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Determinants of Participation in the Rural Nonfarm Economy in Eastern Ethiopia

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Abstract
This thesis attempts to investigate the push and pull factors that influence the participation decision of rural households in nonfarm activities (RNFA[1]) and the income earned from this sector. Multinomial logistic regression was applied to estimate the likelihood of participation in RNFA and a censored income determinant function (tobit) was estimated to understand factors influencing nonfarm income share in the study area. Results show that only 21% of the total household income was derived from different nonfarm activities with activity rate of 46%. In disaggregated functional categories, 21% and 24.6% of the total sampled households participated in wage employment and self-employment, respectively. However, income from each activity accounted for only 10.3% and 11% of total income. The multinomial logit analysis showed that the likelihood of earning income from nonfarm economic activities was significantly influenced by capacity variables such as wealth and human capital. Having better education, land holding, access to irrigation and number of adult members positively influenced the likelihood of involvement in nonfarm activities. The result was associated with access to irrigation and implies that households with better economic condition are pulled to the nonfarm sector attracted by the better return from the nonagricultural sector. Female-headed households were found more likely to participate in own business than male-headed ones. Estimation of the tobit model revealed that having access to credit, better land size, livestock and number of adults in the household significantly and positively influenced the share of income from RNFE. It was also found that age and sex (male) of household head had positive effect on the share of income from RNFE. The findings of the study suggest that efforts should focus on the promotion of nonfarm opportunities that do not impose barriers to entry through provision of physical infrastructure such as road, improving credit provision, improving educational status and improving irrigation water accessibility. These efforts can be expected not only to directly raise the income levels of the disadvantaged but also to reduce inequality by raising wages received by those who remain employed as non-agricultural laborers.

1. INTRODUCTION

Ethiopia is one of the poorest countries in the world with GDP per capita of 110 USD and Africa's second most populous nation with over 96 million inhabitants, of whom over 80%, live in rural areas. Agriculture is the dominant sector of the country's economy, representing nearly 42% of GDP, 77% of employment, and 84% of exports (ATA, 2015). In addition, the majority of the agriculture sector consists of smallholder farmers who make their living from less than two hectares of land.

Given that agriculture is the mainstay of the Ethiopian economy, food insecurity and poverty are attributed to the poor performance of the agricultural sector (ATA, 2015).

In developing counties where smallholder farming is dominant like Ethiopia, non-farm income activities play an enormous role in breaking the vicious cycle of food insecurity and poverty, because non-farm income can significantly increase the total income of rural dwellers, help smooth out income fluctuations, and improve food security through savings, which in turn allows rural dwellers to survive sudden shocks (Omilola, 2009).

Recently, there has been an increasing recognition that the rural economy is not confined to the agricultural sector, but embraces the broad spectrum of needs of all rural people including social service provision, economic activities, infrastructure and natural resources (Davis & Bezemer, 2004). Evidence from the developing world suggests that economic diversity in the countryside has the potential to foster local economic growth and alleviate the rural-urban income gap and rural poverty (Ellis, 1998). Hagblade et al., (2002) state that 30–50% of rural livelihood income in sub-Saharan Africa is derived from rural nonfarm activities.

The national five year (2011-2015) development strategy of the country has also considered investing in agricultural productivity and nonfarm economic opportunities for household food security. Despite these positive trends, food insecurity and malnutrition remain significant problems. Although major famines such as those in the 1970s and 1980s have not recurred, localized food shortages have occurred (FAO, 2013). Households and individuals in rural areas face different constraints on their choice of income-generating activities and diversification patterns which in turn determines the likelihood of benefiting from nonfarm employment.

However, empirical studies done on the nature, determinants and effect of nonfarm employment in the study area are scarce or not available. The available studies in this regard are limited to some geographical areas.

[1] Rural nonfarm activity

With a view to bridge this gap, this study tries to answer the following two specific questions: (i) what determines an individual's choice of participation in nonfarm employment? (ii) What determines household's nonfarm incomes levels?

2. REVIEW OF RELATED LITERATURE

2.1 The Rural Nonfarm Income: Concepts and Definitions

The most commonly used definition of "non-farm" and "off-farm" activity is the one forwarded by Reardon *et al.* (2001). According to them, the distinction lies on three-way classification on the basis of location, sector and function. "Farm" or "agricultural" refers to all activities in the agriculture sector, regardless of location or function. "Non-farm" or "nonagricultural" includes all activities outside the agricultural sector, regardless of location. "On-farm" or at-home includes all activities on one's own property, regardless of sectoral or functional classification; almost always self-employment. "Off-farm" or away-from-home refers to all activities away from one's own property, regardless of sectoral or functional classification; it can be wage or self-employment.

There are two concepts related to the term "rural non-farm". First, when we refer to "rural" income we mean income earned only in rural areas by rural households. This is distinct from income earned anywhere (including urban areas) by rural households (Barrett *et al.,* 2001). Second, the sector "agriculture" should be defined to identify "non-farm" activities as any activities outside agriculture (own farming and wage employment in agriculture). Following Reardon et *al.* (2001), Davis *et al.* (2004), and Hagblade *et al.* (2007), agriculture, in addition to cropping, includes livestock husbandry, fishing and forestry. Although agro-processing is closely linked to agriculture (e.g. by transforming raw agricultural products) it is classified as non-farm. Jin and Deininger (2008) defined nonfarm activities as all rural businesses that pursue market-oriented non primary productive activities, including transformation, transport and marketing of primary products, mining, manufacturing, commerce, transportation, and other services

Likewise, Lanjouw and Lanjouw (2000) noted that typically the distinction between rural and urban employment is based on the place of residence of workers, nonfarm activity undertaken by farm households as independent producers in their homes, the subcontracting of work to farm families by urban-based firms, nonfarm activity in village and rural town enterprises, and commuting between rural residences and urban non- farm jobs. So those who commute to a job in a nearby urban center are considered to be rural nonfarm workers.

Ellis (1998) distinguishes off-farm from nonfarm in that the former refers typically to wage or exchange labor on other farms (i.e. within agriculture), whereas "non-farm" income sources are also identified as "non-agricultural" income sources which include nonfarm wage employment, nonfarm rural self-employment, and other income, such as remittance, pension and rental income, contrary to the farm income where it refers to income generated from own account farming. Similar distinction is made by Davis and Bezemer (2004).

2.2 Determinants of Participation of the Poor in Rural Nonfarm Activities

Individuals and households in rural areas are differently positioned in terms of their ability and motivations to engage in different types of nonfarm employment Decisions by rural households concerning involvement in RNF activities depend on two main factors, i.e. *incentives* offered and household *capacity* (Reardon *et al.,* 1998). Various studies have been carried out which aim to provide more information on access constraints faced by poor people seeking to work in the RNF economy. Some of the constraints identified may be equally applicable to participation in wage labor in the farm sector. Many factors are at play, and the particular activities that result are rarely attributable to a single factor.

"Capacity variables" enabling households to undertake RNF activities, given the incentive levels, include capital assets such as human, social, financial, organizational, and physical capital. There are two strands in the literature on which one can draw to conceptualize the role of capital as determinant of RNFA (Reardon *et al.,* 1998). .

According to Gordon and Craig (2001) reported better education level increases probability of employment in regular salaried The opposite is often observed for employment in the casual non-agricultural wage sector. Involvement in self-employment is usually most likely for those with some basic education, but is lower for both the illiterate and those with high levels of education. Corral and Reardon,(2001); Hossain, (2004) argue better-educated members of rural populations have better access to any nonfarm employment, and are also more likely to establish their own nonfarm businesses.

The household's endowment of work force also affects the diversity of household income sources, large-size households operating small farms as when population pressure on limited land is intense and/or access to operational holdings of productive land is not broadly based tend to engage in non-agricultural activities to supplement farm income (Balisacan, 1991). Land is also the major determining factor of participation in RNF employment. However, the relationship between land endowments and participation in the nonfarm economy is a complex one. The relation between landholding size and the share of nonfarm income in total household income is likely to be depicted by a negatively sloped curve (Wandschneider, 2003). The reason is that rural households

with good access to land are not compelled to diversify into nonfarm employment to the same extent as landless or marginal farming households .in the contrary, those with limited or no access to land have to work as agricultural laborers and engage in non- farm activities in order to earn a living (Hossain, 1999; Hagblade et al., 2002; Wandschneider, 2003). However, an inverse correlation between land ownership and the share of nonfarm income at the household level is not always verified empirically (Reardon et al., 2000). Households with relatively large land sizes, measured as the total area of land owned by the household, in hectares have higher nonfarm income because land can be used as collateral or generate investment capital from crop sales that can be used for nonfarm businesses.

(Lanjouw and Lanjouw, 2000; Hagblade *et al.,* 2002).), show that gender and social status can also restrict access by the poor to the most lucrative nonfarm activities in some settings. In the same way that child-rearing obligations may limit women's mobility and force them into home-based, highly labor-intensive pursuits. Social restrictions may force specific poor household groups into traditionally reserved low-productivity rural nonfarm activities. Access to finance affects participation in nonfarm employment by funding investment (directly or through loans), making payment of bribes possible and providing a buffer against risk.because use of rural credit services are usually considered important incentives for adjusting resource allocation at the farm household level. Gordon (2000) and Ruben and Crecx (2003).

2.3 Theoretical Framework

A number of factors determine labor demand and supply and hence allocation into different sectors. In a farm household economy with a perfect market, labor is allocated between farm and nonfarm activities in such a way that the marginal value of farm labor equals the wage rate for nonfarm activities. This means that individuals are willing to participate in nonfarm work as long as their marginal value of farm labor (or reservation wage) is less than the nonfarm wage rate they command (Ellis,1993; Gordon, 2002; Devise *et al.,* 2003). This implies that poorer farm households have a stronger incentive to diversify their income sources into nonfarm activities because they have a lower marginal value of farm labor. One of the motives to diversify income sources into nonfarm activities is to manage the risk associated with agricultural production (Ellis 1993; Ellis, 1998; Tassew, 2000).

The extent of the risk motive to diversify income depends critically on risk aversion. Because risk aversion varies inversely with wealth the risk incentive to diversify income sources is stronger for poor than for rich. However, there can be entry barriers in the off-farm and nonfarm labor market because these activities may require investment on equipment purchase or rent, skill acquisition and license fee (Ellis, 1993; Tassew, 2001).

The basic idea of nonfarm work is relied on the idea of time allocation in labor supply theory. Various studies adapted the home-production theory to develop the model of labor market decision. The basic concept in nonfarm work decisions are the trade-off between leisure (all non-work activities) and consumption of goods for individuals in a farm household. A farmer, his/her spouse and other farm household members are assumed to maximize utility which is to be a function of consumption goods, C, and leisure, L, and assume affected by exogenous preference structures, E, i.e. individual, family and farm characteristics (Ellis, 1993; Taylor *et al.,* 2007). This can be represented in a mathematical formulation as follows.

$$Max\ U = U(C, L, E) \text{where } Uc > 0, UL > 0. \quad (2.1)$$

Utility is maximized subject to time, income, farm production constraints. Total time available, *T*, is allocated between farm work, *F*, nonfarm work, *NF*, and leisure (*L*):

$$T = F + NF + LT \quad (2.2)$$

The consumption of goods will be limited by the available income generated from nonfarm work (wage times the time worked, *W *NF*), net farm income (*PQ – RX*) and other income, *V*.

This gives the budget constraint:

$$C = W^{*}NF + PQ - RX + V \quad (2.3)$$

Following Taylor *et al.,* (2007), it is assumed that the wage rate is exogenous and that individuals can freely adjust the amount of nonfarm work. Thus, there is an optimal number of nonfarm work-hours at the given wage rate. Assuming competitiveness in inputs and output markets, farm income is set equal to farm profit. In equation (2.3), P is anticipated price of farm outputs, R and X are input prices and quantity of inputs used, respectively. Lastly, the farm output as representing Q is produced as a function of farm work time and nonlabor inputs used.

$$Q = f(F, XK, H) \quad (2.4)$$

where it is also affected by farm-specific characteristics, K, particularly land holding and livestock etc. and human capital characteristics, H. This function is assumed to be strictly concave in the inputs. Following Taylor *et al.* (2007), optimal conditions of the above utility function can be obtained by using the Lagrangian function as shown below.

$$\boldsymbol{\Gamma = U(C, L,)E + \lambda(T - F - NF - L) + \gamma[WNF + PQ - RX + V - C) + \delta(f(F, XK, H) - Q]} \quad \ldots\ldots \quad (2.5)$$

The first-order conditions (FOCs) of equation (2.5) can be further summarized as:

$$\frac{\boldsymbol{U'L}}{\boldsymbol{U'C}} = p * f'_{F}( ) = w \quad (2.6)$$

The FOCs show decisions on nonfarm work made simultaneously with decision on on-farm inputs, including members' farm work and consumptions. Equation (2.6) ensures the equality of leisure-consumption marginal rate of substitution and the marginal value of farm and nonfarm work. The FOCs also provide the equation for the optimal amount of inputs in farm production such as

$$\boldsymbol{P} * \boldsymbol{f'_X}(\,) = \boldsymbol{R} \qquad (2.7)$$

The market-wage rate should in optimum be equal to the marginal rate of substitution of leisure and consumption. $P*f'_F(.)$ is the value of marginal productivity of labor farm, and the optimal labor use in agriculture is where this equals the market wage rate – the opportunity cost of family labor. A household will choose to work more farm work if marginal productivity of labor in farm is above the market wage rate. If marginal productivity of labor in farm work is less than wage rate, then the household will work more off-farm.

We can summarize the model above by stating that nonfarm work decision can be obtained from the rule which states that the farm household member will be engaged in nonfarm only when the wage rate exceeds the marginal value of farm work. That is,

$$D = 0 \;\; if \; W \leq Pf * WF(P_i, R_i, E_i, K_i, \mathrm{H_i}) \quad \text{or}$$

$$D = 1 \;\; if \; W > Pf * WF(P_i, R_i, E_i, K_i, H_i, V_i) \quad \ldots. \qquad (2.8)$$

Equation (2.8) is a binary decision rule which is a function of all exogenous variables in the model since the optimal allocation is determined jointly between nonfarm work-hours and farm work as implied in equation (2.6). The stock of human capital, household and farm characteristics, nonfarm wage rates, input prices, output prices and other income are exogenous to the maximization problem. In sum, the general form of determinant of nonfarm work may be set up as a function of preference structure (*E*) including age, gender and family structures; human capital (*H*) including education; farm-specific characteristics (*K*) including landholding, irrigation, etc.; and other income (*V*). Or, it can be simply written as

$$OF = f(E_i, K_i, H_i, V_i) \qquad (2.9)$$

for each *i* member of the farm household being analyzed in this study. This general form can be extended to include different type of activities within the households, including agricultural versus non-agricultural activities of the farm households' members.

The above adopted model of agricultural household has combined the profit-maximizing problem of the farm with the utility-maximizing problem of the family deciding on time allocation and consumption. It depends on the assumption of separability between the farm production and the family consumption decisions, and it implies that hired and family labor are equivalent and all members have access to well-functioning labor market to bring their labor demands into balance with their family supplies.

Reardon (1998) explains that incentives either "pull" or "push" individuals into the labor market. The potentially higher returns to labor that could be obtained from working off the farm would "pull" or lure households into diversifying. Households which are "pulled" into nonfarm activities participate as a means of obtaining more income and improving their current living conditions. By contrast, factors such as risk to the farm production, lack of access to credit, for example will tend to "push" households into nonagricultural activities.

3. METHODOLOGY

3.1 Data Source and Sampling Techniques

Both primary and secondary data were used in this study. The primary data pertaining to the year 2011 were collected from sample respondents through interviewing using a structured questionnaire. The questionnaire was designed to generate data on some institutional and economic variables and input output data. Contents of the questionnaires were refined and verified based on a pretesting prior to embarking into the formal survey. Continuous supervision was also made by the researcher himself to reduce error during data collection and to make corrections right on the spot.

A two stage sampling technique was applied to choose the representative samples from the total rural population. In the first stage, random selection of 4 Peasant associations(PA) from the total 17 Pas is conducted after clustering each PA based on traditional agro-ecology characteristics, namely *Kolla(lowland)* and *Woynadega(midland),* which resulted in categorizing 9(nine) PAs into midland and 8 into lowland. In view of agroecological representation, two PAs were randomly chosen from each agro ecologies were selected.

In the second stage, with the help of the list of household heads that are found in each selected PAs' Agricultural development agents (DA) office, proportion of the total household heads in the each selected PAs is calculated(see table 5). The size of sample household heads was assigned for the 4 PAs. Then by giving equal chance; respondent household heads were selected randomly. Finally, from the total of one hundred thirty sample household heads 77 (59 %) were the midlanders (*Woinadega*) and 53 (41 %) were the lowlanders (*Kolla*).

3.2 Data Analysis

3.2.1 Econometric Models

Specification of the participation equation- the Multinomial Logit Model

This model is specified to determine factors affecting household participation decision in nonfarm employment. There are situations where the dependent variable is unordered, for example in the case of categorical response, where there is no ranking or order but are essentially nominal in character. In such a situation, we have to construct a choice model where a set of independent variables determine the kind of occupation that an individual is engaged in. There are many models to deal with such discrete categorical responses. The most commonly used are multinomial logit and multinomial probit. However, although multinomial probit has some attractive features, including the provision of general patterns of cross elasticity, it can be applied only when there is small number (usually three) of alternatives, because for categories of more than three alternatives, its mathematical computation gets more complicated than multinomial logit (McFadden 1984, as cited in Park & Karr, 1999).

Multinomial logit model is a straightforward extension of the binary logit model. However, it is worth noting that this model suffers from the assumption that the choice probabilities implied by the model must satisfy an Independence of Irrelevant Alternatives (or IIA) property. This means that the ratio of probabilities of any two choices (in response categories) will be the same, regardless of what the other alternatives are. In other words, the ratio of probabilities of any two choices for a particular observation is not influenced systematically by any other alternatives.

Following Davidson et al. (1999) and Greene (2003), the relationship between the explanatory variables and the probability of a particular outcome, when the regressors do not vary over choices, can be specified as follows,

$$P_{ij} = \frac{e^{x_i\beta_j}}{\sum_{j=0}^{m} e^{x_i\beta_j}} \qquad j = 0,1,2,\cdots,m \qquad (3.1)$$

In this model, the choice probabilities are dependent on individual characteristics and the model estimates relative probabilities. Hence, for the ith respondent faced with j choices, we assume that the indirect utility of a choice is superior to other choices. In equation (3.4), Pij=0, if the individual is participating in only farm activity; Pij=1, if the individual is participating in nonfarm wage employment; and Pij=2, if the individual is participating in nonfarm self-employment.

where P is the probability of an employment of the jth choice; j is job category; e is natural logarithm; β is the vector of parameters associated with Xi independent variables to be estimated.

The number of parameters to be estimated is equal to the number of individual characteristics multiplied by the number of possible choices minus one. Each of the responses will fall into one of the categories with Pij probabilities.

Specifications of income equation:-The Tobit Model

Income from nonfarm employment is found to be zero for 53% of the sample respondents. For this type of study where the dependent variable is the share of nonfarm income in the total income, there is a possibility to encounter observations with zero value which is not due to zero income but simply caused by as a result of non-participation in nonfarm employment. Estimation of parameters of explanatory variables, that determine the participation/nonparticipation in RNFE and the income earned from it using OLS regression may come out with biased and inconsistent results (Greene, 2003;Gujarati, 2004). The bias arises from the fact that if we consider only the observable part (participants in this case) and omit the others (nonparticipants), there is no guarantee that the expected value of the error term, E(ui), will be necessarily zero. Without E(ui) = 0 we cannot guarantee that the OLS estimates will be unbiased. It is intuitively clear that if we estimate a regression line based on the observable observations only, the resulting intercept and slope coefficients are bound to be different from the results obtained with all observations considered.

Because of such restrictions in the values taken by the regress and(share of nonfarm income), a limited dependent variable regression model is more appropriate than mere use of ordinary least squares (OLS).

There are three types of regression models under the limited dependent variable models. These are censored regression (or tobit), truncated regression and sample selection regression models. Inferring the characteristics of a population from a sample drawn from a restricted part of the population is known as truncation. A truncated distribution is the part of an untruncated distribution that is above or below some specified value (Greene, 2003). Where a sample in which information on the regress and is available only for some observation is known as censored sample. Therefore, the tobit model shown in equation (3.2) is a censored regression model because it is possible to view the problem as one where observations of the dependent variable (Y*) at or below zero are censored. While truncation changes the sample size, censoring does not..

The econometric model applied for analyzing individual and household factors influencing the probability of change in income in nonfarm activity using the tobit model is shown in equation (3.2). This model is chosen because it has an advantage over the other models such as Linear Probability Model, Logistic and Probit in that it reveals the effect of the explanatory variables on household's probability of earning income from nonfarm

employment and the effect of intensity of a change on the explanatory variables on the share of income from nonfarm employment.

Following Amemiya (1985), the Tobit model can be specified as

$$Y_i^* = \beta_i x_i + u_i$$

$$Y_i = \begin{cases} Y_i^* \text{ if} Y_i^* > 0 \\ 0 \text{ if} Y_i^* \leq 0 \end{cases} \qquad \text{for } i = 1,2,\cdots,n \tag{3.2}$$

where Yi is the observed dependent variable; Yi* is the latent variable which is not observable; Xi is vector of household and farm characteristics, individual, and institutional characteristics affecting probability of earning income in nonfarm employment and the amount of income from the nonfarm employment; βi is a vector of unknown parameters to be estimated; ui are residuals assumed to be independently and normally distributed with mean zero and a common variance σ2 (i = 1,2, … n).

The zero threshold value in the model is not a very restrictive assumption, because the threshold value can be set to zero or assumed to be any known or unknown value (Amemiya, 1985). The model parameters will be estimated by maximizing the Tobit likelihood function of the following form (Amemiya, 1985and Maddala, 1997).

$$L = \prod_{y_i>0} \frac{1}{\sigma} f\left(\frac{Y_i - \beta_i x_i}{\sigma}\right) \prod_{y_i \leq 0} F\left(\frac{-\beta_i x_i}{\sigma}\right) \tag{3.3}$$

where f and F are the density probability function and cumulative distribution function of Yi*, respectively. $\prod y \leq 0$ means the income over those i for which Yi* $\leq$ 0, and $\prod y \geq 0$ means the income over those i for which Yi* >0.

Maximum likelihood estimation would use logarithmically transformed version of Equation (3.6). It may not be sensible to interpret the coefficients of a Tobit in the same way as one interprets coefficients in an uncensored linear model. Hence, one has to compute the derivatives of the estimated Tobit model to predict the effects of changes in the exogenous variables.

Greene (2003) proposed the following techniques to decompose the effects of explanatory variables into the probability and intensity effects. Thus, a change in Xi (explanatory variables) has two effects. It affects the probability that the observation will fall in positive part of the distribution and it affects the conditional mean of Yi* in the positive part of the distribution. This decomposition approach is used in this study.

The change in the probability of income change from nonfarm employment as independent variable Xi changes can be computed as:

$$\frac{\partial F(z)}{\partial X_i} = f(z)\frac{\beta_i}{\sigma} \tag{3.4}$$

The marginal effect of an explanatory variable on the expected value of the dependent variable is:

$$\frac{\partial E(Y_i)}{\partial X_i} = F(z)\beta_i \tag{3.5}$$

where $\frac{\beta i x i}{\sigma}$ is denoted by z.

The change in income with respect to a change in an explanatory variable among nonfarm income earners will be

$$\frac{\partial E(Y_i / Y_i^* > 0}{\partial X_i} = \beta\left[1 - z\frac{f(z)}{F(z)} - \left(\frac{f(z)}{F(Z)}\right)^2\right] \tag{3.6}$$

whereas F(z) is the cumulative normal distribution of Z, $f(z)$ is the value of the derivative of the normal curve at a given point (i.e., unit normal density), Z is the z-score for the area under normal curve, β is a vector of Tobit maximum likelihood estimates and σ is the standard error of the error term.

Table 1- Hypothesis and description of Explanatory variables used in the econometric models

Variable	Description	Type of the variable	expected effect on Participation	expected effect on Income level
AGE_HHD	Age of the household head in years	Continuous	Negative	Positive
EDU_HD	Education of the household head (1=at least elementary complete,0=not completed)	Dummy	Positive	Positive
SEX-HD	Gender of the household head (1=male, 0=female)	Dummy	Positive	Positive
LND_HLD	Total farm size in hectares	Continuous	Undetermined	Positive
TLV-STK	Total livestock unit owned	Continuous	Negative	Positive
ADLT	Number of family members with in the age of 14-64	Continuous	Positive	Positive
DIS_RD	Distance from all whether road in kilometers	continuous	Negative	Negative
EX_PRT	Extension contact (0=no, 1=yes)	Dummy	Undetermined	Positive
IRRGT	access to Irrigation(1-Accesed,0=No Accessed	Dummy	Negative	Positive
AGR-ECO	Agro ecology (1=middle land,0=low land	Dummy	Positive	Positive
CRDT	Amount of credit borrowed	continuous	Positive	Positive

4 RESULTS AND DISCUSSION

In the study area, the results indicate that all households derive income from farming which accounts for 78.2% total income on average. The other portion 21.4% was derived from different nonfarm activities which is different from Jayne et al.'s (2003) who reported 8.1% for Ethiopia and 40% for Kenya. Crop farming was by far the most important single source of income for the rural households, providing about 68% of total income with a participation rate of 100%. More than 60% of the sample households derived income from livestock enterprises, but income from this source was only 11.6% of total income. This suggests that the type of livestock activities is small-scale, mostly free range backyard type. In the study area 46 percent of the sample households are found to participate in RNFE. This result is quite different from the findings reported by different authors in Ethiopia. In Tigray(northern region of Ethiopia), Woldehanna and Oskam (2001) reported an 80% rate of participation while in Oromia only 25% participated in nonfarm employment (van den Berg and Kumbi, 2006), southern and central Ethiopia rural villages with a participation rate of 37% (Matsumoto et al., 2006), 57% (Beyene,2008). Difference between these rates may indicate the structural difference between the economies in these agro ecologies, although the survey year also may matter in a cross section data.

Clear picture can be captured when we disaggregate the participation into functional categories which reveals that 21% and 24.6% of the total sampled households are participated in wage employment and own business respectively. Again of those who participated in RNFE, 46.6% are wage employed and 53.4% are self-employed. However, income from each activity accounts for only 11.3% and 13% of total income, which implies that most rural households participating in the nonfarm activities are engaged in a low return business operation. The smaller contribution of non-agricultural wage income to total income could be because of the little educational and professional qualification of the rural farmers, which probably could reduce their earning from available non-agricultural activities.

Self-employed income is mainly derived from trade (own mini shop-keeping, t'chat, vegetable retailing, etc.) 34%, cooperative business (9%), food processing, brokering, milling and water pump renting (6%), extraction and selling stone (6%), food, tea & coffee preparation and selling, fire wood and charcoal selling, groundnut processing, soil brick manufacturing etc. The non-agricultural wage employment includes jobs in construction, manufacturing, civil service, PSNP and public works (22) Agricultural processing(chat and ground nut) (7%) and other unskilled daily laborer (kuli) in construction area (15%), soldiers, police and teachers each contribute only 4% of the nonagricultural wage participation.

4.1 Results of the Econometric analysis

4.1.1 Tests for Multi- linearity

Multinomial logit and tobit models were employed to estimate the effects of the hypothesized explanatory variables on the participation of rural households in RNFE level of income earned given participation in this sector. In this section, the model results are presented and discussed.

However, prior to estimation of both models, continuous and discrete explanatory variables were checked for existence of multi co-linearity and high degree of association using variance inflation factor (VIF) and contingency coefficients, respectively. In this VIF values have shown that all the continuous explanatory variables have no serious multi co-linearity problem. The results of the computation of contingency coefficients reveal that there was no serious problem of association among discrete variables For this reason, all of the explanatory variables were included to estimate the multinomial logit and Tobit models model. Both the regression models are estimated using the Maximum Likelihood Estimation Method.

4.1.2 Determinants of Participation in the Rural Nonfarm Employment in the Study Area

The dependent variable in the multinomial logit model was defined as nonagricultural self-employment, nonagricultural wage employment and agricultural (farm) employment. The multinomial model requires that a particular occupational category be designated as the numeraire against which all results should be compared. Farm occupation is chosen as the comparison group. Farm activity is a key occupation of the poor in the study area. Choosing this category for comparison purposes thus allows asking whether the other occupational categories can be regarded as systematically different in any way. This implies that parameter estimates for the categories which are included should be interpreted not as correlates of employment in a given occupational category, but as indicators of the strength of association of a particular explanatory variable with the respective occupational category relative to the same explanatory variable with farm labor (Lanjouw and Sharif, 2002). All these activities measure the probability of an individual participating in these various employment activities in the rural areas as a function of a vector of incentive and capacity variables.

The goodness of fit information of the MNL model suggest that a log likelihood ratio of 89 which follows chi square(ch^2) distribution indicate that the explanatory variables in the model explained the probability of occupational choice significantly. Moreover, the count R2 of 0.692 imply that the model correctly predicted 69.2% of occurrences of participation correctly.

Among the variables used to estimate the likelihood of participating in RNF employment, 58% of the

explanatory variables are found to significantly affect participation of households in non-agricultural wage employment and nonfarm self-employment in the study area.

The likelihood of participation in nonfarm self-employment occupation is affected by gender in Harari rural areas. However, the result is not in line with the hypothesis that female-headed households are less likely to participate in both categories because of the capacity constraints and institutional factors prevailing in the society. However, female-headed households are less likely to participate in non-agricultural wage employment than farm works compared to their male counter parts. The likelihood of participation in nonfarm wages jobs than farm works was higher for male household heads compared to females by 42%. It is significance at a 10%. However, it is interesting that female headed households tends to involve in nonfarm own business operation than farm works compared to their male counterparts in 8 % probability difference.

As expected, the effect of age of the head of the household on the probability of participating in RNF activities is found to be negative. The negative association indicates the preference of the younger households for nonfarm jobs over arduous agricultural activities in developing countries (Hossien, 1995). This is a common phenomena reported in many studies across the world (e.g., Hossien (1995) for Bangladesh; Sosina and Barrette (2009) for Ethiopia and Sancheze (2005) for Bolivia). Households' heads with one more year of age are more likely to refrain from joining the nonfarm wage jobs compared to their younger neighbors. A one year increase in age decreases significantly the probability of involvement in non agricultural wage jobs than farm works by 7%.

Education of the household head was a dummy which took a value of 1 if the head completed at least an elementary education and zero if he/she completed less than grade six. The result was somewhat mixed. Elementary education, contrary to the hypothesis which assumed positive relation, did not affect the nonfarm wage labor supply. The possible explanation for this is that most of the nonfarm wage jobs in the study area at the time of the survey did not require formal education. From the descriptive analysis we can see that around 47% of the nonfarm wage activities were unskilled jobs (guard, public works and other unskilled jobs). This result is consistent with Beyene's (2008) findings using nationally representative data from CSA. However, a look at a more functional view revealed that completing elementary education improved the probability of participation in rural nonfarm self-employment than farm employment by 8.4% compared to those who are less educated, at 1% level of significance. In the context of household livelihood strategies, this suggests that in households adopting mixed farming nonfarm strategies, members with low level of education are more likely to remain on the farm.

The other effect of capacity variable, i.e., landholding influenced the choice as expected. The negative sign for non-agricultural wage jobs shows that farmers are participating in such nonfarm activities for push reasons. This implies that, most households engaged in low earning jobs as the small farm size forces them to look for other sources of income for subsistence. Access to one unit of additional land decreases the probability of participation in wage job relative to farm works by 33% at 10% significance level. The effect of the same variable on the likelihood involving in self-employment was, however, different from this. The size of land holding is in favor of pulling the household to a non-farm sector than farm works with 10% significance level. A unit change in the size of land could raise the probability of participation in own business in contrast to farm works by 23%. Such outcome is plausible because those who have the capacity to accumulate capital from the surplus obtained from farm are pulled by the benefit from the rural nonfarm sector. This supports the view that land endowments play a key role in explaining both survival-led and opportunity-led diversification strategies (Reardon, 1998).

The influence of dependency burden of households to diversify income to a nonfarm sector is found as expected for both categories. At the household level, many children combined with few working adults imply a high consumption, which also influences the wellbeing of the household members. Hence, this subsistence pressure tends to increase the participation in self and wage employment (Glauben et al., 2005). The positive sign of the coefficient of this variable indicates that high dependency ratio increases the likelihood of participation in nonfarm jobs than a farm activity. Unit change in dependency ratio increases the likelihood of participation in nonfarm wage jobs and self-employment than farm works by 6% and 3% respectively.

For both occupation, having additional adult members in the household, measured as the number of productive age group (14-64 years of age) is a highly significant determinant for participation in nonfarm occupations, especially for nonagricultural self-employment (with 5% significance level). Addition of one adult member in the household results in a 13% and 5.2% increase in the likelihood of participation in nonagricultural wage and self-employment activities than farm activity. This implies that having a larger household, thereby having a greater labor force, gives the household the flexibility to distribute work between the farm and nonagricultural employment, and therefore have a higher capacity of diversification. This result is consistent with findings in rural Ghana (Abdulai & Delgado, 1999) and Ethiopia (Sosina, 2009).

The hypothesis that residing in a more favorable climatic and geographic environment, gives rise to more opportunities to diversify income or participate in nonagricultural employment is found to go against the finding of the study. It is interesting that the households residing in unfavorable areas (kola) raises the probability of engagement in rural nonfarm employment (in both categories) than farm activity as compared to those residing in middle land. It is significantly in less than 1% confidence level for nonfarm wage labor supply. The unexpected

sign of this variable is probably due to the fact that households in low land areas are pushed to nonfarm economic activity, especially to a less remunerative unskilled job and low return self-employments because of the subsistence pressure they face. The same result is reported by Sosina et al, (2009) in Ethiopia.

Table 2-parameter estimate of Multinomial Logit Model

	Wage Employment			Self		
|Variable	Coefficient	t-value	Margina	Coeffi	t-	Mar
Constant	-0.540(1.730)[1]	-0.312	0.001	-	1.32	-
AGR-ECO	-2.050(0.643)	-3.190***[2]	0.381	2.534(	-	0.06
SEX-HD	1.749(1.111)	1.714*	0.419	-	3.64	-
AGE_HHD	-0.108(0.034)	-3.151***	-0.069	-	-	-
EDU-HD	0.015(0.660)	0.023	0.058	1.233(	-	0.08
ADLTS	0.683(0.305)	2.239**	0.135	0.637(	1.72	0.05
DPNDRATIO	0.369(0.331)	1.782*	0.062	0.626(	2.15	0.02
LND_HLD	-0.827(0.996)	-1.731*	-0.330	3.593(	1.85	0.23
IRRGT	-0.123(0.846)	-0.145	-0.054	0.675(	3.11	0.04
TLV_STK	0.041(0.159)	0.256	0.000	0.237(	0.87	0.01
DIS_RD	-0.269(0.137)	-2.170**	-0.064	0.027(	1.55	0.01
EX_PRT	0.026(0.645)	0.040	0.013	-	0.20	-
CRDT	0.001(0.000)	1.323	0.000	0.00(0.	-	0.00
LR (X^2)=89***						
Correct predictions=69.2% , N=130						

1.1.1. Determinants of level of Income from the Rural nonfarm Employment

The results of the multinomial logit model above allowed us to understand which characteristics play an important role in determining the probability of participation in different kinds of employment. In this section, the analysis will focus on the result of the Tobit model which examines the effect of the same explanatory variables on the level of income earned from RNFE, given participation.

The income determinant function was specified in such a way that it includes the capacity (physical and human assets like land, livestock, education, age) and incentive variables that influence the intensity of income gained from the sector under consideration.

The dependent variable, income, was measured as the share of the income from the nonfarm, given participant in RNF economic activity. The tobit estimates are reported in Table 22. It was found that only six explanatory variables namely, age of the household, number of adults in the household, total cultivated land size, access to irrigation, amount of credit borrowed and total livestock owned influenced income significantly, whereas the other six did not affect even at 10% confidence level.

Table3: parameter estimates of the Estimated Tobit Model

Variable	Coefficient	Standard Error	Marginal effect	t-value
Constant	-0.116	0.131	-0.082	-0.885
AGR-ECO	0.007	0.052	0.005	0.129
SEX-HD	0.119	0.077	0.084	1.551
AGE_HHD	0.06	0.003	0.045	2.401***
EDU-HD	0.075	0.062	0.053	1.304
ADLTS	0.044	0.026	0.041	1.716*
DPND_RATIO	-0.014	0.03	-0.01	-0.455
LND_HLD	0.29	0.088	0.205	3.277***
IRRGT	0.158	0.075	0.112	2.109**
TLV-STK	0.028	0.014	0.02	1.954**
DIS_RD	0	0	0	-0.687
EX_PRT	-0.022	0.057	-0.015	-0.382
CRDT	0.012	0	0.011	1.623*

In line with the hypothesis, the age of the household head, as a measure of human capital accumulation gained from experience in the given sector, was found to positively influence the income obtained from RNFE. In magnitude, a one year additional experience in the sector raises the share of income from the non farm sector by

[1] The values in Parenthesis are Standard errors
[2] ***,**,* represents the significance at 1%,5% and 10% respectively.

4.5 % at 1% level of significance.

The number of adult members in the household, being engaged in RNF, was also found to significantly affect income, which is also in line with the hypothesis. Having additional adult member in the household would result in raising the share of income from RNF activities by 4.1% per year. Here, the mechanism is presumably that an individual from a family in which many other family members are cultivators is likely to devote himself to his nonfarm occupation rather than combine nonfarm activities with cultivation. This translates into more days worked in the nonfarm sector and higher total earnings. The result is significant at 10% significance level.

Total cultivated land was found to influence the level of income from nonfarm economic activities significantly, as expected. Having participated in RNF employment, an increase in landholding, which indicates an increase in wealth, would enable the household to obtain the capital necessary to engage in lucrative nonfarm employment through providing liquidity to start own business.

Moreover, as households with a better wealth status are more likely to be risk lovers compared to the landless or relatively very smallholders, they tend to invest in more diversified businesses (Reardon 1997, Reardon et al. 1998, Barrett et al. 2000). Likewise, access to irrigation significantly influenced the income gained from nonfarm (at 1% significance level). Households who had access to irrigation earned income 11 times higher than those who did not have access to irrigation.

Livestock holding as a wealth variable indicates the capacity of the household to involve in a high return income sources. The result reveals that although small a unit change, TLU results in a 2% marginal return from nonfarm sector, the result is as expected.

The possibility of getting access to credit solves the liquidity problem of households being fortune, for credit helps the farmers buy agricultural inputs and equipments, thereby raise productivity of farm whose income could shift to nonfarm enterprise development and also the cash obtained from credit can serve as starting business for new enterprises. The effect of this variable emerged as expected in that it influenced the income positively at 10% significance level. A 10% increase in amount of credit would result in marginal return of share of income by 11%.

5 CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Conclusions

This study has investigated the push and pull factors behind the decision of rural household's occupational choices with special emphasis on nonfarm employment in more functionally disaggregated activities, i.e., farm work, wage job and self-employment. Apart from this research question it also identified relevant household, socioeconomic, and institutional factors influencing the level of income obtained from the rural nonfarm activities. The descriptive analysis revealed that only 21% of the total household income was derived from different nonfarm activities. Crop farming provided about 68% of total income with a participation rate of 100%. More than 60% of the sample households derive income from livestock enterprises, but income from this source was only 11.6% of total income. This suggests that the type of livestock activities is small-scale, mostly free-range backyard type which lacks modern livestock husbandry practice. The same analysis showed that 46% of the sample households are found to participate in RNFE. When disaggregated the participation into functional categories, it revealed that 21% and 24.6% of the total sample households participated in wage employment and self-employment, respectively. However, income from each activity accounts for only 11.3% and 13% of total income, which implies that most rural households participating in the nonfarm activities are engaged in a low return business operation. This can be attributed to low capacity variables like education and wealth (land) in the study area.

The multinomial logit model estimated the effect of capacity and incentive variables on the participation of household in RNFE. It showed that the likelihood of earning income from nonfarm economic activities was significantly influenced by capacity variables such as wealth and human capital. Having better education achievement and landholding and access to irrigation influenced the likelihood of involving in own business (self-employment) activities positively. This result implies that households with better economic conditions are pulled to the nonfarm sector attracted by the better return from the non-agricultural sector. Having large number of adults in the household expands the probability of engaging in nonfarm wage than farm jobs in the study area. This result implies that in areas where the landholding per household is small (e.g. 0.7 hectare in the study area), the per capita land cannot afford to supply consumption for the whole year. Moreover, the small size creates a fear of being food insecure. Hence, adults in such households are pushed out to the RNF activity for survival reason and coping mechanism.

An activity choice is not always in favor of male-headed households. The estimation result showed that in the study area female-headed households are more likely to participate in self-business operation than male-headed households. This is an opportunity to ensure the equality of gender through promoting access and power for women in the region. This situation might occur due to cultural reason or subsistence pressure. The model also revealed that relatively young households tend to involve in nonagricultural jobs than farm works compared to their older peers.

The income determinant function estimated that income from nonfarm sector, given participation in RNFE, was influenced by household asset status and socioeconomic characteristics which determine productivity and access to market information. Having access to credit, better land size, livestock and number of adults in the household contribute to better earning of income from the nonfarm sector. This result suggests that wealth accumulated from agricultural income can help families invest in high-return business activities. The larger number of adult members' positive association with nonfarm income share also suggests that an individual from a family in which many other family members are cultivators is more likely to devote himself to his nonfarm occupation rather than combine nonfarm activities with cultivation. This translates into more number of days worked in the nonfarm sector and higher total earnings. Extension contact does not seem to influence the share of nonfarm income in the study area. Probably, the reason might be that extension message could spill over to the households that did not participate in extension or were contacted by extension workers.

5.2 Policy Implications

The analysis of nonfarm employment probabilities and earnings suggests that the poor are not particularly well placed to benefit from RNFE sector. Low education levels, wealth and access to credit scheme and irrigation appear to restrict access of the poor to the relatively more attractive nonfarm occupations, which are more likely to be able to lift their livelihood status.

It also suggest efforts should focus on the promotion of nonfarm opportunities that do not impose barriers to entry through provision of physical infrastructure such as roads, credit, improving educational status and improving irrigation water accessibility. These efforts can be expected not only to directly raise the income levels of the poor who gain access to such jobs but they are also likely to contribute to inequality reduction by raising the wages received by those who remain employed as non-agricultural laborers. Youth targeted rural entrepreneurship and skill development coupled with expansion of women entrepreneurship promotion should be the focus of policy makers in the study area

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