farm enterprises is also based on the assumption that more productive enterprises are more likely to grow, survive and create the quantity and quality of employment necessary for development and structural change in rural Africa. In this section we analyze, to the extent possible, the survival and exit of these enterprises. As mentioned, the LSMS-ISA data set is not ideal to study this area of enterprise behavior as the surveys were not designed as enterprise surveys. We therefore present a set of descriptive statistics to learn more about the patterns of survival and exit of enterprises in our sample.

The LSMS-ISA surveys capture the number of months per year a rural non-farm enterprise was operating in the year preceding the survey. Figure 3 shows a significant proportion of rural enterprises operating less than 6 or 12 months per year. Only between 42 and 64 percent of all enterprises operate continuously during the whole year, with the highest percentage found in Nigeria. As we found in the previous section, enterprises that operate for shorter times during the year are less productive.

**Figure 3:** Months in Operation



*Notes:* Survey weights included; Malawi not reported due to lack of data; Enterprises that are less than one year in operation are excluded; Rural areas only.

From the survey data we also calculate the same shares for enterprises operating in urban areas. As expected, Table 8 shows that proportionately more urban enterprises operate continuously during a year compared to rural enterprises. This suggests that seasonality has a potentially important impact on the dynamics of rural entrepreneurship in Africa, and might push households into non-farm activities during the off-season or during a poor harvest, for example to assist in consumption smoothing over the year, given that

markets for insurance and credit are largely missing or imperfect.

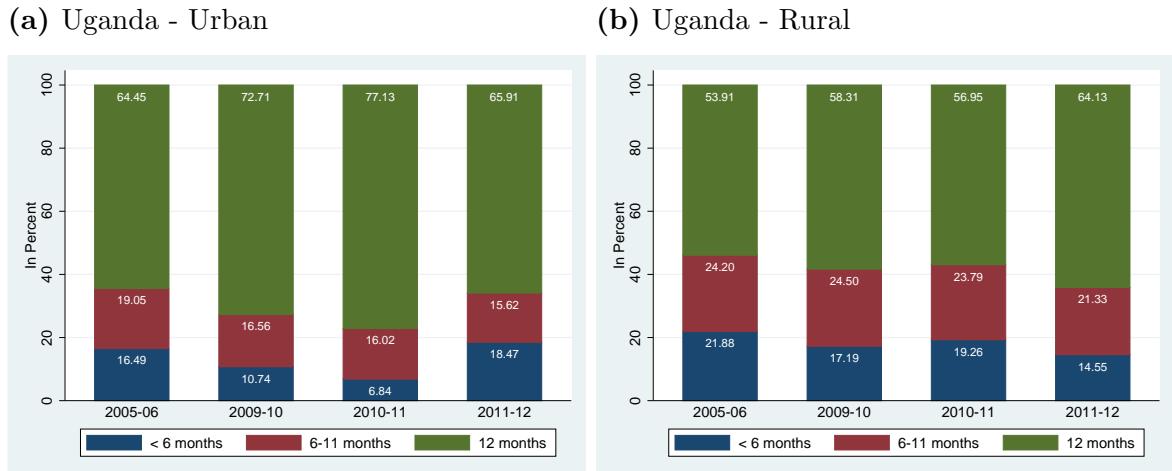
**Table 8:** Months in Operation - by Location

	Niger		Nigeria		Tanzania		Uganda	
	rural	urban	rural	urban	rural	urban	rural	urban
<6	23	9	10	7	23	12	19	7
6-11	24	16	26	24	29	25	24	16
12	53	75	64	69	48	63	57	77

*Notes:* Survey weights included.

Figure 4 depicts the months of enterprise operation over time using data from Uganda.<sup>14</sup> We notice the difference between rural and urban enterprises. In all four survey years, the share of enterprises operating throughout the year is lower in rural than in urban areas. We may posit that seasonal work, especially in agriculture, is a possible explanation for this finding, which can cause a mismatch between household consumption and income. While household labor is needed on the fields during planting and harvest, surplus labor can be allocated to non-farm enterprises during the low season. Engaging in non-farm activities can therefore be a consumption-smoothing strategy.

**Figure 4:** Months in Operation - by Location

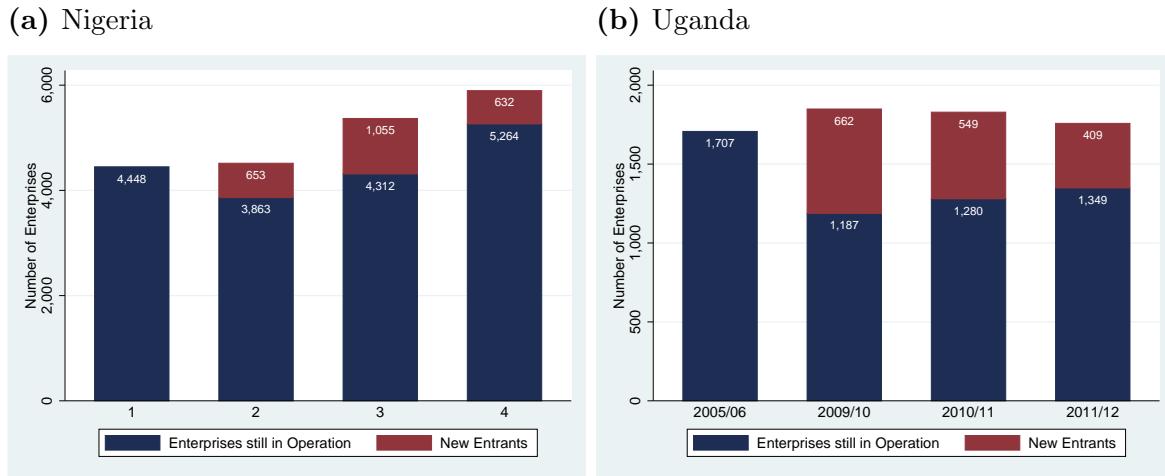


*Notes:* Survey weights included.

The surveys also capture information about the numbers of non-farm enterprises operated across the waves. Figure 5 shows the number of enterprises counted for Nigeria and Uganda in each of the survey years. In Nigeria the number of new business activities is accounted for in one specific question, in Uganda enterprises from previous rounds that are no longer operating are included in the consecutive rounds as “empty” observations. The data can be used to obtain insight of entry and exit numbers into and from the non-farm enterprise sector. In the second, third and fourth survey rounds we include the number of enterprises that “survived” in between the surveys, with the previous survey round as the baseline survey.

<sup>14</sup> For this figure we can also use data from the 2005/2006 survey. In the panel regressions we did not include this survey round due to data discrepancies.

**Figure 5:** Entries and Exits into the Non-Farm Enterprise Sector



Notes: PP = Post-Planting, PH = Post-Harvest; Rural areas only.

The number of enterprises has continuously increased in Nigeria over the four survey rounds, while the number has been more stable in Uganda. We note that numbers of the same or close survey years are more similar, as less time has passed for a change in the number of enterprises. Nigeria has not only experienced a steady increase in the number of enterprises, but also has a lower share of new entrants compared to Uganda.

Finally we reflect on the reasons why rural enterprises exit the market.<sup>15</sup> In Uganda the households were asked why their enterprise stopped operations during the previous year.<sup>16</sup> In Table 9 we summarize their responses, distinguishing between rural and urban enterprises. The most important self-reported reasons of market exit are low profitability, lack of finance, as well as the impact of idiosyncratic shocks such as death or illness in the family, and unreliable supplies. Labor related reasons (idiosyncratic shocks) are more pronounced in rural than in urban areas. This may reflect the limited or total lack of insurance and social protection schemes in rural Uganda.

Among the enterprises that were discontinued during the previous twelve months in Uganda, respondents were further asked whether or not they were planning to restart their enterprise. In 2010/11 57.34 percent did not plan a restart, 35.66 percent considered it probable, and the remaining 6.99 percent were certain of retaking operation. In 2011/12 73.19 percent did not plan a restart, 24.54 percent considered it probable, and the remaining 2.27 percent were certain of retaking operation.<sup>17</sup> It seems that in their majority enterprises were discontinued for good, and only a small share of firm had plans of retaking operations, indicating that many rural non-farm enterprises in Uganda are created, operated and stopped.

<sup>15</sup> At present we do not have adequate data to estimate survival models to identify which factors determine the survival of enterprises.

<sup>16</sup> 768 observations are captured over two survey rounds.

<sup>17</sup> All shares are weighted.

**Table 9:** Reasons for Enterprise Exit

Reason	2010-2011		2011-2012	
	Urban	Rural	Urban	Rural
Insecurity or theft	2.95	4.10	3.28	0.19
Lack of supply (inputs or raw material)	9.00	7.52	4.74	7.43
Lack of demand	5.14	6.04	5.84	1.50
Economic factors (profitability)	27.59	32.93	19.09	15.72
Technical issues	0.46	0.62	0.89	0.76
Labor related (death or illness)	5.57	9.00	5.68	7.07
Government regulation				0.89
Competition	1.79	1.67		3.30
Lack of electricity		0.15		
Lack of space or premises	0.55	0.29	0.43	1.47
Lack of transport	2.97	0.81		1.11
Lack of finance	29.33	23.59	34.63	31.37
Other	14.65	13.30	25.41	29.16

*Notes:* Survey weights included.

## 5 Summary and Concluding Remarks

In this paper we provide answers to three questions about non-farm enterprises in rural Africa on (i) the determinants of enterprise operation and choice of business activity, (ii) their productivity, and (iii) their survival and exit. Our findings tell a story of rural household enterprises as “small businesses in a big continent”, where large distances, rural isolation, and low population density carry a large cost in terms of productivity, and where the necessity to start an enterprise pushes households into less productive, occasional enterprises. We first summarize the results, before discussing policy implications.

First, we find evidence that households are both pushed and pulled into entrepreneurship. The necessity to cope and manage risk can push households into operating an enterprise given the lack of social protection and insurance schemes, a risky environment, shocks, surplus household labor, and seasonality. This necessity motivation is reflected in the nature of these enterprises as small, informal household enterprises that are often operated for only a portion of the year. Nevertheless for some households opportunities to respond to demand and access to markets may beckon. Variables such as distance to markets and local infrastructure were found to be significant and positive, suggesting that policies to foster agglomeration and improve infrastructure can be beneficial for rural entrepreneurship. While such policies support rural entrepreneurship mainly from the demand side, supply side policies that reduce the necessity type of entrepreneurship and encourage risk-taking may need more emphasis. These can include policies to provide or extend social protection and (micro) insurance.

Our evidence further suggests that the focus on both the household and the individual level is appropriate. The character of rural enterprises as household enterprises implies that decisions are taken collectively at the household level. Education and age of the household head, the household’s wealth, and access to credit are associated with a

higher likelihood to be entrepreneurial. It means that the promotion of education, credit provision, and a general improvement in household wealth and income is expected to have a positive impact on rural entrepreneurship.

We also find that the determinants of enterprise operation influence the type of business households operate. Credit and education are closely associated with agribusiness and trade, as well as operating a bar or restaurant. We further find that easier to enter businesses, such as trade or agribusiness, are more likely to be operated by household that have experienced a shock. Distance to a population center is less important for professional services or bars & restaurants. Whereas gender was not found to be a significant constraint to operate an enterprise, women are less likely to operate certain types of businesses, a finding that is consistent with expectations from non-unitary household decision-making models. These include transport businesses, professional services, and non-agricultural businesses. The latter, being among the most frequently operated type of business in our sample, suggests that female entrepreneurs may face important barriers to enter certain business activities.

Second, our results confirm a link between a household's motivation to operate a non-farm enterprise and its subsequent productivity. Enterprises that are operated by necessity, e.g. due to shocks, are more likely to be less productive than enterprises that are operated as a result of the household utilizing an opportunity. Households responding to an opportunity not only attain better capacity utilization by operating all through the year, but also may seek out credit, or have better educated enterprise owners. Perhaps due to greater risk and more prevalent market failures in rural areas, we find that rural non-farm enterprises are on average less productive than their urban counterparts. Moreover, non-farm enterprises located in regions that have been subject to a history of violent conflict show a lower productivity level.

With regard to individual level determinants of labor productivity, our findings also confirm that female-owned enterprises are less productive than male-owned enterprises, although we may underestimate female-owned enterprises productivity due to the constrained time-use of women. A further important finding is that enterprises owned by young adults are significantly less productive than those of older adults. Given that Africa is the continent with the most youthful population, and with millions of young job seekers entering rural labor markets annually, this finding suggests additional support for young enterprise owners.

Third, rural enterprises also exit the market. In rural Africa, a large number of rural household enterprises are occasional enterprises that operate for only a proportion of the year. Enterprises in rural areas are more often operating intermittently compared to their urban counterparts. With regard to exit reasons the findings show that rural enterprises are more likely to cease operations due to idiosyncratic shocks than urban enterprises, reflecting the risky environment in which they operate.

These findings provide some justification for policies that support enterprise owners, such as education and training, access to credit to expand business activities, or development of clusters. However, these are already part of most entrepreneurship development programs in Africa. Therefore we additionally suggest policies that can cushion shocks and protect

households from negative external events, especially households and enterprises with younger heads and owners, for example (micro) insurance schemes or social protection policies. We expect that policies that tackle the difficulties of rural entrepreneurship from both angles (support entrepreneurs and cushion them from external events) will have a more pronounced impact on enterprise creation and productivity, which in turn contributes to higher survival rates and job creation.

Finally we call for more and better data, survey work, and research. While the LSMS-ISA database offer a rich set of data and information, including a separate section on non-farm entrepreneurship, we face a number of data challenges. For instance, differences and inconsistencies in the content of questionnaires across countries only allows limited comparability. Furthermore, our measure of productivity is partial and imprecise, and we cannot match the type of business activity with individual enterprise information with the current data. Hence we cannot accurately calculate the dispersal of productivity across different types of business activities. Given the need for employment and faster productivity growth to facilitate structural transformation in rural Africa, the benefits of obtaining improved data on non-farm enterprises may be worth the effort.

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## A Appendix: Data Manipulation

### All Estimates

We replace the age of the household head or enterprise owner with the median age in case the age variable is missing, below 15, or above 99. This happened however only for very few observations.

### Probit Analysis

We arrange the shock variables in four different subgroups: idiosyncratic shocks, price shocks, geographic shocks, and other shocks. While “other shocks” is given by the survey questionnaire, we allocate all shocks that are connected to the individual household in the category “idiosyncratic shocks”, as for example death or illness of a household member, loss of employment, experience of violence, or theft. We allocate all shocks that are connected to changes in the price to the variable price shocks, which can include both increases and decreases in the price level.<sup>18</sup> We allocate all shocks that are connected to the geography and that have a possible impact on agriculture to the category “geographic shocks”, as for example floods, droughts, pest attacks, or livestock epidemic.

### Panel Data Analysis

Households are visited and interviewed during the first survey round, and households operating a non-farm enterprise are registered in the respective section. Due to the panel design, the same households are visited again in the consecutive survey rounds. If a household of the previous round is no longer operating the non-farm enterprise, the household is still registered in the respective section, but does not fill out the questions on non-farm entrepreneurship. Therefore it is possible to identify the enterprises that were discontinued since the last survey round if the enterprises can clearly be tracked over the waves. If not, it is possible to know the number of enterprises that were discontinued. In Uganda, various “empty” observations in follow-up surveys do not have observations in the previous survey round(s), and we decided to exclude these observations, as it is not clear what kind of information they present, if they are discontinued enterprises or false observations. We delete 82 out of 7,985 observations, resulting in a final database of 7,903 enterprises for the panel data analysis. We do not encounter this issue in Nigeria.

Further data manipulation includes the following: prices are inflation deflated to prices of the first survey round in the respective country, using the IMF’s inflation index of average consumer prices (percentage change). Furthermore prices are “winsorized” at 1 percent. We also “winsorize” the number of employees at 1 percent. We further replace a few outlier values, for example if the months in operation exceeded 12 months.

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<sup>18</sup> We cannot construct two different variables to account for increases and decreases in the price level due to the inconsistent formulation of survey questions over the country questionnaires.

## B Appendix: Summary Statistics

### B.1 Prevalence

**Table 10:** Prevalence of Non-Farm Enterprises in Rural Africa

Country	Nr of HH surveyed	HH with NFE	in % weighted	Nr of NFEs	Avg Nr of NFE/HH
Ethiopia	3,466	919	22.87	1,112	1.21
Malawi	10,038	1,755	16.88	1,872	1.07
Niger	2,430	1,427	61.73	2,188	1.53
Nigeria	3,380	1,707	52.62	2,688	1.57
Tanzania	2,629	1,061	38.65	1,363	1.26
Uganda	2,105	953	42.24	1,471	1.54
Total	24,551	8,115	41.63	11,064	1.36

*Notes:* Weighted country shares are calculated using survey weights, the total share includes population weight.

**Table 11:** Prevalence of Non-Farm Enterprises in Urban Africa

Country	Nr of HH surveyed	HH with NFE	in % weighted	Nr of NFEs	Avg Nr of NFE/HH
Ethiopia	503	293	56.11	370	1.26
Malawi	2,233	817	35.11	938	1.15
Niger	1,538	998	67.78	1,539	1.54
Nigeria	1,620	1,108	70.50	1,760	1.59
Tanzania	1,295	746	60.28	960	1.29
Uganda	611	354	54.21	572	1.62
Total	7,297	4,023	64.59	11,064	1.36

*Notes:* Weighted country shares are calculated using survey weights, the total share includes population weight.

## B.2 Probit Model

Table 12: Summary Statistics - Probit Model

Household operates a NFE	Ethiopia		Malawi		Niger		Nigeria		Tanzania		Uganda	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Female	0.20	0.18	<b>0.26</b>	<b>0.19</b>	0.11	0.09	<b>0.17</b>	<b>0.12</b>	0.25	0.24	<b>0.31</b>	<b>0.25</b>
Age	<b>45.37</b>	<b>41.77</b>	<b>43.50</b>	<b>39.84</b>	44.19	44.96	<b>51.38</b>	<b>48.98</b>	<b>48.95</b>	<b>44.99</b>	<b>46.28</b>	<b>42.33</b>
Married	0.81	0.82	<b>0.72</b>	<b>0.81</b>	0.90	0.91	<b>0.76</b>	<b>0.85</b>	0.57	0.54	<b>0.68</b>	<b>0.79</b>
Read & Write	<b>0.40</b>	<b>0.49</b>	<b>0.58</b>	<b>0.71</b>	0.25	0.31	<b>0.48</b>	<b>0.63</b>	<b>0.64</b>	<b>0.74</b>	0.63	0.64
Number of Adults	2.71	2.67	<b>2.37</b>	<b>2.53</b>	2.90	3.09	<b>2.91</b>	<b>3.34</b>	<b>2.83</b>	<b>3.12</b>	<b>3.26</b>	<b>3.64</b>
Income					<b>0.50</b>	<b>0.89</b>	<b>0.93</b>	<b>0.64</b>	<b>0.56</b>	<b>0.87</b>	<b>0.50</b>	<b>0.82</b>
Rooms	<b>1.64</b>	<b>1.81</b>	<b>2.44</b>	<b>2.63</b>	2.50	2.76			<b>3.37</b>	<b>3.82</b>	2.80	2.84
Credit	<b>0.26</b>	<b>0.37</b>	<b>0.11</b>	<b>0.19</b>					0.08	0.11		
Food Shortage	0.32	0.37	<b>0.52</b>	<b>0.47</b>	<b>0.47</b>	<b>0.38</b>			0.27	0.21	0.21	0.27
Shock (idiosyn.)	0.18	0.20	<b>0.27</b>	<b>0.38</b>	0.22	0.21			0.20	0.17	0.19	
Shock (price)	0.33	0.37	<b>0.41</b>	<b>0.46</b>	0.29	0.34			0.24	0.48	0.44	0.02
Shock (geogr.)	0.24	0.22	0.48	0.52	0.45	0.40			0.14	0.11	0.18	0.17
Shock (other)	0.02	0.04	0.02	0.02	<b>0.15</b>	<b>0.21</b>			0.01	0.01	0.00	0.02
Distance	0.37	0.33	<b>0.38</b>	<b>0.35</b>	0.66	0.62			0.23	0.54	0.53	0.25
Precipitation	1.17	1.21	<b>1.07</b>	<b>1.05</b>	<b>0.38</b>	<b>0.40</b>			1.47	1.07	1.07	1.24
N	2,547	919	8,283	1,755	1,003	1,427	1,673	1,707	1,761	1,241	1,152	953

Notes: Survey weights included; Coefficients in bold indicate differences between households with and without a non-farm enterprise that are significant at a 5 percent level; Rural areas only.

## Definition of Variables for the Probit Model

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Female	1 if female.
Married	1 if married (monogamous or polygamous).
Read & Write	1 if individual can read and write in any language.
Number of Adults	Number of adults in the household age 15 and older.
Income	Annual net household income in 1,000's of USD.
Rooms	Number of rooms in the household.
Credit	1 if household has access to credit. This variable is defined as general access to credit, and does not further specify for which purpose the household used it.
Food Shortage	1 if household experienced food shortage (self-reported variable).
Shock	1 if household experienced a shock. Shocks can be idiosyncratic (e.g. death or illness of a household member), related to prices (e.g. increase in the price level of certain goods and services), related to agriculture (e.g. droughts or floods), or other types of shocks (not further specified in the questionnaire).
Distance	Defined as distance to next population center of 20,000 or more inhabitants, in 100's of km.
Precipitation	Annual precipitation in 1,000's of mm.

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### B.3 Multinomial Logit Model

**Table 13:** Summary Statistics - Multinomial Logit Model

Variable	Ethiopia			Malawi		
	Mean	Min	Max	Mean	Min	Max
Female	0.20	0	1	0.25	0	1
Age	44.37	15	97	42.80	15	99
Read & Write	0.42	0	1	0.60	0	1
Number of Adults	2.69	1	10	2.40	1	13
Credit	0.28	0	1	0.13	0	1
Shock (idiosyn.)	0.18	0	1	0.29	0	1
Shock (price)	0.34	0	1	0.42	0	1
Shock (geogr.)	0.24	0	1	0.49	0	1
Shock (other)	0.03	0	1	0.02	0	1
Distance	0.36	0.02	2.08	0.37	0.00	1.21

*Notes:* Survey weights included; Rural areas only.

#### Definition of Variables for the MNLM Model

Female	1 if female.
Age	In years.
Read & Write	1 if individual can read and write in any language.
Number of Adults	Number of adults in the household age 15 and older.
Credit	1 if household has access to credit. This variable is defined as general access to credit, and does not further specify for which purpose the household used it.
Shock	1 if household experienced a shock. Shocks can be idiosyncratic (e.g. death or illness of a household member), related to prices (e.g. increase in the price level of certain goods and services), related to agriculture (e.g. droughts or floods), or other types of shocks (not further specified in the questionnaire).
Distance	Defined as distance to next population center of 20,000 or more inhabitants, in 100's of km.

## B.4 Heckman Selection Model

**Table 14:** Summary Statistics - Number of Observations by Age Category

	Ethiopia	Malawi	Niger	Nigeria	Tanzania	Uganda
Younger than 25	196	220	281	234	3	105
Age: 25 to 34	338	695	628	697	35	312
Age: 35 to 44	260	480	549	762	31	344
Age: Older than 45	178	472	729	941	24	319
Total	972	1,867	2,187	2,634	93	1,080

*Notes:* Rural areas only.

**Table 15:** Summary Statistics - Heckman Selection Model

	Ethiopia			Malawi		
	Obs	Mean	St Dev	Obs	Mean	St Dev
<b>Individual Characteristics</b>						
Household Head						
Female	4,150	0.25	0.43	12,506	0.24	0.43
Age Categories	4,146	3.05	0.97	12,506	2.88	1.01
Read & Write	4,131	0.41	0.49	12,506	0.68	0.47
Enterprise Owner						
Female	1,344	0.51	0.50	2,802	0.38	0.48
Age Categories	1,342	2.52	1.02	2,802	2.62	0.96
Read & Write	1,336	0.48	0.50	2,802	0.77	0.42
<b>Household Characteristics</b>						
Number of Adults	4,159	4.13	2.16	12,506	2.47	1.22
Rural	4,159	0.86	0.34	12,506	0.81	0.39
Credit	4,087	0.25	0.42	12,506	0.13	0.34
Shock	4,159	0.47	0.50	12,505	0.69	0.46
Distance	4,159	0.41	0.34	12,506	0.34	0.23
<b>Enterprise Characteristics</b>						
Firm Size	1,470	2.25	1.86	2,809	2.59	1.73

**Table 16:** Summary Statistics - Heckman Selection Model

	Nigeria			Uganda		
	Obs	Mean	St Dev	Obs	Mean	St Dev
<b>Individual Characteristics</b>						
Household Head						
Female	6,555	0.13	0.33	3,508	0.29	0.46
Age Categories	6,537	3.42	0.79	3,506	3.18	0.89
Read & Write	6,543	0.64	0.48	3,395	0.66	0.47
Enterprise Owner						
Female	4,364	0.57	0.50	1,909	0.52	0.50
Age Categories	4,358	2.92	0.99	1,907	2.85	0.98
Read & Write	4,354	0.63	0.48	1,895	0.74	0.44
<b>Household Characteristics</b>						
Number of Adults	6,555	3.35	1.89	3,508	4.10	2.51
Rural	6,558	0.66	0.47	3,511	0.76	0.43
Shock	6,558	0.31	0.46	3,444	0.46	0.50
Distance	6,558	0.20	0.20	3,102	0.22	0.19
<b>Enterprise Characteristics</b>						
Firm Size	4,318	2.24	1.57	1,525	3.14	1.89

**Definition of Variables for the Heckman Selection Model**

Female	1 if female.
Age Categories	15 to 24 = age category 1, 25 to 34 = age category 2, 35 to 44 age category 3, 45 and older = age category 4.
Read & Write	1 if individual can read and write in any language.
Number of Adults	Number of adults in the household age 15 and older.
Rural	1 if household is located in a rural area.
Credit	1 if household has access to credit. This variable is defined as general access to credit, and does not further specify for which purpose the household used it.
Shock	1 if household experienced a shock. Shocks can be idiosyncratic (e.g. death or illness of a household member), related to prices (e.g. increase in the price level of certain goods and services), related to agriculture (e.g. droughts or floods), or other types of shocks (not further specified in the questionnaire).
Distance	Defined as distance to next population center of 20,000 or more inhabitants, in 100's of km.
Firm Size	Number of workers in the enterprise.
Agro-Ecological Zones	Tropic-warm or tropic-cool, combined with different precipitation levels: arid, semi arid, sub humid, humid.

## B.5 Panel Data Analysis

**Table 17:** Summary Statistics - Panel Data Analysis

		Nigeria			Uganda		
	Obs	Mean	St Dev	Obs	Mean	St Dev	
<b>Individual Characteristics</b>							
Female	8,715	0.56	0.50	4,686	0.49	0.50	
Age Categories	8,711	2.96	0.99	4,684	2.83	0.98	
Read & Write	8,687	0.64	0.48	4,530	0.75	0.43	
Migration				4,796	0.64	0.48	
<b>Household Characteristics</b>							
Rural	8,715	0.62	0.49	4,795	0.71	0.45	
Number of Adults	8,715	3.90	2.15	4,686	3.71	2.16	
Shock	8,715	0.24	0.43	4,796	0.48	0.50	
<b>Enterprise Characteristics</b>							
Credit	8,666	0.08	0.26	4,785	0.12	0.33	
Firm Size	8,715	2.21	2.06	4,796	4.04	2.28	
Months in Operation				4,779	9.59	3.49	

### Definition of Variables for the Panel Data Analysis

Female	1 if female.
Age Categories	15 to 24 = age category 1, 25 to 34 = age category 2, 35 to 44 age category 3, 45 and older = age category 4.
Read & Write	1 if individual can read and write in any language.
Migration	1 if individual migrated. It indicates if the individual moved from another district or country to the current place of residence.
Rural	1 if household is located in a rural area.
Number of Adults	Number of adults age 15 or older in the household.
Shock	1 if household experienced a shock. Shocks can be idiosyncratic (e.g. death or illness of a household member), related to prices (e.g. increase in the price level of certain goods and services), related to agriculture (e.g. droughts or floods), or other types of shocks (not further specified in the questionnaire).
Credit	1 if household has taken out credit to expand the business. The use of credit is clearly related to the purpose of operating and expanding the business, and not used for other purposes within the household.
Firm Size	Number of workers in the enterprise.
Months in Operation	Number of months the enterprise was in operation during the past 12 months (max. 12).