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Opportunities and determinants of rural non-agricultural activities in Ethiopia

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The main goal of this study is to investigate the characteristics and determinants of rural non-agricultural activities using country representative household survey. This study is based on 14,616 sampled households which was collected from the four main regions of Ethiopia, namely Tigray, Amhara, Oromia and SNNPR which represent more than 90% of the population of Ethiopia. Descriptive statistics and probit model were implemented for the analysis of the study. The study revealed that non-agricultural participation ranges from 17 to 37% in Amhara and SNNPR regions, respectively. The main non-agricultural activities of Ethiopia covers major economic sectors were manufacturing (brewing traditional alcohols and grain milling among others), trade activities (whole sale and retail trade) and service activities (transport, carpentry, repair service and small restaurants among others). The determinants of rural non-agricultural activities include lack of access to agricultural land, low/volatile earnings and social/economic independence. Majorly, lack of market opportunities, limited access to credit, poor access to road and lack of education were most prominent. It was recommended that rural infrastructure development is critically relevant for facilitating the promotion of rural non-agricultural activity of Ethiopia.

Key words: Non-agricultural activity, determinants, households, Ethiopia, Probit model.

INTRODUCTION

Diversification of the source of household income is a common practice in many countries but factors influencing this decision differ. Households in developing economies are not an exception to this phenomenon (Lemi, 2006). Agricultural households expand the sources of their income due to pull and push factors. A common pull factor is that a non-agricultural activity generates extra income. On the other hand, a common push factor is to minimize risks and cope with shocks. Both types of diversification influence the well-being of rural households. Pull factors increase income and improve welfare of the households, whereas the push factors are expected to reduce poverty levels of the households (Nega et al., 2009).

Traditionally, it is assumed that the entire rural economy depends on agriculture with the non-agricultural sector contributing negligibly. However, this has changed recently and it is widely recognized that non-agricultural

activities make considerable contributions to economic growth, reduce poverty and limit rural-urban migration (Lanjouw and Lanjouw, 2001). Empirical evidence indicates that non-agricultural activities on average constitute 40 to 45% of the total income for rural African households. Furthermore, non-agricultural activities are found to improve household income and wealth and hence contribute significantly to the survival strategies of households (Barrett et al., 2001).

In this study, non-agricultural activities defined as all economic activities such as manufacturing, service and mining and extractives except agriculture, livestock, fishing and hunting. This definition holds true regardless of the location (rural or urban) and functional classification (wage activity or self-activity) (Barrett et al., 2001; Haggblade et al., 1989; Lanjouw and Feder, 2001). For many centuries, Ethiopian rural households practiced non-agricultural activities in addition to agriculture. Households in many parts of the country had been traditionally involved in a variety of non-agricultural activities such as iron melting, tanning hides and skins and weaving cloths all contributing to being crucial for household livelihoods (Pankhurst, 2002).

Ethiopian rural households widely practiced non-agricultural activities in addition to agriculture. Few attempts have been made to study non-agricultural activities in Ethiopia. The majority of earlier studies were conducted based on household surveys with limited coverage that hardly represent the whole country. Furthermore, the importance of non-agricultural activities in Ethiopia is not properly recognized and is rarely supported by the government. Evidence based policy intervention for promoting non-agricultural activities in Ethiopia requires studying the existing features and prospective of the sector. Therefore, this study uses a comprehensive household survey that represents the Ethiopian population to explore the characteristics and constraints of non-agricultural activities in Ethiopia.

This study is aimed at identifying the opportunities, characteristics and main determinants of non-agricultural activities in Ethiopia. The following are the research questions of this study: What are the different non-agricultural activities in Ethiopia? What are the basic characteristics of these non-agricultural activities? What are the determinants of non-agricultural activities?

MATERIALS AND METHODS

Data

The main dataset applied in this study is derived from the Ethiopian RICS. The World Bank (WB) in cooperation with the Central Statistical Agency of Ethiopia (CSA) conducted the RICS. The survey was carried out as part of the national Agricultural Sample Survey (AGSS). The AGSS is a country-level survey that is undertaken annually and covers all parts of the country. The aim of the AGSS is to assemble seasonal basic data about Ethiopia's agriculture. More specifically, it gathers data on total cultivated land,

volume of production (by crop types) and farm management practices. Therefore, during the 2006/2007 agricultural season, the AGSS incorporated the RICS as part of the annual survey. In other words, the field survey of the RICS centered on the survey areas of the AGSS.

The RICS covers four main regions, namely Tigray, Amhara, Oromia, and SNNPR, which together represent more than 90% of the population of Ethiopia. In each one of the four regions, representative agricultural households were selected. The sampling strategy of the RICS follows that of the AGSS and classifies regions based on Enumeration Area (EA). EA refers to the units of land demarcated for the aim of enumerating the population and housing units with no error and replication. Each EA comprised 150 to 200 households. The following steps were followed to select representative households. First, each region was divided into 5 to 19 zones depending on the size of the population. Second, each zone was divided into EAs and a zone could have between 2 to 48 EAs depending on the population size. Lastly, households were chosen from each EA using the simple random sampling method. Consequently, the RICS incorporates 14,616 agricultural households selected from four regions of Ethiopia. The data provided include: (1) Demographic characteristics such as age, education, gender, and household size. (2) Main characteristics of the non-agricultural activities such as source of start-up capital, motives to start business, seasonality of non-agricultural activity, number of employees, average monthly sales and the major constraints facing the activity.

Method

Descriptive statistics and probit methods were implemented for the purpose of this study. The descriptive statistics was applied to explore the characteristics and opportunities of non-agricultural activity. On the other hand, probit model was estimated to identify the main determinants of non-agricultural participation of rural household in Ethiopia.

The agricultural household model predicts that households allocate labor to agricultural and non-agricultural activities based on the marginal return of labor from these activities (Singh et al., 1986). Rural households participate in non-agricultural activities by comparing the value of reservation wage and market wage. A reservation wage is defined as the marginal value of labor time that is not employed in non-agricultural activities, while the market wage in this specific case is the wage obtained from the non-agricultural activities. Households are employed in non-agricultural activities when wages from the market are higher than the reservation wage (Huffman and Lange, 1989).

The decision of households to diversify or not to diversify into non-agricultural activities is a binary outcome variable. The probit model is an appropriate non-linear regression model for estimating response or a dependent variable which has a binary outcome (Wooldridge, 2002). Thus, the probit model is estimated to identify the major constraints of non-agricultural participation of rural households in Ethiopia. The probit model for the household non-agricultural labor supply decision can be specified as follows:

$$P_r(P_i = 1) = P_r(W_m > W_r) = X_i\beta + \varepsilon$$

Where P_r is the probability to diversify into non-agricultural activities, P_i is the household participation decision. $P_i=1$ if the household diversifies into non-agricultural activities and $P_i=0$ if the household does not diversify into non-agricultural activities. W_m is the wage from non-agricultural activities, W_r is the reservation wage, ε is the random disturbances term of the model and X_i is the vector of the exogenous factors that influence the households' non-agricultural participation decisions.

Table 1. Summary of descriptive statistics.

Variable	Mean	Standard deviation
Distance to major market centers (minutes of walking)	79.8	63.5
Distance to all whether road (minutes of walking)	111.8	136.7
Household size	6	10
Education (household head)	2	3
Age (household head)	43	16

Source: Own computation based on Central Statistical Agency and World Bank (2007).

The probit model applied to the RICS data was estimated using STATA. The following factors that potentially influence the non-agricultural participation are included in the model: Distance to the major market center, proximity to all-weather road, household size, and demographic factors (the household's head education, gender, and age). Distances to the major market center and all-weather road are measured by number of minutes to reach a market center and an all-weather road, respectively. Furthermore, the household head's education and age are measured in years. Gender is captured by a dummy variable in the model; it attains "1" if the head is male and "0" otherwise. The summary of variable included in the probit model is depicted in Table 1.

RESULTS AND DISCUSSION

Non-agricultural activities across regions and major sectors in Ethiopia

Table 2 shows non-agricultural participation across the four regions of the study based on the respondents answer to the question of whether they participate or not. Households were asked whether they diversified into non-agricultural activity in the previous last three years and the responses are recorded as "no" or "yes". Rural households of all regions are engaged in non-agricultural activity. From the total sampled households, 22.5% diversify into non-agricultural activity. This does not imply that these households are exclusively engaged in non-agricultural activity. The non-agricultural activity may be performed as a complement to agriculture on part time bases or during the agricultural off-seasons.

Non-agricultural participation ranges from 17 to 37% in Amhara and SNNPR regions respectively (Table 2). It may not be appropriate to compare non-agricultural participation across the different regions because the sampled households are not proportional to the population size of each region. However, the divergence of non-agricultural participation across regions can be partly explained by the disparity in the availability of rural infrastructure across the different regions.

Ethiopian non-agricultural activities can be broadly categorized into manufacturing, trade and service sectors (Table 3). The manufacturing activities include food, beverages, brewing, distilling, grain milling and other manufacturing. On the other hand, trade activities include whole sale and retail trade whereas service activities include transport, carpentry, repair service, small restaurants, etc. Table indicates that 52, 36 and 12% of rural households are engaged in trade, manufacturing and service sectors, respectively. The higher engagement of households in most regions in trade can be explained by the ease of entry in such activity.

Sources of capital for non-agricultural activities in Ethiopia

For the establishment of non-agricultural activities, households may raise start-up capital from agricultural income, non-agricultural self-activity income, wage or salary, remittance, sale of assets, loan from banks or private money lender or gift from family or relatives. Table 4 shows the share of each income in the start-up capital of households. It indicates that the start-up capital is mainly obtained from agricultural income (54.7%), gifts from relatives or friends (13.2%) and non-agricultural self-activity (10.7%).

Pull-push factors influencing non-agricultural activities

Rural household of Ethiopia are either pulled into or pushed towards non-agricultural activity. The pull factors motivate the household to engage in non-agricultural activities. Main pull factors include: The presence of non-agricultural opportunities, the favorable demand for non-agricultural goods and the higher returns on non-agricultural activities (Woldenhanna and Oskam, 2001; Beyene, 2008). Obtaining additional income for supporting agriculture and for attaining social and economic independence are also reported as additional incentives for diversification into non-agricultural activities (Gebre-egziabher, 2000; Tesfaye, 2008).

On the other hand, the main push factors triggering non-agricultural activity in rural Ethiopia includes limited or lack of land holding, seasonality of agriculture, low farm income and large family size (Woldenhanna and Oskam, 2001; Beyene, 2008; Tesfaye, 2008). Rural households of Ethiopia are forced into non-agricultural diversification when they encounter failures in crop

Table 2. Non-agricultural activities by major regions in Ethiopia.

Region	Number of rural households		Percentage of household
	No engagement in non-agricultural activities	Engagement in non-agricultural activities	Share of household engagement in non-agricultural activities
Tigray	1,483	396	21.1
SNNPR	1,556	923	37.2
Amhara	6,422	1,377	17.7
Oromia	1,872	587	23.9
Total	11,333	3,283	22.5

Source: Author's compilation from Central Statistical Agency and World Bank (2007).

Table 3. Non-agricultural activities by sectors (%).

Region	Manufacturing	Trade	Service
Tigray	30	56	14
Amhara	43	41	16
SNNPR	32	57	11
Oromia	35	52	13
Total	36	52	12

Source: Author's compilation from Central Statistical Agency and World Bank (2007)

production as one of the household survival strategies. It is reported that rural households diversify into non-agricultural activity mostly due to push factors rather than pull factors (Shen, 2004; Lemi, 2006; Kune and Mberengwa, 2012). Table 5 depicts the finding of RICS, in which sampled households were asked to indicate the main motivation to diversify into non-agricultural activity. The main motives are to look for a means to invest in agriculture (42.6%), low or volatile earnings (30%), limited access to agricultural land (12%) and the presence of market opportunity for non-agricultural goods (6%).

Constraints of non-agricultural activities

The self-reported impediments of non-agricultural activities are described in Table 6. In the RICS, households are asked to specify the major constraints they face in starting and operating non-agricultural activities. Findings indicate that non-agricultural activity is constrained by limited access to finance, lack of market opportunities, lack of basic utilities (electricity, water and telecommunication), bad road transportation and lack of business training. Major constraints are limited access to finance (48.2%), lack of market (24.5%) and lack of training (12.5%).

Determinants of non-agricultural activities: Probit model results

Table 7 reports the probit model estimation results of the

determinants of non-agricultural activities of Ethiopia based on RICS. The model is estimated with robust standard error to avoid the problem of heteroscedasticity. The value of goodness-of-fit of the model as shown by McFadden pseudo R^2 is 0.12. For verifying the validity of the estimated model, statistical tests such as t-test, Wald Chi-square test, and multicollinearity test are conducted.

The empirical results of these statistical tests demonstrated the robustness of the estimated model. Specifically, the t-test statistics indicate that every variable incorporated in the model is statistically significant at 5% level (the sign ** shows a 5% significance level). The Wald Chi-square test (Prob>chi2) confirmed that at least one of coefficients in the estimated model is different from zero. Furthermore, the variance inflation factor (vif) test for multicollinearity indicates that the explanatory variables in the models are free from multicollinearity; none of the independent variables is highly correlated to each other.

The following paragraph presents the discussion and interpretation of the influence of each explanatory variable in the estimated model.

Proximity to market center

Distance to the major market center is incorporated to capture the impact of access to market for non-agricultural activities. Distance to the market center is integrated in the model by considering the walking time spent to arrive at the nearest major market center that is calculated in minutes. The estimation results indicate that

Table 4. Major sources of start-up capital in Ethiopia.

Source of capital	Percentages of households
Agricultural income	54.7
Gift from family or friend	13.2
Non-farm self-activity income	10.7
Private money lender	8.8
Other sources	6.5
Loan from bank or cooperatives	3
Wage or salary	2
Sale of assets	0.8
Remittance	0.3

Source: Author's compilation from Central Statistical Agency and World Bank (2007).

Table 5. Motives to diversify into non-agricultural activities.

Motive	Percentage of households
Pull factors	
Means to invest in agriculture	42.6
Market opportunity	6
Push factors	
Low/volatile earnings	30
No access to agricultural Land	12
Others	
Social/economic independence	4.3
Other motives	2.8
Support from NGO/government	0.1
Advice from relatives/friends	2

Source: Author's compilation from Central Statistical Agency and World Bank (2007).

Table 6. Self-reported constraints of non-agricultural activities.

Constraint	Percentage of households
Access to finance (lack of capital and credit services)	48
Lack of market (lack of market information, low demand, etc)	25
Lack of training	13
Access to road, transportation and telecommunication	7
Government administrative bureaucracy and related constraints (license, high tax, among others)	4
Other constraints (lack of time, lack of working place, among others)	4

Source: Author's compilation from Central Statistical Agency and World Bank (2007).

distance to market has a negative sign and significantly affects non-agricultural diversification. The marginal effect indicates that households that are residing one more minute walking distance farther away from the main market center are 0.04% less likely to engage in non-agricultural activities relative to households residing closer to the market center. This outcome is consistent with other empirical evidence in Ethiopia (Block and Webb, 2001; Shen, 2004; Tesfaye, 2008; Rijkers and Söderbom, 2013).

Access to roads

Access to the closest all-weather road is included to examine the effect of road infrastructure on non-

Table 7. Determinants of non-agricultural activities.

Variable	Coefficient	Robust standard error	P>/z/	Marginal effect
Access to market (walking distance in minutes)	-0.0015 **	0.0003	0.000	-0.0004
Access to road (distance to all weather road)	-0.0004**	0.0001	0.002	-0.0001
Household size	0.0605 **	0.0066	0.000	0.0151
Education (household head)	0.0332 **	0.0054	0.000	0. 0083
Gender (household head)	-0.8429**	0.0329	0.000	-0.2503
Age (household head)	-0.1871**	0.0010	0.000	-0.0047

*Pseudo R2 = 0. 1230; Prob>chi2=0.0000; **5% statistically significant.
Source: Own computation based on Central Statistical Agency and World Bank (2007).

agricultural participation. Proximity to all-weather road is captured in the model by considering the travel time spent to reach the closest all-weather road that is observed by the walking distance in minutes. The outcome of the estimation indicates that distance to roads has a significant negative influence on the non-agricultural diversification of rural households of Ethiopia. Thus, the marginal effect shows that households located one more minute walking distance further away from all-weather road are 0.01% less likely to engage in non-agricultural activities relative to households who reside closer to all-weather roads. This indicates that the road infrastructure slightly facilitates rural non-agricultural activities.

Household size

The size of household positively affects non-agricultural participation. The marginal effect indicates that the presence of one additional household member increases the chance to participate in non-agricultural activities by 1.5%. A larger size of households results in a higher supply of labor force at the household level. This additional labor supply is more probable to participate in the non-agricultural sector. This outcome is consistent with other empirical evidence in Ethiopia by Tesfaye (2008) and Beyene (2008).

Education

The education status of the head of the household can be a barrier to non-agricultural diversification. The maximum years of education was considered to approximate the household head's education. The estimation results indicate that the more years of education of the household head, the more positive the influence on non-agricultural participation of households. In other words, availability of household member with more years of education is more likely to engage in non-agricultural activities relative to a household with lower years of education. This is intuitive, as education can be considered important for business

awareness of households. This is shown by the marginal effect of the model that indicates that every extra year of education results in a 0.83% higher probability of engaging in non-agricultural activities.

Household head's gender

The model results indicate that non-agricultural participation is significantly influenced by the household head's gender. A female-headed household has a larger chance of engaging in the non-agricultural sector relative to a male-headed household. Specifically, male-headed households are 25% less likely to engage in non-agricultural activities relative to female-headed households. This outcome is similar to other studies in the country (Demeke, 1997; Carswell, 2002; Bhatta and Årethun, 2013). Women are more likely to engage in non-agricultural activities because they are constrained in accessing agricultural land and other resources (Demeke, 1997). This triggers more participation of female-headed households in non-agricultural activities relative to male-headed households.

Household head's age

The number of years is used to measure the age of the family head and model results indicate that it negatively and significantly affects non-agricultural activities. In other words, the younger the head, the higher is the possibility to participate in non-agricultural activities. This correlation between age and non-agricultural participation can be interpreted in two different ways: (1) Older people have more experience in farming; therefore they prefer to stay in farming, and are less enthusiastic to engage in non-agricultural activities. (2) The younger heads of households usually possess less land compared to the older household heads due to population growth and inheritance. Therefore, they utilize non-agricultural opportunities as a survival strategy (Woldehanna and Oskam, 2001). This outcome is consistent with other empirical evidence of Ethiopia (Lemi, 2006; Tesfaye,

2008; Beyene, 2008; Bhatta and Årethun, 2013).

Conclusion

The aim of this study is to investigate the characteristics and major constraints of non-agricultural activities. The dataset for this study was sourced from RICS which is a comprehensive and representative household survey. Considerable shares of households in rural areas engage in non-agricultural activities in Ethiopia. From the total sampled households, 22.5% diversify into non-agricultural activity. The non-agricultural activity is performed as a complement to agriculture on part time bases or during the agricultural off-seasons. The non-agricultural participation rate varies across different region. Non-agricultural participation ranges from 17 to 37% in Amhara and SNNPR regions, respectively. The main non-agricultural activities are manufacturing, trade and service. The rate of non-agricultural participation varies across the different economic sectors such as trade (52%), manufacturing (36%) and service (12%). The higher engagement of households in most regions in trade can be justified by the ease of entry in such activity.

The main sources of capital to establish non-agricultural activities are agricultural income and support from families or relatives. Rural households engage in non-agricultural activities due to lack of agricultural land, low earnings and for obtaining additional income to invest in agriculture. The major constraints of non-agricultural activity are poor access to road, credit facility, market opportunities and lack of education/training. Therefore, in order to promote rural non-agricultural activity, the policy priority should lies on the development of rural road transport infrastructure, schools and credit facility.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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