

Patterns and Determinants of Non-Farm Entrepreneurship in Rural Africa: New Empirical Evidence

Paula Nagler*

Wim Naudé[†]

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Abstract

A substantial number of African households do not limit their labor to agriculture, but diversify into non-farm entrepreneurship. Why and how they do so remains however relatively unexplored, especially from a comparative and empirical perspective. Using the World Bank's LSMS-ISA survey data that covers six countries in Sub-Saharan Africa, this paper answers three questions about the neglected topic of rural non-farm entrepreneurship. (i) How prevalent is non-farm entrepreneurship in rural Africa? (ii) Do households enter the sector as a result of push or pull factors? (iii) Which types of businesses do they operate? We find that almost half of all households in rural Africa are engaged in non-farm entrepreneurship, with however substantial country-level heterogeneity. Using probit regressions we also find that enterprises are operated due to both push and pull factors. Push factors are related to the risk of farming under imperfect and missing markets for credit and insurance, and include shocks, surplus household labor, and seasonality in agriculture. Pull factors that allow households to seize business opportunities, are related to the access to credit, household wealth and education. Finally we find, using a multinomial logit model, that the type of business activity households operate also depends on individual, household and location characteristics.

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*Maastricht School of Management, UNU-MERIT/MGSoG, and Maastricht University, Maastricht, The Netherlands, paula.nagler@maastrichtuniversity.nl

[†]Maastricht School of Management, UNU-MERIT/MGSoG, Maastricht University, Maastricht, The Netherlands and IZA-Institute for the Study of Labor, Bonn, Germany, w.naude@maastrichtuniversity.nl

1 Introduction

Around a decade ago [Wiggins \(2000\)](#) lamented that “little is known” about Africa’s rural non-farm economy, beyond an “embryonic set of ideas”. Since then the embryonic set of ideas has been elaborated in more detail by scholars, who established as a “stylized fact” of African agriculture that a substantial and rising number of households in Africa do not limit their labor to agriculture, but diversify and start rural non-farm enterprises ([Davis et al., 2007](#); [Reardon et al., 2006](#); [Rijkers and Costa, 2012](#); [Start, 2001](#)).¹ Why and how they do so remains however relatively unexplored, especially from a comparative and empirical perspective. The extant scholarly literature ascribes the rise in rural non-farm enterprises to market imperfections and a poor business environment in African countries that hampers (risky) farming and urban-based manufacturing. While very plausible, most of the empirical evidence in support of these hypotheses are based on one-period, single-country, and rather limited survey data, and have furthermore focused on self-employment in urban areas. One consequence may be the fact that most poverty alleviation interventions in Africa neglect rural entrepreneurship ([Fox and Sohnesen, 2013](#)).

In our paper we address this neglected area of research by providing new comparative empirical evidence. We use the recently available, nationally representative surveys Living Standards Measurement Study - Integrated Surveys in Agriculture (LSMS-ISA) that cover six countries over the period 2005 to 2013 (Ethiopia, Malawi, Niger, Nigeria, Tanzania, Uganda).² It is the first time, to the best of our knowledge, that this unique data set has been used to provide an empirical overview of rural Africa’s non-farm enterprises. In the analysis we answer three questions, based on descriptive statistics and using econometric techniques (probit regression models and multinomial logit models). (i) How prevalent is non-farm entrepreneurship in rural Africa? (ii) Do households enter the sector as a result of push or pull factors? (iii) Which types of businesses do they operate?

Our key findings are summarized as follows. For the first question we find that a significant share of households operate one or more non-farm enterprises, but that the share largely varies across countries. Enterprises and self-employment are also more prevalent in urban areas of Africa than in rural areas. In comparison with studies from other continents we cannot find evidence that rural households have a higher propensity to operate non-farm enterprises or that these are more important in Africa than in other regions (e.g. Asia or Latin America). For the second question we find evidence of both *push* and *pull* factors, revealing substantial country-level heterogeneity. *Push* factors include shocks, surplus household labor, and seasonality. The impact of

¹ Rural non-farm enterprises are business ventures started and managed by households outside of agriculture. They typically include businesses in agribusiness, services, trade and retail, tourism, rural industrialization, construction, and mining. Although referred to as non-farm, many of these enterprises are linked to agriculture, and are often operated on a farm (e.g. food processing, veterinary services) ([Rijkers and Costa, 2012](#)). Non-farm enterprises are part of the broader rural economy. [Barrett et al. \(2001\)](#) contain a more detailed discussion of the concepts of the rural economy in general, including agriculture and the non-farm economy, and [Roepstorff and Wiggins \(2011\)](#) on the concept and measurement of agribusiness.

² See also the World Bank’s website www.worldbank.org/lsms-isa

these determinants is reflected in the nature of non-farm enterprises as small, informal household enterprises that are often operated from the household residence or the immediate surroundings. With regard to *pull* factors we find that education (the ability to read & write), household wealth, and access to credit are significant factors of the rural household's decision to operate a non-farm enterprise. For the third question we find that individual, household and location characteristics also matter with regard to the type of business activity a household engages. Overall we are cautious about generalizing the specific determinants due to specific nature of risk and market imperfections across countries. The few generalizations that we confidently make are the higher probability of households engaging in non-farm entrepreneurship in urban areas, and the higher irregularity of enterprise operation in rural areas.

The paper is organized as follows. We start in section 2 by screening the literature with regard to our three questions. In section 3 we describe the LSMS-ISA database used for the analysis. In section 4 we report our findings: in 4.1 we study the importance of non-farm enterprises in rural Africa and discuss in section 4.2 the regression results identifying individual, household and location characteristics that determine a rural household's decision to start and operate non-farm enterprises. In section 4.3 we further take the type of business activity into account. The final section concludes.

2 Literature Review

2.1 Importance of Non-Farm Entrepreneurship

The position in the existing literature has shifted over time. In earlier thinking on rural development, influenced by the Lewis model of structural change (Lewis, 1954), the rural economy was expected to become less important as a contributor to rural household income over time (Lanjouw and Lanjouw, 2001). Urbanization and industrialization have consequently been a focus of development policies for most of the period since the 1960s, and agriculture often (implicitly) repressed and regulated (Havnevik et al., 2003). Most empirical studies on enterprises and entrepreneurship in Africa have focused on urban areas (Naudé, 2011).

The fact that non-farm enterprises could potentially be important for rural development has only been recognized from the late 1990s onward, when it became clear that, contrary to expectations, the contribution of these enterprises to rural household income has not declined over time, but in fact increased (Davis et al., 2007; Reardon et al., 2006). Today, between 40 and 50 percent of household income in rural Africa originates from rural non-farm enterprises (Davis et al., 2007; Reardon et al., 2006; Rijkers and Costa, 2012; Start, 2001; Lanjouw and Lanjouw, 2001). For some of the countries under closer scrutiny in this paper, Reardon et al. (2006) report income shares from non-farm enterprises of 20 percent in Ethiopia (1999), 64 percent in Malawi 64 (2004) and 54 and 46 percent in Uganda and Tanzania (2000), respectively. An analysis of the Rural Income Generating

Activities (RIGA) database³ by Davis et al. (2007) finds that rural non-farm enterprises contribute more than 50 percent to rural household income in 11 out of 15 countries, with a cross-country average of 58 percent.

Davis et al. (2007) point out that the share of non-farm income is less important in Africa compared to other regions. Other studies using data of countries outside of Africa seem support this finding: for instance, Janvry and Sadoulet (2001) find that in Mexico the non-farm economy on average contributes 55 percent to rural household income. Escobal (2001) reports a figure of 51 percent for Peru. Lanjouw and Lanjouw (2001) report 39 percent for Brazil, 41 percent for Chile, 50 percent for Colombia and 59 percent for Costa Rica. Shi et al. (2007) report 46 percent for China.

2.2 Determinants of Enterprise Operation

According to the existing literature, households in rural Africa operate enterprises outside of agriculture due to both *push* and *pull* factors, with household capabilities and the institutional environment (e.g. market failures) mediating (Reardon et al., 2006). One of the most important *push* factors is the high degree of risk in African agriculture (Rijkers and Söderbom, 2013). In the presence of failures in markets for credit and insurance, risk-averse farm households are keen to diversify their income *ex-ante* in anticipation that a crop may fail, or *ex-post* in the aftermath of a shock (Ackah, 2013). Rural enterprises as such are a form of self-insurance in the face of limited insurance markets.

Longer-term structural *push* factors include surplus labor in households, as growing families put pressure on fixed parcels of farmland over time (Babatunde and Qaim, 2010; Reardon, 1997; Reardon et al., 2006). *Push* factors also include seasonality: household members may be *pushed* off-farm in the low season, a situation aggravated by a lack of facilities for inter-temporal arbitrage. As such rural non-farm enterprises often present secondary activities (Lanjouw and Lanjouw, 2001). This conclusion has been supported by empirical studies that find that the non-farm enterprise sector in Africa is a heterogeneous sector (e.g. Davis and Bezemer, 2004; Barrett et al., 2001) and consists largely of small and informal businesses in the commercial, trade and services sectors (Davis et al., 2007). Haggblade et al. (1989) report that 95 percent of the rural non-farm enterprises employ less than five workers.

Whether rural households operate non-farm enterprises may also be due to their desire to utilize business opportunities, so called *pull* factors into entrepreneurship. In this regard household capabilities and assets, as well as individual characteristics have been found to be crucial (Barrett et al., 2001). Household capabilities and assets typically include gender, age (also a proxy for experience), education, marital status (Abdulai and Delgado, 1999), as well as financial assets (Ackah, 2013; Bhaumik et al.,

³ The RIGA data set covers around 90,000 observations across Albania, Bangladesh, Bulgaria, Ecuador, Ghana, Guatemala, Indonesia, Madagascar, Malawi, Nepal, Nicaragua, Nigeria, Pakistan, Panama and Vietnam.

2011), and the size of the household itself.⁴ Women, at least in Africa, have been found to be more likely to engage in the non-farm economy (Ackah, 2013; Canagarajah et al., 2001; Rijkers and Costa, 2012) or to migrate (Shi et al., 2007) compared to men. Schooling seems to be relatively more important for finding non-farm wage employment than for starting a new business (Bayene, 2008; Davis et al., 2007; Elbers and Lanjouw, 2001; Reardon et al., 2006).

Both *push* and *pull* factors are influenced by the features of the local and regional economies where households are located which are mostly exogenous to the household. For instance the agro-climatic environment determines the extent to which agriculture is productive and/or risky (Reardon, 1997). There is evidence that rural entrepreneurship fares better under favorable agro-climatic conditions (e.g. better rainfall) that are good for agricultural productivity and where other natural resources, e.g. in mines and tourist attractions, can be found (Reardon et al., 2006). The location of a household also determines the distance from urban areas, ports and markets. Fafchamps and Shilpi (2003) find that the share of non-farm wage employment declines the further a household lives away from a urban center, and that there is a U-shaped relationship between distance from a urban center and the share of income from self-employment. This finding suggests a kind of protection effect of deep rural isolation for non-farm enterprises. Also, the closer a household is located to an urban center, the more likely an individual household members migrates to this urban area (Reardon, 1997). 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 (Wiggins, 2000; Roepstorff and Wiggins, 2011).

3 The Database

The LSMS-ISA database covers, at the time of writing, six countries in Sub-Saharan Africa: Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda.⁵ In all countries where LSMS-ISA surveys have taken place, the plan is to conduct surveys approximately every two to three years to obtain longitudinal data. At present a cross-sectional data base is available for all six countries, and panel data for Nigeria, Tanzania and Uganda.⁶ For our analysis we use the databases: Ethiopia 2011/12, Malawi 2010/11, Niger 2011/12, Nigeria 2010/11, Tanzania 2010/11, and Uganda 2010/11. These were the latest data sets available for a cross-country analysis in December 2013.

The questionnaire contains three sections: a community section, an agricultural section and a household section. The community section records access to public services and infrastructure, social networks, governance, and retail prices. The agricultural section

⁴ The presence of children in a household may limit the choices of individual household members, particularly women, within the non-farm economy, resulting in activities attached to the household residence (Havnevik et al., 2003).

⁵ Data will also be collected for Burkina Faso and Mali.

⁶ Two waves in Nigeria (2010/11 and 2012/13) that include both post-planting and post-harvest collection dates. Two waves in Tanzania (2008/09 and 2010/11). Four waves in Uganda (2005/06, 2009/10, 2010/11, and 2011/12).

records crop production, storage and sales, land holdings, farming practices, input use and technology adaptation, access to and use of services, infrastructure and natural resources, livestock, and fishery. Finally, the household questionnaire records household demographics, education, health and nutrition, food consumption and expenditure, non-food expenditure, employment, non-farm self-employment and other sources of income, dwelling conditions, durable assets, migration, and participation in projects and programs. The survey data is geo-referenced, which allows us to include the impact of geographically determined variables such as rainfall, and distance from major roads and urban centers into our regression analysis.

Although the data set is new, unique and facilitates the comparability between countries (a feature that has so far been lacking in the available data), shortcomings remain. For instance, while all six countries include a section with a set of questions covering the area of non-farm enterprises, the availability of specific questions differs between countries and not all aspects are included in all country questionnaires. Questions that are available in all, or at least the majority of countries, often contain different answer possibilities of survey participants, also reflecting the specific country context. Further standardization would be desirable.

In the following sections we use the LSMS-ISA database in two ways. First we explore the database to identify the salient patterns of rural non-farm entrepreneurship and analyze whether non-farm enterprises are an important feature of rural economies, and set out the new insights to our existing knowledge. Second, we use econometric techniques to answer the second and third question. We run a number of probit regressions to identify individual, household and location variables that determine a household's decision of starting and operating a non-farm enterprise, and we use multinomial logit models to study the variables that further determine the type of business activities that households operate. We also report and discuss these results in the respective sections.

4 Results

4.1 Importance of Non-Farm Enterprises in Rural Africa

One of the conclusions in the literature is that non-farm entrepreneurship contributes a significant share to the income of rural households in Africa. Data from the LSMS-ISA is consistent with this fact and confirms that non-farm entrepreneurship activities are ubiquitous in the countries surveyed. As shown in Table 1, almost 42 percent of the 24,551 rural households surveyed reported operating a non-farm enterprise (NFE). Overall, our sample comprises 11,064 individual enterprises in 8,137 rural households, resulting in an average of 1.36 enterprises per household. The country shares however vary widely, from a relatively low share of 17 percent in rural Malawi, to almost 62 percent in rural Niger.

With regard to the share of household income deriving from these household enterprises, we only have sufficient responses for Ethiopia in the LSMS-ISA data set. 27 percent of households engaged in non-farm entrepreneurship derive 50 percent or more of their

Table 1: 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	3,969	1,212	23.23	1,482	1.22
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	1,083	39.10	1,363	1.26
Uganda	2,105	953	42.24	1,471	1.54
Total	24,551	8,137	41.68	11,064	1.36

Source: Authors' calculations based on LSMS-ISA data.

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

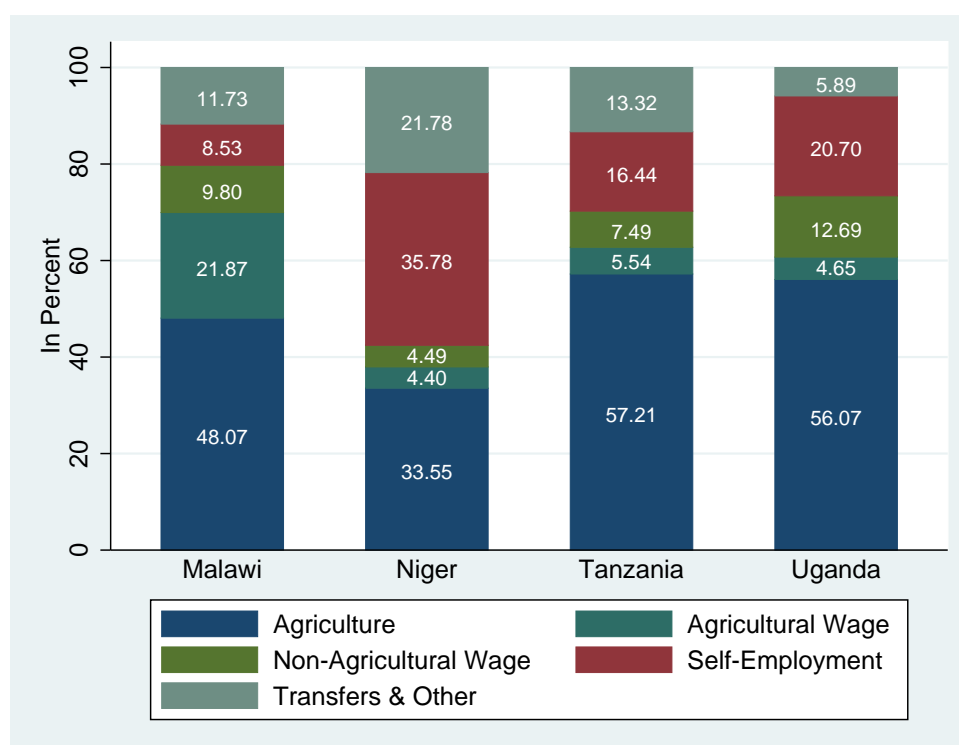
income from these activities, but only 5 percent of households all income.

Using recent RIGA data, we calculate the shares of annual net household income by household activity for four countries in our sample: Malawi 2010/11, Niger 2011, Tanzania 2008/09, and Uganda 2010/11.⁷ Figure 1 suggests that the importance of self-employment varies widely between these African countries. While it contributes less than 9 percent to total household income in Malawi, its share is approximately four times as high in Niger (almost 36 percent). Furthermore, compared to urban areas (not included in Figure 1) household income deriving from self-employment is smaller in rural areas. In urban areas self-employment contributes 22 percent to household income in Malawi, 48 percent in Niger, 43 percent in Tanzania and 33 percent in Uganda. We can thus conclude that (i) the non-farm enterprise sector is not equally important across African countries and that (ii) although more than 42 percent of all rural households operate a non-farm enterprise, the contribution of these enterprises to total household income is proportionately lower in rural than in urban areas.

This conclusion is supported by an analysis of the job creation potential of rural non-farm enterprises. The vast majority of non-farm enterprises in the LSMS-ISA surveys are small household enterprises: over 80 percent do not employ non-household workers. Less than 3 percent employ five or more non-household workers. This suggests that non-farm enterprises do not create significant numbers of jobs for the large number of new job seekers entering the African labor markets each year. Overall, the rural non-farm enterprise sector is less important in the LSMS-ISA surveys compared to our expectations based on the literature survey. Consequently, we propose a more cautious interpretation of the importance of this sector as a contributor to employment creation and rural development, as a stylized fact in rural Africa.

⁷ Household income is calculated closely following the definition by the International Labour Organization (ILO), where household income consists of all receipts whether monetary or in kind that are received by the household or individual household members at annual or more frequent intervals. It excludes windfall gains and other irregular or onetime receipts. The household income calculated in the RIGA data is based on different sources of income: wage, non-wage, dependent and self-employment, that a household can earn over a well-defined reference period. See also Carletto et al. (2007).

Figure 1: Contribution of activity to total household income (in %)



Source: Authors' calculations based on RIGA data (weighted shares).

Note: Rural areas only.

4.2 Household Determinants of Non-Farm Enterprise Operation

Next we are interested in identifying the reasons (i) why households decide to operate non-farm enterprises and (ii) why not more rural households operate such enterprises. After all, a higher number of enterprises and a higher share of income deriving from self-employment are found in urban areas in Africa and rural areas in developing countries outside of Africa. If an employment transformation is to occur in Africa, it may involve a move from employment in agriculture to self-employment and the creation of more non-farm enterprises. These enterprises are expected to create almost 40 percent of all new jobs in Africa between 2010 and 2020 (Fox et al., 2013). However, it is not clear how to translate this expectation into reality, given the profile of the sector described so far. To better understand why and how households operate non-farm enterprises, we identify in this section the determinants of this decision by analyzing individual, household and location characteristics of rural households operating a non-farm enterprise. As we mention in the introduction, there seems to be a wide agreement to the extent of a “stylized fact”, that market imperfections and a poor business environment are responsible for this outcome.

4.2.1 Descriptive Analysis

A descriptive analysis of the LSMS-ISA data set suggests that rural non-farm enterprises largely operate due to *push* factors, rather than *pull* factors, as discussed in the literature. This first tentative conclusion is based on the finding that between 91 and almost 100 percent operate informally. In Ethiopia, the country with the highest rate of formality, only 8.95 percent of rural enterprises have a formal license to operate, while in Niger only 0.39 percent are registered with the government.⁸ These findings are consistent with the existing literature such as [Davis et al. \(2007\)](#) who finds from the RIGA data set that most non-farm entrepreneurial activities consist of small and informal businesses and [Haggblade et al. \(1989\)](#) who found that 95 percent of rural non-farm enterprises in a cross-country sample employ five or less workers.

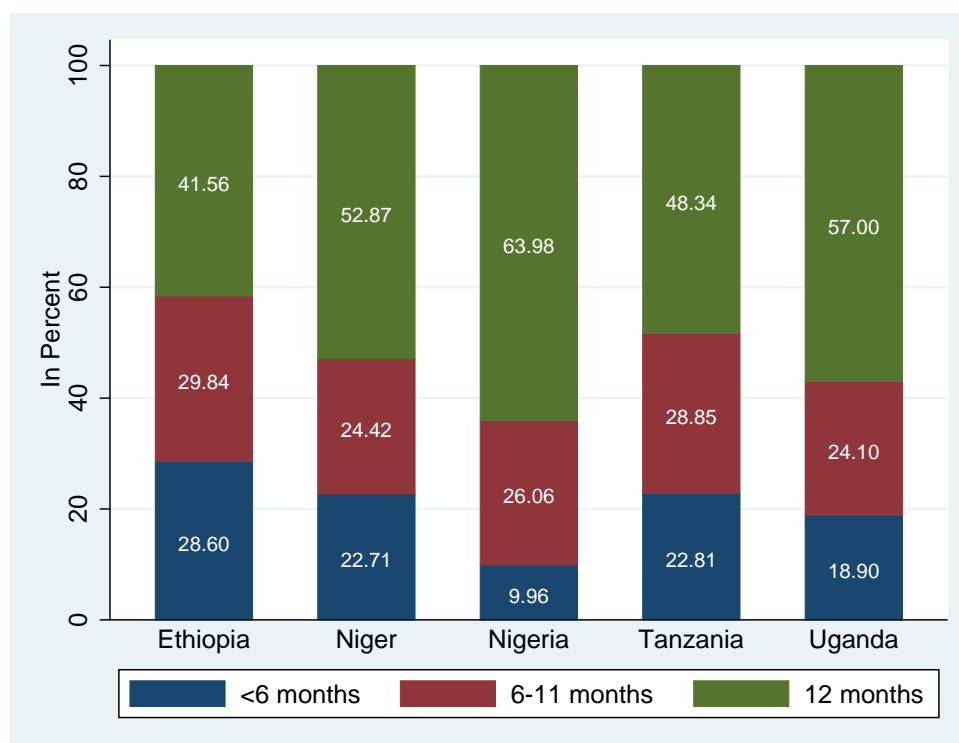
The conclusion that rural non-farm enterprises are started due to *push* factors is further strengthened by the fact that almost half of the non-farm businesses in the LSMS-ISA data set are operated from the household's residence or in the immediate surroundings. Rural non-farm enterprise activity is thus primarily household-based. Most of the enterprise activity that does not take place in the surroundings of the household residence, is either located in a traditional market place or performed mobile. Less than 5 percent of rural non-farm enterprise activities are located in a commercial district or shop premises.

Corresponding to the location of enterprise operation, most households indicate that their enterprises are providing consumer goods or services, or are engaged in trading. Only 20 to 30 percent of households indicate that their enterprises are engaged in the processing of agricultural products. This is a surprising finding and raises the question why agribusiness is not more prevalent in rural Africa. This question is reinforced when considering the responses of rural enterprises as to the nature of their business clients. They report that local final consumers are the most important customer base, accounting for 77 percent of sales. Most of the remainder of their sales are to markets, small businesses and traders in the local environment. Rural non-farm enterprises sell very little to governments, NGOs or manufacturing firms, the main actors in most rural development support programs.

Although little prior research exists on the subject, it may be reasonable to suppose that rural non-farm enterprises are affected by seasonality. We discussed in the literature review that seasonal variations in agriculture can be a *push* factor for households to start and operate a non-farm enterprise during the off-season. The impact of seasonality will therefore be reflected in the number of months per year a non-farm enterprise is in operation. Seasonal factors may thus lead households to close their enterprises temporarily, for instance when household members are required to work in agriculture. 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 2](#) shows a significant proportion of the rural enterprises operating less than 6 or 12 months per year. Only between 42

⁸ The definition of informal enterprises differs slightly between the various questionnaires. For instance in Ethiopia formal firms are those with a license to operate, in Malawi enterprises registered with the Malawi Revenue Authority, in Niger enterprises with a fiscal identification number, in Nigeria whether the enterprise is registered with the government, and in Uganda whether the enterprise is registered for income tax and/or VAT. There were no questions in the Tanzania survey that recorded the formality of rural non-farm enterprises of households surveyed.

Figure 2: Months in operation



Source: Authors' calculations based on LSMS-ISA data (weighted shares).

Notes: Malawi not reported due to lack of data. Enterprises that are less than one year in operation are excluded.

and 64 percent of all enterprises operate continuously during the whole year, with the highest percentage found in Nigeria. It further supports our suspicion that *push* factors are potentially important determinants.

From the survey we also calculate comparable shares for non-farm enterprises operating in urban areas. As expected, Table 2 reports that proportionately less rural enterprises operate continuously during a year compared to urban enterprises. This suggests that seasonality does have a potentially important impact on the dynamics of rural entrepreneurship in Africa, pushing households into non-farm activities during the off-season or during a poor harvest, or to assist in consumption smoothing over the year, given that markets for insurance and credit are largely missing or imperfect.

Table 2: Months of business operation - rural vs. urban (in %)

	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

Source: Authors' calculations based on LSMS-ISA data (weighted shares).

4.2.2 Econometric Analysis

In this section we extend the descriptive statistics and run a set of probit regressions to identify individual, household and location characteristics that might determine the decision of a household to operate a non-farm enterprise.

Formally, we estimate:

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

where the dependent variable is a binary variable equal to one if a household operates a non-farm enterprise, and zero if not. \mathbf{x}'_i represents a vector of individual characteristics including a constant, and comprises the variables gender, age, education (ability to read and write) and marital status of the household head. \mathbf{w}'_i represents a vector of household characteristics including household size, the share of adults (household members age 15 or older), the number of rooms in the dwelling as an approximation to household wealth, net household income (in local currency), and a binary variable if a household member has taken out credit over the past 12 months, indicating the possibility of accessing financial support. Furthermore a binary variable if the household experienced food shortage or a shock over the past 12 months (idiosyncratic shocks, price shocks, geographic shocks, other shocks).⁹ Finally \mathbf{z}'_i represents a set of location variables, also named geo variables, including the household distance to the next major road (in 100 km), the distance to the next population center (in 100km), and annual precipitation (in 1,000 mm). These variables are based on our literature review.

First we run a set of probit regressions using the aggregated sample. We include dummies for the different countries, with Ethiopia as the reference category, to have a first overview of variables that are significant in the African context. The results are contained in Table 3. Second, we run separate probit regressions for the six countries of our sample to identify country-level heterogeneity. The results are contained in Table 4 for rural households (reporting average marginal effects), and in Table 11 in Appendix C for urban households. Table 10 (also in Appendix C) furthermore reports coefficients and average marginal effects for rural households.

Table 3 contains the coefficients and average marginal effects of the aggregated data. The first and second column show the results of all households in the sample, the third and fourth column for rural households, and the fifth and sixth column for urban households. It shows that rural households in Africa are on average 16 percentage points less likely compared to urban households to operate a non-farm enterprise. Cities are indeed more likely places to find enterprises in Africa, as they are across the world. In the table we also find significant country-level heterogeneity. The probability of a household being involved in operating an enterprise is 8 percentage points lower in Malawi than in Ethiopia, but 31 percentage points higher in Nigeria than in Ethiopia. According to the regression results

⁹ Idiosyncratic shocks consist of shocks that are particular to the household, for example illness or death of a family member, or loss of employment. Price shocks consist of unexpected prices changes of food prices, input- and output prices, and can go in both direction (increase or fall). Geographical shocks consist of natural disasters such as floods, droughts, or pests. The category other shocks does not further specify the type of shock within the data.

the effects of individual and household level characteristics are important determinants of entrepreneurship overall, as reflected in the statistically significant coefficients of age, marital status, educational attainment (“read & write”) and household size. The signs and magnitudes of some of these coefficients are interesting. For instance the effect of educational attainment (“read & write”) is significant in rural areas only, returning a positive coefficient. This result suggests that educated individuals can find wage employment more easily in urban areas, but that this option is largely lacking for educated individuals in the rural non-farm economy in African countries.

As elsewhere in the literature *push* factors in the form of shocks and risks significantly affect rural entrepreneurship. The effects are however of a complex nature. Households that have experienced food shortages are 3 percentage points more likely to operate a non-farm enterprise in the aggregated sample. The effect of the variables “idiosyncratic shock” and “other shocks” is significant for the aggregate sample and for rural households, and has a positive effect suggesting that enterprise operation can present a fallback option for households. However, the effect of “distance” does not seem to impact the likelihood of operating a non-farm enterprise, as well as precipitation.

Table 4 contains the results (average marginal effects) pertaining to rural households broken down by country.¹⁰ In the regressions we include the same set of variables as in the previous table using the aggregate sample, and include now also annual net household income for the countries for which this variable is available (in local currency, in 1,000,000).¹¹ Firstly, the results show that the effect of age is significant and negative suggesting that households with younger heads are more likely to operate a non-farm enterprise. Secondly, the results show that the effect of gender is insignificant in most countries with the exception of Tanzania, where women-headed households are 22 percentage points more likely to start a non-farm enterprise compared to a male-headed household. Whether the head of a household is married has only a marginally significant effect in Malawi, where it increases the probability by 3 percentage point. Education and skills formation may support non-farm entrepreneurship, as the effect of the variable “read & write” is significant and positive in rural Malawi, Nigeria and Tanzania. Literate household heads are thus more likely to start a non-farm enterprise in these countries than illiterate household heads. The effect of “household size” is significant and positive in four countries (Malawi, Nigeria, Tanzania and Uganda), consistent with the literature that larger households allocate surplus labor into non-farm enterprises.

Considering whether liquidity constraints inhibit entrepreneurial activities, one of the most salient constraints on entrepreneurship in Africa established in the literature, we find supportive evidence. First, we look at the effect of income and find that the effect of annual net household income is positive and significant for the countries where this variable is available. Another variable that we use as a proxy to household wealth, the effect of number of “rooms” in a household dwelling, is both positive and significant for Ethiopia and Tanzania. As expected, the effect of access to credit is also positive and

¹⁰ See Appendix B for the complete table including the regression coefficients.

¹¹ As we do not have the exchange rates used in the RIGA surveys, we provide current exchange rates to have an approximate idea of the currency value in USD. Malawi: 1.00 USD = 394.431 MWK; Niger: 1.00 USD = 482.200 XOF; Tanzania: 1.00 USD = 1,661.49 TZS; Uganda: 1.00 USD = 2,542.98 UGX [28 May 2014].

Table 3: Probit regressions - complete sample

Dependent NFE	(1) All Countries	(2) AME	(3) Rural	(4) AME	(5) Urban	(6) AME
Rural	-0.482*** (0.06)	-0.162*** (0.02)				
Female	0.087 (0.06)	0.029 (0.02)	0.061 (0.07)	0.020 (0.02)	0.137 (0.13)	0.047 (0.05)
Age	-0.002 (0.01)	-0.003*** (0.00)	-0.000 (0.01)	-0.003*** (0.00)	-0.008 (0.02)	-0.002* (0.00)
Age ²	-0.000 (0.00)		-0.000 (0.00)		0.000 (0.00)	
Married	0.108* (0.06)	0.036* (0.02)	0.026 (0.06)	0.009 (0.02)	0.349*** (0.12)	0.124*** (0.04)
Read & Write	0.129*** (0.04)	0.044*** (0.01)	0.160*** (0.04)	0.053*** (0.01)	-0.089 (0.11)	-0.030 (0.04)
HH Size	0.067*** (0.02)	0.016*** (0.00)	0.054** (0.02)	0.015*** (0.00)	0.128*** (0.04)	0.022*** (0.01)
HH Size ²	-0.002* (0.00)		-0.001 (0.00)		-0.006*** (0.00)	
Share of Adults	-0.017 (0.10)	-0.006 (0.03)	0.010 (0.11)	0.003 (0.04)	-0.009 (0.25)	-0.003 (0.09)
Rooms	0.042*** (0.01)	0.014*** (0.00)	0.050*** (0.02)	0.017*** (0.01)	0.013 (0.03)	0.005 (0.01)
Credit	0.258*** (0.05)	0.087*** (0.02)	0.257*** (0.06)	0.087*** (0.02)	0.320** (0.16)	0.103** (0.05)
Food Shortage	0.080** (0.04)	0.027** (0.01)	0.056 (0.04)	0.019 (0.01)	0.141 (0.10)	0.048 (0.03)
Shock (idiosyn.)	0.067* (0.04)	0.023* (0.01)	0.084** (0.04)	0.028** (0.01)	-0.000 (0.09)	-0.000 (0.03)
Shock (price)	0.038 (0.05)	0.013 (0.02)	0.022 (0.05)	0.007 (0.02)	0.095 (0.10)	0.032 (0.03)
Shock (geogr.)	-0.052 (0.04)	-0.017 (0.01)	-0.037 (0.05)	-0.012 (0.02)	-0.120 (0.11)	-0.042 (0.04)
Shock (other)	0.222** (0.09)	0.076** (0.03)	0.290*** (0.10)	0.100*** (0.03)	0.057 (0.21)	0.019 (0.07)
Dist to Road	-0.475* (0.28)	-0.121 (0.08)	-0.318 (0.28)	-0.067 (0.08)	-1.491 (1.50)	-0.489 (0.47)
Dist to Road ²	0.455** (0.19)		0.395** (0.19)		0.777 (1.80)	
Dist to Popcenter	0.085 (0.19)	0.016 (0.04)	-0.107 (0.21)	-0.031 (0.05)	0.805 (0.61)	0.247 (0.18)
Dist to Popcenter ²	-0.057 (0.11)		0.021 (0.11)		-0.360 (0.43)	
Precipitation	-0.041 (0.06)	-0.014 (0.02)	-0.044 (0.06)	-0.014 (0.02)	-0.072 (0.14)	-0.025 (0.05)
Malawi	-0.246*** (0.06)	-0.082*** (0.02)	-0.250*** (0.06)	-0.083*** (0.02)	-0.615*** (0.13)	-0.212*** (0.05)
Niger	0.928*** (0.09)	0.311*** (0.03)	1.009*** (0.10)	0.334*** (0.03)	0.198 (0.18)	0.068 (0.06)
Nigeria	0.919*** (0.08)	0.308*** (0.02)	0.903*** (0.09)	0.299*** (0.03)	0.533*** (0.19)	0.183*** (0.07)
Tanzania	0.482*** (0.08)	0.162*** (0.03)	0.431*** (0.09)	0.143*** (0.03)	0.211 (0.16)	0.073 (0.05)
Uganda	0.549*** (0.07)	0.184*** (0.02)	0.523*** (0.07)	0.173*** (0.02)	0.232 (0.16)	0.080 (0.06)
Constant	-0.617*** (0.21)		-1.008*** (0.23)		-0.235 (0.44)	
N	25,826	25,826	19,962	19,962	5,864	5,864

Standard errors in parentheses

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

significant for Ethiopia and Malawi. We have to stress however, that these “wealth” variables are likely to be endogenous and that we need to be careful in assigning a causal relationship. Nevertheless, the findings are in line with the existing literature and suggestive of market imperfections in the financial markets.

Furthermore we are interested in the riskiness of farming as a *push* factor, and in particular whether the effects of shocks to agriculture and associated food shortages are significant. The results show that households experiencing food shortages over the past 12 months are more likely to operate a non-farm household enterprise in Uganda only, and are less likely to do so in Malawi and Niger. Furthermore, we find that being subject to “idiosyncratic shocks” (such as death or illness within the household) is positively associated with operating a non-farm enterprise in Malawi. The effect of experience a “price shock”, returns negative and significant outcomes in Uganda. The effect of “geographical shocks” is mixed (see Malawi and Nigeria), while the effect is positive for “other shocks” in Niger. External risks, as measured in the survey, have different and even opposing effects depending on country circumstances. These findings reflect different risk-coping and risk-management strategies of households depending on local circumstances.

Finally we look at the local business environment and possible agglomeration effects. The regression results indicate that one of our proxies for local business environment, the effect of a household’s distance from a major road, is significant and negative in the case of Nigeria. Specifically, the probability of a household operating a non-farm enterprise decreases by 33 percentage points per 100 km of distance from a major road. The effect of “distance to the next population center”, for instance a secondary town, is equally negative and significant for Malawi and Uganda. In Malawi it decreases the likelihood by 10 percentage points, and in Uganda by 24 percentage points per 100 km of distance from a population center. It suggests that agglomeration and local infrastructure measuring potential market access, can be an important determinant for non-farm enterprise formation in rural Africa.

Additionally, we run the regressions using the complete sample, broken down by countries, including a dummy variable indicating if households are located in rural areas. This allows us to identify a possible effect of the household’s location in rural or urban areas with regard to the likelihood of enterprise operation.¹² The effect of the binary variable “rural” is negative and significant for all countries, with the exception of Niger, where the effect is positive, but only marginally significant at the 10 percent level. The general negative effect of the binary variable indicates a lower likelihood of households operating a non-farm enterprise in rural areas of almost all countries. This is a surprising fact as educated workers in urban areas can find easier wage employment and are therefore less prone to become entrepreneurs. The difference in percentage points varies from approximately 7 in Malawi and Uganda to 27 in Ethiopia. Non-farm rural entrepreneurs in Africa clearly face disadvantages in comparison to urban entrepreneurs in their lack of amenities, densities and spillover effects, as well as in their greater lack of wage employment alternatives. This is also reflected in the findings that urban households are more likely to operate enterprises throughout the year, and that being educated is more likely to lead to wage employment in urban areas.

¹² Table not reported, available upon request.

Table 4: Probit regressions - rural households only (average marginal effects)

Dependent NFE	(1) Ethiopia	(2) Malawi	(3) Niger	(4) Nigeria	(5) Tanzania	(6) Uganda
Female	-0.027 (0.04)	0.001 (0.02)	-0.059 (0.06)	0.022 (0.10)	0.218*** (0.05)	0.006 (0.03)
Age	-0.003*** (0.00)	-0.001** (0.00)	0.001 (0.00)	-0.002 (0.00)	-0.008*** (0.00)	-0.004*** (0.00)
Married	-0.061 (0.04)	0.028* (0.02)	-0.045 (0.06)	0.038 (0.09)	0.032 (0.04)	0.052 (0.04)
Read & Write	0.027 (0.02)	0.035*** (0.01)	0.015 (0.03)	0.115*** (0.04)	0.139*** (0.04)	-0.011 (0.03)
HH Size	0.001 (0.01)	0.008*** (0.00)	-0.009 (0.01)	0.031*** (0.01)	0.024** (0.01)	0.018*** (0.01)
Share of Adults	-0.131** (0.06)	-0.019 (0.03)	-0.195*** (0.07)	0.028 (0.10)	0.185 (0.12)	0.167** (0.07)
Income		0.251*** (0.05)	0.315*** (0.04)		0.039*** (0.01)	0.038*** (0.01)
Rooms	0.033*** (0.01)	0.005 (0.00)	-0.001 (0.01)		0.036*** (0.01)	0.000 (0.01)
Credit	0.086*** (0.02)	0.066*** (0.01)			0.034 (0.07)	
Food Shortage	0.035 (0.03)	-0.026*** (0.01)	-0.078*** (0.02)	0.030 (0.03)	0.002 (0.05)	0.082** (0.03)
Shock (idiosyn.)	0.035 (0.02)	0.060*** (0.01)	0.009 (0.03)	-0.038 (0.04)	0.048 (0.05)	0.045 (0.03)
Shock (price)	0.013 (0.03)	0.002 (0.01)	0.024 (0.03)	0.019 (0.04)	-0.052 (0.05)	-0.185*** (0.07)
Shock (geogr.)	-0.032 (0.03)	0.022** (0.01)	-0.013 (0.03)	-0.070* (0.04)	0.026 (0.05)	0.047 (0.03)
Shock (other)	0.118 (0.07)	0.018 (0.04)	0.091*** (0.03)	0.023 (0.10)	-0.019 (0.15)	0.049 (0.08)
Dist to Road	0.066 (0.14)	-0.012 (0.08)	-0.280 (0.27)	-0.329* (0.18)	0.142 (0.14)	-0.268 (0.30)
Dist to Popcenter	-0.058 (0.08)	-0.102*** (0.03)	-0.064 (0.07)	-0.069 (0.15)	-0.060 (0.07)	-0.238* (0.13)
Precipitation	0.033 (0.04)	-0.031 (0.02)	0.416 (0.28)	-0.051 (0.03)	-0.073 (0.07)	0.000 (0.09)
N	3,366	10,017	2,430	1,074	1,286	1,789

Standard errors in parentheses

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

Differences between the regressions pertaining to rural and urban households (see Table 11) show the heterogeneity in determinants: while the effect of gender is significant in rural Nigeria and returns a positive result, it is marginally significant in the urban areas of Ethiopia. Furthermore the effect of age seems to be less important compared to rural areas, where only the outcome for Niger is significant. The effect of marital status is significant in the rural areas in Malawi, Nigeria and Tanzania, returning a positive coefficients in Malawi and Nigeria, and a negative coefficient in Tanzania. While the effect of the education variable “read & write” is positively associated with the probability of engaging in non-farm entrepreneurship in rural areas (where the variable is significant), the opposite is observed for urban areas. As we have mentioned, this possibly indicates better opportunities of finding wage-employment in urban areas if the household head is

educated. The results for the effect of “household size” are similar in both tables: the coefficient is positive and significant in most countries, suggesting the allocation of surplus labor into non-farm entrepreneurship. The effect of the “share of adults” is significant in rural Ethiopia, Niger and Uganda, with contradicting outcomes, but only significant in urban Ethiopia with a positive coefficient. The effect of “annual net income” is significant and positive for all rural areas in the countries where this variable is available, as well as for urban Malawi and Niger. It is not significant for urban Tanzania and Uganda. The effect of the “number of rooms” has a positive and significant coefficient in rural Ethiopia and Tanzania, while it is not significant in urban areas. The effect of credit is positive and significant in rural Ethiopia and Malawi, and positive and significant in urban Ethiopia and Tanzania. The effect of experiencing food shortages has a significant and negative outcome in rural Malawi and Niger, and a positive and significant outcome in rural Uganda, but is not significant in the urban areas. Experiencing a shock leads to mixed results. In rural Malawi an the effect of an “idiosyncratic shock” returns positive coefficients, as well as the effect of “other shocks” in rural Niger. In rural Nigeria an idiosyncratic shock has a negative effect. Idiosyncratic shocks return a positive and significant coefficient in urban Malawi. The variable “other shocks” returns mixed results: in urban Tanzania the coefficient is significant and positive and in urban Uganda it is significant and negative. The effect of “distance to the nearest road” is significant and negative in rural Nigeria, and urban Uganda. The effect of “distance to the nearest population center” is significant and negative in rural Malawi and Uganda, but in none of the urban areas. The effect of “precipitation” is not significant in rural areas, but marginally significant and negative in urban Malawi and Nigeria.

We run a set of additional regressions that include a number of country-specific variables that are not available for all countries in the sample, or at least for the majority, or differently coded per country. While we do not report the detailed tables here,¹³ these results are broadly consistent with the picture that has emerged so far. By adding the number of phones per household as an alternative indicator of household wealth, we find in the case of Ethiopia that households with more phones are 3.4 percentage point more likely to operate a non-farm enterprise per additional phone. In Nigeria the number of beds per household as a proxy to wealth is significant and increases the probability of entrepreneurship by 5 percentage points per additional bed. Adding the variable “land holdings” (plot) also returns significant results. If the household owns or cultivates a plot, it decreases the probability by almost 33 percentage points compared to households without a plot. However adding other variables to study whether liquidity constraints matter, such as the existence of a commercial bank or a micro-finance institute in the community, or the land use by households or the farm type, are found to be insignificant across the countries in the sample.

We finally report that a number of unique variables on the country level confirm substantial country-level heterogeneity between the determinants of household enterprises between countries. For instance the effect of a household’s religion is collectively significant at 1 percent. Taking the country’s traditional religion as the reference category, we find that Islamic households have a 16 percentage points higher probability of operating a non-farm enterprise, and Christian households a 9 percentage points higher probability. Cultural differences and traditional lifestyles are equally important. In Niger,

¹³ Available upon request.

a country different from the others in terms of climate and the prevalence of nomadic households, the effect of the variable “nomad” (indicating a nomadic lifestyle), decreases the probability of operating a non-farm enterprise by a large and significant 37 percentage points compared to non-nomadic households.

4.3 Type of Enterprise Activities

To finalize the analysis, we run a multinomial logit model (MNL) using the rural sample, where the dependent variable continues to account for households with and without non-farm enterprises, but is now, in case of entrepreneurship, extended by types of business activity. We no longer look at a binary variable, but at a variable with different categories. The MNL can be seen as estimating, simultaneously, binary logit regressions for all the categories or alternatives of the dependent categorical variable.

More 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 and also referred to as the comparison group. The log odds of an outcome compared 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 (determinants) 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 (?).

We take the households that do not operate a non-farm enterprise as the base category, and study a set of individual, household and location characteristics to see which variables are significant for the choice of business activity. We choose a more limited set of variables, namely individual characteristics (female, age, the ability to read & write), household characteristics (household size, access to credit, shocks), and location characteristics (distance in 100 km to the nearest population center with 20,000 or more inhabitants), and study only the cases of Ethiopia and Malawi due to data availability.

Tables 5 and 6 return the results for Ethiopia and Malawi. We report relative risk ratios in both tables. The results largely confirm the outcomes from the probit regressions, but give a more nuanced picture with regard to the types of business activities households operate.

In Ethiopia the effect of “gender” is insignificant for most types of business activity. We find some types of activity, where women have a lower likelihood of operating a non-farm enterprise compared to the base outcome (households without non-farm enterprises), namely non-agricultural business, sales and transport. If the results in the regression table return a value of 0.000, no observation can be made in this category (e.g. among the 15 enterprises in the transport sector, all household heads are male). The effect of “age” is significant and smaller than 1, confirming and results of the probit regression, and implying that the household head from households operating a non-farm enterprise are on average younger compared to households heads from households without a business. The effect of the ability to “read & write” is significant, only for agribusiness and sales, and the effect of “household size” only for professional services and bars & restaurants, and return a lower probability compared to the base outcome. The effect of “credit” increases the probability of households to operate enterprises in agribusiness and trade.

Table 5: Multinomial Logit Model - Ethiopia (Rural)

	Non-Ag.	Agrib.	Trade	Sales	Prof. Serv.	Transp.	Bars & Res.	Other
Female	0.350*** (0.14)	1.470 (0.35)	0.825 (0.29)	0.463* (0.20)	0.885 (0.50)	0.000*** (0.00)	1.656 (1.41)	0.699 (0.28)
Age	0.957*** (0.01)	0.946*** (0.01)	0.963*** (0.01)	0.942*** (0.01)	0.929*** (0.01)	0.944*** (0.02)	0.899*** (0.02)	0.941*** (0.01)
Read & Write	0.866 (0.17)	0.635** (0.12)	0.781 (0.27)	0.333*** (0.11)	0.416 (0.29)	0.702 (0.54)	0.522 (0.27)	1.313 (0.31)
HH Size	0.927 (0.05)	0.964 (0.05)	0.920 (0.06)	0.983 (0.10)	0.480*** (0.09)	0.827 (0.12)	0.666*** (0.07)	0.975 (0.05)
Credit	1.296 (0.32)	1.992*** (0.47)	2.084*** (0.43)	1.002 (0.35)	0.018*** (0.02)	0.490 (0.52)	1.549 (1.76)	0.975 (0.31)
Distance	0.501* (0.00)	0.472 (0.00)	0.016*** (0.01)	0.129** (0.01)	0.600 (0.01)	0.002** (0.02)	0.243 (0.02)	0.145*** (0.01)
Shock (idiosyn.)	0.813 (0.31)	2.016*** (0.45)	1.242 (0.36)	1.174 (0.51)	5.604*** (3.18)	0.017*** (0.02)	0.794 (0.92)	0.949 (0.30)
Shock (price)	0.673 (0.22)	0.557* (0.17)	1.226 (0.45)	0.892 (0.39)	3.188*** (1.38)	0.014*** (0.02)	0.177** (0.13)	1.054 (0.39)
Shock (geogr.)	0.808 (0.33)	0.628 (0.18)	0.946 (0.31)	1.183 (0.53)	0.237 (0.21)	3.405 (3.81)	0.489 (0.39)	0.643 (0.23)
Shock (other)	2.044 (1.87)	1.227 (0.92)	3.915*** (1.90)	4.913* (4.06)	0.000*** (0.00)	0.000*** (0.00)	0.000*** (0.00)	1.258 (1.03)
N	3,335							

Exponentiated coefficients; Standard errors in parentheses

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

The effect of “distance to the next population center” is in all categories below 1 (where significant), and confirms the importance of access to markets. Types of business activities, where distance does not return significant results are agribusiness, professional services, and bars & restaurants. Business activities that accommodate clients in the immediate surroundings of the business. The effect of the “shock variables” return again mixed results. Where significant, the outcome returns in some cases a relative risk ratio over 1, implying a higher likelihood of engaging in this type of business activity, for example for agribusiness, trade, or professional services, or below 1, implying a lower likelihood, for example for transport and bars & restaurants. This results seems to confirm that “easy to enter” business are operated by household that experienced a shock, while the transport sector or food services generally require higher investment and face barriers

to entry for households in times economic hardship.

In Malawi the picture that emerged is similar to Ethiopia, but we find a set of country-level differences. The effect of gender is significant for more types of business activities and confirm that female-headed households have a lower probability of entering various business types, compared to the base outcome. Another difference can be observed with regard to the shocks. Where the relative risk ratios are significant, they are above 1, with the exception of “other shocks”. The other variables return rather similar outcomes. The effect of “credit” is, for example, equally significant for agribusiness and trade. In Malawi is it not significant for professional services, but for bars & restaurants instead.

Table 6: Multinomial Logit Model - Malawi (Rural)

	Non-Ag.	Agrib.	Trade	Sales	Prof. Serv.	Transp.	Bars & Res.	Other
Female	0.151*** (0.04)	1.077 (0.16)	0.672* (0.14)	0.308*** (0.06)	0.587 (0.30)	0.000*** (0.00)	0.610 (0.31)	0.686*** (0.10)
Age	0.950*** (0.01)	0.965*** (0.00)	0.940*** (0.01)	0.966*** (0.00)	0.943*** (0.02)	0.895*** (0.03)	0.913*** (0.02)	0.956*** (0.00)
Read & Write	0.934 (0.11)	0.548*** (0.06)	0.970 (0.12)	0.480*** (0.05)	0.181*** (0.09)	0.611 (0.22)	0.593* (0.16)	0.899 (0.10)
HH Size	0.972 (0.04)	0.899*** (0.03)	1.011 (0.04)	0.881*** (0.03)	0.619*** (0.10)	1.060 (0.14)	0.937 (0.11)	1.017 (0.03)
Credit	0.895 (0.18)	1.462** (0.25)	1.831*** (0.33)	1.041 (0.22)	2.845 (2.09)	0.791 (0.42)	2.781** (1.14)	1.858*** (0.27)
Distance	0.112*** (0.00)	0.084*** (0.00)	0.113*** (0.00)	0.054*** (0.00)	0.007*** (0.01)	0.051*** (0.01)	0.096*** (0.01)	0.087*** (0.00)
Shock (idiosyn.)	1.181 (0.18)	1.330** (0.19)	1.015 (0.16)	1.635*** (0.24)	2.548* (1.34)	1.484 (0.57)	0.818 (0.30)	1.364** (0.19)
Shock (price)	0.896 (0.13)	0.985 (0.12)	0.808 (0.12)	1.241* (0.16)	0.794 (0.44)	0.930 (0.41)	0.646 (0.22)	0.557*** (0.07)
Shock (geogr.)	0.837 (0.11)	0.829 (0.10)	0.834 (0.12)	1.344** (0.18)	0.559 (0.35)	1.025 (0.44)	0.569 (0.22)	0.672*** (0.08)
Shock (other)	1.151 (0.64)	0.477 (0.26)	0.594 (0.30)	0.921 (0.39)	0.000*** (0.00)	0.000*** (0.00)	2.563 (2.67)	1.381 (0.51)
N	10,040							

Exponentiated coefficients; Standard errors in parentheses

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

Overall we find that the effect of variables that are significant for all types of business activities, or at least the majority, confirm the results of the probit regressions. The effects of “age” and “distance” decrease the probability of engaging in any types of business activity compared to the base category of not operating a non-farm enterprise. For the other variables the outcome is mixed, for example the variables “female” or “ability to read & write” of the household head, or the “shock” variables. However, we have to keep in mind that individual characteristics are selected from the household head, and not necessarily from the enterprise owner or manager, and that some business categories have only a few observations (e.g. professional services, transport, bars & restaurants).

5 Concluding Remarks

This paper analyzed non-farm entrepreneurship in rural Africa and was motivated by three questions: (i) How prevalent is non-farm entrepreneurship in rural Africa? (ii) Do households enter the sector as a result of push or pull factors? (iii) Which types of businesses do they operate? Based on our analysis, we find that non-farm entrepreneurship is more prevalent in urban than in rural areas of Africa, and that the prevalence of non-farm enterprises varies widely among the countries in our sample. We further conclude that significant country-level heterogeneity of household characteristics associated with enterprise operation exists. We finally find that household characteristics also vary in their level of importance when households select into certain types of business activities. These nuances suggest that care is needed in branding general answers from the literature as “stylized facts” of African non-farm entrepreneurship. In the remaining section we first summarize our results, before discussing policy implications.

In the first part of the analysis we find widely varying shares of enterprise operation in rural Africa, ranging from 17 percent in Malawi, to almost 62 percent in Niger. While rural households in Malawi derive less than 9 percent of their income from self-employment, the share amounts to almost 36 percent in Niger.

In the second part we analyze individual, household and location characteristics that determine or are associated with a household’s engagement in non-farm entrepreneurship. We find evidence primarily for both *push* factors. *Push* factors (shocks, surplus household labor, seasonality in agriculture) are reflected in the nature of these enterprises as small and informal household enterprises operated from the household residence or the immediate surroundings. Very few enterprises employ workers that are not part of the extended family. Furthermore the share of enterprises that do not work continuously over the year is higher in rural than in urban areas, implying seasonal labor allocation into agriculture. We also find that the effect of household size and of certain types of shocks are significant and positive. Other significant determinants include education of the household head, access credit, household wealth. We have to be cautious to generalize any of the determinants, as the specific nature of (agricultural) risk and market imperfections differ substantially across the countries in our sample. This means that rural entrepreneurship is responsive to country-level circumstances and policies and that “one-size fits all policies” for stimulating the rural economy are difficult to justify.

In the third and last part we study the choice of business activity for Ethiopia and Malawi, using multinomial logit models. Our results suggest that individual, household and location characteristics matter differently for different types of business activities. We find that access to credit as a constraint is more important if households engage in the agribusiness and trade sector.

What are the policy implications from these empirical findings? First of all, we conclude that careful country studies need to take place before policies to support enterprise creation or enlargement are implemented. As both *push* and *pull* factors are identified in the analysis, policies should tackle market imperfections from both angles. In the case of *push* factors, we encourage the implementation of social protection schemes in

rural areas that shield households experiencing a shock from entering the sector as a form of survival mechanism. We assume that under such circumstances households are forced into low-productivity and low-income sectors, and that these enterprises have a low probability to survive. In the case of *pull* factors, we support the implementation of micro-credit schemes that give low-income households access to credit, and investment in human capital (training and education). Households can then seize opportunities in the non-farm economy by establishing enterprises that have the potential to grow and to eventually employ workers outside of the family.

However, more research is needed. For a long time, the lack of data has impeded to conduct research in the non-farm economy of rural Africa. While the LSMS-ISA data provides for the first time data that allows to study non-farm entrepreneurship from a comparative perspective, we also encourage further research that looks into more detail at country-specific circumstances, for example by conducting qualitative or mixed-methods research. We further encourage research that takes advantage of the panel data that will eventually become available and that considers the development of the non-farm economy over time. Sharing best-practices with other developing countries that have successfully implemented social protection schemes, for example in Asia and Latin America, can help to build up knowledge on how to run and operate these schemes in a developing country context. Rural Africa should also look at social protection schemes that are different compared to the ones we find in developed countries, as these might also be more suitable for a sustainable operation in rural Africa.

For the moment non-farm entrepreneurship continues to represent a largely informal and survivalist sector, where rural non-farm entrepreneurship provides a risk-diversifying mechanism for households. Rural non-farm entrepreneurship does still not contribute significantly to employment creation in a region, where massive numbers of young workers are expected to enter the labor force over the coming years. The comparatively high economic growth rates in Africa over the past decade have not yet been accompanied by significant structural economic change in rural areas. Although we agree that a risk-management and risk-coping function is important given the shocks and seasonality that rural households in Africa have to contend with, we do not expect a significant contribution from rural non-farm entrepreneurship to employment creation and poverty reduction in the near future. This conclusion bears a resemblance to conclusions by other scholars (e.g. [Rijkers and Söderbom, 2013](#); [Start, 2001](#)) who have pointed out that Africa's non-farm economy has a limited impact on poverty reduction and economic growth. Our results cannot, generally speaking, dispel such pessimistic evaluations of the state of non-farm entrepreneurship in rural Africa.

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A Appendix: Summary Statistics

Summary statistics of section 4

Table 7: Summary statistics probit model - rural

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	0.26	0.19	0.11	0.09	0.17	0.12	0.25	0.24	0.31	0.25
Age	45.37	41.77	43.50	39.84	44.19	44.96	51.38	48.98	48.95	44.99	46.28	42.33
Married	0.81	0.82	0.72	0.81	0.90	0.91	0.76	0.85	0.57	0.54	0.68	0.79
Read & Write	0.40	0.49	0.58	0.71	0.25	0.31	0.48	0.63	0.64	0.74	0.63	0.64
Household Size	5.05	5.37	4.52	5.00	6.17	6.84	5.19	6.19	5.19	5.90	5.98	6.79
Share of Adults	0.59	0.54	0.59	0.55	0.53	0.50	0.65	0.60	0.61	0.58	0.60	0.57
Income			51,963	86,129	233,868	418,618	727,608	1,056,841	1,263,345	2,071,663		
Rooms	1.64	1.81	2.44	2.63	2.50	2.76			3.37	3.82	2.80	2.84
Credit	0.26	0.37	0.11	0.19					0.08	0.11		
Food Shortage	0.32	0.37	0.52	0.47	0.47	0.38	0.26	0.27	0.21	0.21	0.22	0.27
Shock (idiosyn.)	0.18	0.20	0.27	0.38	0.22	0.21	0.23	0.20	0.17	0.19	0.15	0.19
Shock (price)	0.33	0.37	0.41	0.46	0.29	0.34	0.22	0.24	0.48	0.44	0.02	0.01
Shock (geogr.)	0.24	0.22	0.48	0.52	0.45	0.40	0.14	0.11	0.18	0.17	0.29	0.35
Shock (other)	0.02	0.04	0.02	0.02	0.15	0.21	0.01	0.01	0.01	0.00	0.02	0.02
Dist to Road	14.98	14.97	10.84	9.37	16.26	11.09	18.33	16.75	20.80	21.16	8.55	8.11
Dist to Popcenter	36.69	33.44	37.69	35.49	65.86	61.96	23.89	22.92	53.91	52.77	24.78	25.31
Precipitation	1,166.26	1,206.95	1,068.41	1,049.48	376.69	401.14	1,470.53	1,417.18	1,071.51	1,065.28	1,238.64	1,224.92
N	2,547	919	8,283	1,755	1,003	1,427	1,673	1,707	1,761	1,241	1,152	953

Source: Authors' calculations based on LSMS-ISA data (weighted shares). Bolded coefficients indicate differences between households with and without a non-farm enterprise that are significant at a 5 percent level.

Table 8: Summary statistics probit model - urban

Household operates a NFE	Ethiopia		Malawi		Niger		Nigeria		Tanzania		Uganda	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Female	0.30	0.38	0.19	0.15	0.18	0.15	0.21	0.17	0.34	0.29	0.35	0.37
Age	37.43	42.87	39.00	37.86	46.19	46.30	49.97	48.46	41.70	42.25	40.63	41.91
Married	0.62	0.67	0.71	0.80	0.76	0.84	0.66	0.79	0.39	0.51	0.52	0.69
Read & Write	0.71	0.62	0.89	0.91	0.64	0.46	0.80	0.80	0.84	0.91	0.84	0.84
Household Size	3.26	4.44	4.28	4.98	5.52	6.65	4.13	5.14	3.83	4.72	5.10	6.37
Share of Adults	0.73	0.64	0.66	0.61	0.63	0.57	0.77	0.66	0.73	0.68	0.75	0.64
Income			186,341	283,419	877,458	973,587			1,852,313	2,198,232	3,352,193	3,465,517
Rooms	2.07	2.30	2.87	3.08	2.80	2.78			2.65	2.92	2.44	2.69
Credit	0.13	0.26	0.19	0.20					0.12	0.18		
Food Shortage	0.23	0.20	0.29	0.25	0.13	0.15	0.33	0.38	0.17	0.20	0.17	0.13
Shock (idiosyn.)	0.15	0.16	0.22	0.30	0.20	0.22	0.18	0.18	0.30	0.31	0.17	0.13
Shock (price)	0.18	0.19	0.22	0.20	0.24	0.31	0.23	0.26	0.35	0.45	0.00	0.00
Shock (geogr.)	0.09	0.05	0.11	0.10	0.07	0.06	0.03	0.03	0.13	0.12	0.08	0.11
Shock (other)	0.02	0.01	0.02	0.02	0.10	0.11	0.02	0.03	0.00	0.02	0.02	0.01
Dist to Road	15.21	13.53	1.81	1.88	1.05	0.92	5.57	4.50	4.86	4.75	2.45	2.84
Dist to Popcenter	45.04	46.89	9.46	9.96	13.39	11.71	7.43	7.64	18.94	21.18	6.68	9.29
Precipitation	1,155.65	1,207.70	1,061.12	1,026.76	436.25	428.00	1,616.71	1,537.23	1,028.66	1,049.29	1,281.45	1,262.21
N	210	293	1,416	817	540	998	512	1,108	638	887	257	354

Source: Authors' calculations based on LSMS-ISA data (weighted shares). Bolded coefficients indicate differences between households with and without a non-farm enterprise that are significant at a 5 percent level.

B Appendix: Type of Business Activity

Table 9 returns the number of enterprises (absolute number and in percent) for each of the types of business activity for Ethiopia and Malawi, as well as the number of households that do not operate an non-farm enterprise. In the sectors “professional services”, “transport”, and “bar and restaurants” we have very few observations compared to the other sectors in both countries.

Table 9: Types of Business Activity (Rural)

Type of Business Activity	Ethiopia		Malawi	
	N	In %	N	In %
No Enterprise	2,620	77.20	8,295	82.62
Non-Agric. Business	149	4.39	291	2.90
Agribusiness	187	5.51	344	3.43
Trade	138	4.07	291	2.90
Sales	129	3.80	335	3.34
Professional Services	12	0.35	8	0.08
Transport	8	0.24	36	0.36
Bars and Restaurants	9	0.27	33	0.33
Other	142	4.18	407	4.05
Total	3,394	100.00	10,040	100.00

Notes: Summary statistics derived from LSMS-ISA data set.

C Appendix: Probit Regressions

Table 10: Probit regressions - rural households only (coefficients and average marginal effects)

Dependent NFE	(1)	(2)	(3)	(4)	(5)	(6)
	Ethiopia	AME	Malawi	AME	Niger	AME
Female	-0.095 (0.12)	-0.027 (0.04)	0.003 (0.07)	0.001 (0.02)	-0.169 (0.18)	-0.059 (0.06)
Age	-0.011 (0.01)	-0.003*** (0.00)	0.001 (0.01)	-0.001** (0.00)	0.022* (0.01)	0.001 (0.00)
Age ²	0.000 (0.00)		-0.000 (0.00)		-0.000 (0.00)	
Married	-0.203 (0.13)	-0.061 (0.04)	0.121* (0.07)	0.028* (0.02)	-0.130 (0.18)	-0.045 (0.06)
Read & Write	0.094 (0.08)	0.027 (0.02)	0.150*** (0.04)	0.035*** (0.01)	0.044 (0.09)	0.015 (0.03)
HH Size	-0.087 (0.07)	0.001 (0.01)	0.049 (0.03)	0.008*** (0.00)	-0.086* (0.05)	-0.009 (0.01)
HH Size ²	0.008 (0.01)		-0.002 (0.00)		0.005* (0.00)	
Share of Adults	-0.453** (0.21)	-0.131** (0.06)	-0.081 (0.11)	-0.019 (0.03)	-0.561*** (0.21)	-0.195*** (0.07)
Income			1.047*** (0.22)	0.251*** (0.05)	0.903*** (0.13)	0.315*** (0.04)
Rooms	0.115*** (0.04)	0.033*** (0.01)	0.020 (0.02)	0.005 (0.00)	-0.002 (0.03)	-0.001 (0.01)
Credit	0.285*** (0.07)	0.086*** (0.02)	0.253*** (0.05)	0.066*** (0.01)		
Food Shortage	0.120 (0.09)	0.035 (0.03)	-0.110*** (0.04)	-0.026*** (0.01)	-0.223*** (0.07)	-0.078*** (0.02)
Shock (idiosyn.)	0.119 (0.08)	0.035 (0.02)	0.239*** (0.04)	0.060*** (0.01)	0.025 (0.10)	0.009 (0.03)
Shock (price)	0.044 (0.10)	0.013 (0.03)	0.007 (0.04)	0.002 (0.01)	0.070 (0.10)	0.024 (0.03)
Shock (geogr.)	-0.112 (0.12)	-0.032 (0.03)	0.094** (0.04)	0.022** (0.01)	-0.036 (0.08)	-0.013 (0.03)
Shock (other)	0.367* (0.21)	0.118 (0.07)	0.074 (0.15)	0.018 (0.04)	0.268*** (0.09)	0.091*** (0.03)
Dist to Road	0.171 (0.55)	0.066 (0.14)	0.096 (0.56)	-0.012 (0.08)	-0.643 (0.99)	-0.280 (0.27)
Dist to Road ²	0.197 (0.25)		-0.739 (1.24)		-0.608 (1.07)	
Dist to Popcenter	-0.177 (0.42)	-0.058 (0.08)	-1.214*** (0.36)	-0.102*** (0.03)	-0.428 (0.45)	-0.064 (0.07)
Dist to Popcenter ²	-0.036 (0.24)		1.087*** (0.37)		0.192 (0.23)	
Precipitation	0.113 (0.13)	0.033 (0.04)	-0.128 (0.08)	-0.031 (0.02)	1.194 (0.81)	0.416 (0.28)
Constant	-0.198 (0.45)		-1.022*** (0.23)		0.072 (0.55)	
N	3,366	3,366	10,017	10,017	2,430	2,430

Standard errors in parentheses. Survey weights included.

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

Dependent NFE	(7)	(8)	(9)	(10)	(11)	(12)
	Nigeria	AME	Tanzania	AME	Uganda	AME
Female	0.057 (0.28)	0.022 (0.10)	0.634*** (0.16)	0.218*** (0.05)	0.017 (0.10)	0.006 (0.03)
Age	-0.002 (0.02)	-0.002 (0.00)	-0.031 (0.02)	-0.008*** (0.00)	0.037** (0.02)	-0.004*** (0.00)
Age ²	-0.000 (0.00)		0.000 (0.00)		-0.001*** (0.00)	
Married	0.101 (0.23)	0.038 (0.09)	0.092 (0.12)	0.032 (0.04)	0.147 (0.12)	0.052 (0.04)
Read & Write	0.303*** (0.11)	0.115*** (0.04)	0.406*** (0.13)	0.139*** (0.04)	-0.031 (0.08)	-0.011 (0.03)
HH Size	0.111** (0.05)	0.031*** (0.01)	0.066 (0.07)	0.024** (0.01)	0.103*** (0.03)	0.018*** (0.01)
HH Size ²	-0.002 (0.00)		0.000 (0.00)		-0.004** (0.00)	
Share of Adults	0.074 (0.26)	0.028 (0.10)	0.536 (0.34)	0.185 (0.12)	0.474** (0.19)	0.167** (0.07)
Income			0.114*** (0.04)	0.039*** (0.01)	0.108*** (0.02)	0.038*** (0.01)
Rooms			0.104*** (0.03)	0.036*** (0.01)	0.001 (0.03)	0.000 (0.01)
Credit			0.098 (0.20)	0.034 (0.07)		
Food Shortage	0.081 (0.09)	0.030 (0.03)	0.005 (0.14)	0.002 (0.05)	0.230** (0.10)	0.082** (0.03)
Shock (idiosyn.)	-0.102 (0.11)	-0.038 (0.04)	0.138 (0.15)	0.048 (0.05)	0.127 (0.09)	0.045 (0.03)
Shock (price)	0.052 (0.11)	0.019 (0.04)	-0.151 (0.14)	-0.052 (0.05)	-0.570** (0.25)	-0.185*** (0.07)
Shock (geogr.)	-0.187 (0.11)	-0.070* (0.04)	0.075 (0.14)	0.026 (0.05)	0.131 (0.09)	0.047 (0.03)
Shock (other)	0.061 (0.26)	0.023 (0.10)	-0.055 (0.44)	-0.019 (0.15)	0.138 (0.23)	0.049 (0.08)
Dist to Road	-1.385* (0.75)	-0.329* (0.18)	0.447 (0.75)	0.142 (0.14)	-2.929* (1.57)	-0.268 (0.30)
Dist to Road ²	1.502* (0.91)		-0.079 (0.91)		13.213*** (5.04)	
Dist to Popcenter	-0.672 (0.83)	-0.069 (0.15)	-0.382 (0.41)	-0.060 (0.07)	-2.223** (0.94)	-0.238* (0.13)
Dist to Popcenter ²	1.011 (1.13)		0.189 (0.20)		3.169** (1.36)	
Precipitation	-0.135 (0.09)	-0.051 (0.03)	-0.213 (0.20)	-0.073 (0.07)	0.001 (0.24)	0.000 (0.09)
Constant	-0.186 (0.62)		-0.497 (0.64)		-1.434*** (0.53)	
N	1,074	1,074	1,286	1,286	1,789	1,789

Standard errors in parentheses. Survey weights included.

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

Table 11: Probit regressions - urban households only (coefficients and average marginal effects)

Dependent NFE	(1) Ethiopia	(2) AME	(3) Malawi	(4) AME	(5) Niger	(6) AME
Female	0.452* (0.26)	0.156* (0.09)	0.035 (0.16)	0.012 (0.06)	0.008 (0.17)	0.003 (0.06)
Age	-0.001 (0.02)	0.001 (0.00)	0.018 (0.01)	-0.002 (0.00)	-0.015 (0.02)	-0.002* (0.00)
Age ²	0.000 (0.00)		-0.000* (0.00)		0.000 (0.00)	
Married	-0.027 (0.20)	-0.009 (0.07)	0.125 (0.13)	0.044 (0.04)	0.220 (0.16)	0.076 (0.06)
Read & Write	-0.164 (0.22)	-0.057 (0.08)	-0.073 (0.14)	-0.026 (0.05)	-0.472*** (0.10)	-0.158*** (0.03)
HH Size	0.315** (0.14)	0.080*** (0.02)	0.140** (0.07)	0.033*** (0.01)	0.053 (0.04)	0.020*** (0.01)
HH Size ²	-0.011 (0.01)		-0.005 (0.01)		0.001 (0.00)	
Share of Adults	0.688* (0.35)	0.237** (0.12)	0.086 (0.23)	0.030 (0.08)	-0.289 (0.25)	-0.096 (0.08)
Income			0.288*** (0.10)	0.101*** (0.04)	0.081** (0.04)	0.027** (0.01)
Rooms	0.003 (0.07)	0.001 (0.02)	0.012 (0.03)	0.004 (0.01)	-0.040 (0.03)	-0.013 (0.01)
Credit	0.674*** (0.21)	0.222*** (0.06)	-0.025 (0.13)	-0.009 (0.05)		
Food Shortage	-0.113 (0.24)	-0.039 (0.08)	-0.122 (0.08)	-0.043 (0.03)	-0.010 (0.14)	-0.003 (0.05)
Shock (idiosyn.)	-0.003 (0.22)	-0.001 (0.07)	0.263*** (0.08)	0.095*** (0.03)	0.042 (0.10)	0.014 (0.03)
Shock (price)	0.120 (0.12)	0.041 (0.04)	-0.103 (0.10)	-0.036 (0.03)	0.161* (0.09)	0.053* (0.03)
Shock (geogr.)	-0.530 (0.34)	-0.185 (0.11)	-0.022 (0.14)	-0.008 (0.05)	-0.156 (0.16)	-0.053 (0.06)
Shock (other)	-0.736 (0.62)	-0.252 (0.20)	-0.199 (0.23)	-0.067 (0.08)	-0.004 (0.13)	-0.001 (0.04)
Dist to Road	0.506 (1.27)	0.044 (0.25)	-0.188 (4.05)	-0.027 (1.23)	0.047 (9.72)	-1.389 (2.48)
Dist to Road ²	-1.342 (2.03)		3.009 (15.10)		-220.231* (130.77)	
Dist to Popcenter	0.489 (0.60)	0.126 (0.11)	-0.588 (0.75)	-0.138 (0.21)	-0.040 (0.55)	-0.024 (0.15)
Dist to Popcenter ²	-0.136 (0.36)		1.008 (0.80)		-0.126 (0.40)	
Precipitation	0.195 (0.23)	0.067 (0.08)	-0.547* (0.29)	-0.192* (0.10)	-0.600 (0.39)	-0.200 (0.13)
Constant	-1.893*** (0.68)		-0.692 (0.58)		1.159** (0.50)	
N	483	483	2,229	2,229	1,538	1,538

Standard errors in parentheses. Survey weights included.

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

Dependent NFE	(7)	(8)	(9)	(10)	(11)	(12)
	Nigeria	AME	Tanzania	AME	Uganda	AME
Female	0.335 (0.32)	0.106 (0.10)	0.008 (0.19)	0.003 (0.07)	0.036 (0.19)	0.012 (0.06)
Age	-0.035 (0.04)	-0.003* (0.00)	-0.013 (0.03)	-0.000 (0.00)	0.030 (0.03)	0.002 (0.00)
Age ²	0.000 (0.00)		0.000 (0.00)		-0.000 (0.00)	
Married	0.688** (0.29)	0.240** (0.10)	0.123 (0.17)	0.043 (0.06)	0.105 (0.21)	0.036 (0.07)
Read & Write	-0.170 (0.22)	-0.052 (0.06)	0.376 (0.25)	0.135 (0.09)	0.019 (0.21)	0.006 (0.07)
HH Size	0.112 (0.08)	0.012 (0.01)	0.173** (0.09)	0.033** (0.02)	0.187*** (0.05)	0.029*** (0.01)
HH Size ²	-0.007 (0.01)		-0.009 (0.01)		-0.009*** (0.00)	
Share of Adults	-0.015 (0.51)	-0.005 (0.16)	0.323 (0.42)	0.112 (0.15)	-0.489 (0.42)	-0.167 (0.14)
Income			0.056** (0.02)	0.020** (0.01)	-0.006 (0.02)	-0.002 (0.01)
Rooms			-0.033 (0.04)	-0.011 (0.01)	-0.025 (0.05)	-0.009 (0.02)
Credit			0.339 (0.23)	0.115 (0.07)		
Food Shortage	0.153 (0.14)	0.048 (0.04)	0.439** (0.20)	0.146** (0.06)	-0.203 (0.22)	-0.071 (0.08)
Shock (idiosyn.)	-0.013 (0.21)	-0.004 (0.07)	0.095 (0.21)	0.033 (0.07)	-0.270 (0.20)	-0.095 (0.07)
Shock (price)	0.046 (0.22)	0.014 (0.07)	0.261 (0.17)	0.091 (0.06)	-1.699** (0.67)	-0.513*** (0.11)
Shock (geogr.)	-0.222 (0.25)	-0.073 (0.08)	-0.016 (0.17)	-0.006 (0.06)	0.358 (0.25)	0.117 (0.07)
Shock (other)	0.077 (0.34)	0.024 (0.10)	0.969** (0.38)	0.268*** (0.07)	-1.050** (0.43)	-0.363*** (0.13)
Dist to Road	-1.614 (2.41)	-0.531 (0.68)	-2.090 (1.60)	-0.627 (0.48)	-9.044* (4.71)	-2.607* (1.34)
Dist to Road ²	-0.636 (3.12)		2.894 (2.02)		26.623* (15.79)	
Dist to Popcenter	1.537 (1.59)	0.454 (0.41)	1.203 (0.98)	0.330 (0.24)	2.031 (1.46)	0.608 (0.41)
Dist to Popcenter ²	-0.713 (2.78)		-0.611 (0.71)		-1.775 (2.04)	
Precipitation	-0.148 (0.16)	-0.047 (0.05)	0.365 (0.32)	0.127 (0.11)	-0.636 (0.54)	-0.218 (0.19)
Constant	1.084 (0.94)		-1.427* (0.83)		0.119 (1.11)	
N	421	421	714	714	479	479

Standard errors in parentheses. Survey weights included.

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