Determinants of participation and earnings in the rural nonfarm economy in Eastern Ethiopia

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ABSTRACT
This paper investigated the push and pull factors that influence the participation decision of rural households in non-farm activities (RNFA) 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 non-farm 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 non-farm activities. The result was associated with access to irrigation and implies that households with better economic condition are pulled to the non-farm sector attracted by the better return from the non-agricultural 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 rural non-farm employment (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.

Key words: Income diversification, multinomial logit, non-farm income, rural employment

RÉSUMÉ
Ce document examine les facteurs de répulsion et d’attraction qui influencent la décision de participation des ménages ruraux dans les activités non agricoles (RNA) et le revenu tiré de ce secteur. Une régression logistique multinomiale a été appliquée pour estimer la vraisemblance dans la participation des RNA et une fonction déterminante des revenus censurés (Tobit) a été estimée pour comprendre les facteurs qui influencent le revenu non agricole partagé dans la zone d’étude. Les résultats révèlent que seulement 21 % des revenus totaux du ménage étaient dérivés de différentes activités non agricoles avec un taux d’activité de 46%. Dans la catégorie des revenus fonctionnels ventilés, 21 % et 24,6 % du total des ménages échantillonnés ont participé à l’emploi salarié et à l’auto-emploi, respectivement. Toutefois, le revenu provenant de chaque activité ne représentait que 10,3 % et 11 % du revenu total. Le modèle de l’analyse multinomial logit a montré que la probabilité de gagner un revenu d’activités économiques non agricoles était significativement influencée par la capacité des variables telles que la richesse et le capital humain. Avoir une meilleure éducation, possession de terres, l’accès à l’irrigation et le nombre de membres adultes influence positivement la probabilité de participer à des activités non agricoles. Le résultat a été associé à l’accès à l’irrigation et implique que les ménages ayant une meilleure situation économique sont tirés du secteur non agricole attiré par le meilleur retour sur investissement du secteur non agricole. Les ménages dirigés par des femmes étaient plus portés à participer à leur propre entreprise que ceux dirigés par les hommes. L’estimation du
Determinants of participation and earnings in the rural nonfarm economy

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

REVIEW OF RELATED LITERATURE

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. (1998). 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; it can be wage or 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 nonfarm”. 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 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).

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) and Hossain (2004) argue that 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. On 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, 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) and 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-
Determinants of participation and earnings in the rural nonfarm economy

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; Ruben and Crex, 2003).

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 to 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., 2009). This can be represented in a mathematical formulation as follows.

Max \( U = U(C, L, E) \)

where \( U_c > 0, \ U_l > 0 \).

......................................................... (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 (\( L \)):

\[ T = F + NF + LT \] ................................. (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:

\[ C = W*NF = PQ - RX = V \] .......................... (2.3)

Following Taylor et al. (2009), 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.

\[ Q = f(F, XK, H) \] ................................. (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. (2009), optimal conditions of the above utility function can be obtained by using the Lagrangian function as shown below.

\[ r = U(C, L, E) + \lambda(T - F - NF - L) + \eta(W*NF + PQ - RX + V - C) + \delta[\beta(F, XK, H) - Q] \] .......................... (2.5)

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

\[ \frac{U'}{U'C} = \beta_{F} = \frac{W}{w} \] .......................... (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:
\[ P \times f'_x() = R \] \hspace{1cm} (2.7)

The market-wage rate should in optimum be equal to the marginal rate of substitution of leisure and consumption.

\[ P \times f'_x() \] 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.

The model above can be summarized 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,

\[ D = 0 \text{ if } W \leq Pf \times WF (P_f, R_f, E_f, K_f, H_f) \text{ or} \]
\[ D = 1 \text{ if } W > Pf \times WF (P_f, R_f, E_f, K_f, H_f, V_f) \] \hspace{1cm} (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:

\[ 0F = f(E_f, K_f, H_f, V_f) \] \hspace{1cm} (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.

**METHODOLOGY**

**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 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 was 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 ecology.

In the second stage, with the help of the list of household heads that were found in each selected PAs’ Agricultural Development Agents (DA) office, proportion of the total household heads in the each selected PAs was 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 130 sample household heads, 77 (59%) were the midlanders (Woynadega) and 53 (41%) were the lowlanders (Kolla).

**DATA ANALYSIS**

**Specification of the participation equation: The Multinomial Logit Model**

This model is specified to determine factors affecting household participation decision in nonfarm
Determinants of participation and earnings in the rural nonfarm economy

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 and 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,

\[ P_{ij} = \frac{e^{x_i^j \beta_j}}{\sum_{j=0}^{m} e^{x_i^j \beta_j}} \quad j = 0,1,2,\ldots,m \ldots \ldots \quad (3.1) \]

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

Where \( P \) is the probability of an employment of the j-th choice; \( j \) is job category; \( e \) is natural logarithm; \( \beta \) is the vector of parameters associated with \( X_i \) 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 \( P_{ij} \) probabilities.

**Specifications of income equation: The Tobit Model**

Income from nonfarm employment was 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, \( E(u_i) \), will be necessarily zero. Without \( E(u_i) = 0 \) 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

\[ Y_i^* = \beta_i x_i + u_i \]

\[ Y_i = \begin{cases} Y_i^* & \text{if } Y_i^* > 0 \\ 0 & \text{if } Y_i^* \leq 0 \end{cases} \quad \text{for } i = 1, 2, \ldots, n \quad (3.2) \]

Where \( Y_i \) is the observed dependent variable; \( Y_i^* \) is the latent variable which is not observable; \( X_i \) 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; \( \beta_i \) is a vector of unknown parameters to be estimated; \( u_i \) are residuals assumed to be independently and normally distributed with mean zero and a common variance \( \sigma^2 \) (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).

\[ L = \prod_{y_i \leq 0} \frac{1}{\sigma} f\left( Y_i - \frac{\beta_i x_i}{\sigma} \right) \prod_{y_i \geq 0} F\left( -\frac{\beta_i x_i}{\sigma} \right) \quad (3.3) \]

Where \( f \) and \( F \) are the density probability function and cumulative distribution function of \( Y_i^* \), respectively. \( \prod_{y_i \leq 0} \) means the income over those \( i \) for which \( Y_i^* \leq 0 \), and \( \prod_{y_i \geq 0} \) means the income over those \( i \) for which \( Y_i^* > 0 \).

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 \( X_i \) (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 \( Y_i^* \) 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 \( X_i \) changes can be computed as:

\[ \frac{\partial F(z)}{\partial X_i} = f(z) \frac{\beta_i}{\sigma} \quad \text{........................ (3.4)} \]

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

\[ \frac{\partial E(Y_i)}{\partial X_i} = F(z) \beta_i \quad \text{........................ (3.5)} \]

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

\[ \frac{\partial E(Y_i/Y_i^* > 0)}{\partial X_i} = \beta_i \left[ 1 - \frac{z}{F(z)} \right] \quad (3.6) \]

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, \( \beta_i \) is a vector of Tobit maximum likelihood estimates and \( s \) is the standard error of the error term.

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 the findings of Jayne et al. (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 were 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), and in southern and central Ethiopia rural villages participation rates of 37% (Matsumoto et al., 2006) and 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.

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

Self-employed income was 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 and coffee preparation and selling, fire wood and charcoal selling, groundnut processing, soil brick manufacturing etc. The non-agricultural wage employment included 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%), working as soldiers, police and teachers which contributed only 4% of the nonagricultural wage participation.

**Results of the econometric analysis**

**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. 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 showed that all the continuous explanatory variables had no serious multi co-linearity problem. The results of the computation of contingency coefficients revealed 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. Both the regression models were estimated using the Maximum Likelihood Estimation Method.

**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 required that a particular occupational category be designated as the numeraire against which all results were to be compared. Farm occupation was chosen as the comparison group. Farm activity is a key occupation activity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Type of the variable</th>
<th>Expected effect on participation</th>
<th>Expected effect on income level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE_HHD</strong></td>
<td>Age of the household head in years</td>
<td>Continuous</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>EDU_HD</strong></td>
<td>Education of the household head (1=at least elementary complete,0=not completed)</td>
<td>Dummy</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>SEX-HD</strong></td>
<td>Gender of the household head (1=male, 0=female)</td>
<td>Dummy</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>LND_HLD</strong></td>
<td>Total farm size in hectares</td>
<td>Continuous</td>
<td>Undetermined</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>TLV-STK</strong></td>
<td>Total livestock unit owned</td>
<td>Continuous</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>ADLT</strong></td>
<td>Number of family members with in the age of 14-64</td>
<td>Continuous</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>DIS_RD</strong></td>
<td>Distance from all whether road in kilometers</td>
<td>continuous</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>EX_PRT</strong></td>
<td>Extension contact (0=no, 1=yes)</td>
<td>Dummy</td>
<td>Undetermined</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>IRRGT</strong></td>
<td>access to Irrigation (1=Accessed,0=No Accessed)</td>
<td>Dummy</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>AGR-ECO</strong></td>
<td>Agro ecology (1=middle land,0=low land)</td>
<td>Dummy</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>CRDT</strong></td>
<td>Amount of credit borrowed</td>
<td>continuous</td>
<td>Positive</td>
<td>Positive</td>
</tr>
</tbody>
</table>
of the poor in the study area. Choosing this category for comparison purposes thus allowed asking whether the other occupational categories could be regarded as systematically different in any way. This implied that parameter estimates for the categories which were included could 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 measured 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 followed the chi square (ch²) distribution indicated that the explanatory variables in the model explained the probability of occupational choice significantly. Moreover, the count R² of 0.692 implied 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 were 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 was affected by gender in Harari rural areas. However, the result was not in line with the hypothesis that female-headed households were less likely to participate in both categories because of the capacity constraints and institutional factors prevailing in the society. However, female-headed households were 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 was significance at a 10%. However, it is interesting that female headed households tended to involve in nonfarm own business operation than farm works compared to their male counterparts with 8% probability difference.

As expected, the effect of age of the head of the household on the probability of participating in RNF activities was 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 Sanchez (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 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 the Central Statistical Agency, Ethiopia (CSA). However, completing elementary education improved the probability of participation in rural nonfarm self-employment more than farm employment by 8.4% compared to those who were less educated, at 1% level of significance. In the context of household livelihood strategies, this suggested that in households adopting mixed farming nonfarm strategies, members with low level of education were 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 showed that farmers were participating in such nonfarm activities for push reasons. This implied that, most households engaged in low earning jobs as the small farm size forced them to look for other sources of income for subsistence. Access to one unit of additional land decreased 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 was 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 raised 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).
Determinants of participation and earnings in the rural nonfarm economy

The influence of dependency burden of households to diversify income to a nonfarm sector was found as expected for both categories. At the household level, many children combined with few working adults implying 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 increased the likelihood of participation in nonfarm wage jobs and self-employment than farm works by 6% and 3% respectively.

For both occupations, having additional adult members in the household, measured as the number of productive age group (14-64 years of age) was 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 resulted in a 13% and 5.2% increase in the likelihood of participation in nonagricultural wage and self-employment activities rather 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 Ghana (Abdulai and 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 was not consistent with the finding of this study. It is interesting that the households residing in unfavorable areas (kola) had higher probability of engagement in rural nonfarm employment (in both categories) than farm activity as compared to those residing in middle land. 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 was reported by Sosina et al. (2009) in Ethiopia.

Determinants of level of income from the rural nonfarm employment

The results of the multinomial logit model above helped to clarify which characteristics played 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 examined the effect of the same explanatory variables on the level of income earned from RNFE given participation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wage Employment</th>
<th>Self Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.540(1.730)</td>
<td>-3.306(1.639)</td>
</tr>
<tr>
<td>AGR-ECO</td>
<td>-2.050(0.643)</td>
<td>2.534(0.696)</td>
</tr>
<tr>
<td>SEX-HD</td>
<td>1.749(1.111)</td>
<td>-0.301(0.805)</td>
</tr>
<tr>
<td>AGE_HHD</td>
<td>-0.108(0.034)</td>
<td>-0.121(0.036)</td>
</tr>
<tr>
<td>EDU-HD</td>
<td>0.015(0.660)</td>
<td>1.233(0.743)</td>
</tr>
<tr>
<td>ADLTS</td>
<td>0.683(0.305)</td>
<td>0.637(0.295)</td>
</tr>
<tr>
<td>DPNDRATIO</td>
<td>0.369(0.331)</td>
<td>0.626(0.295)</td>
</tr>
<tr>
<td>LND_HLD</td>
<td>-0.827(0.996)</td>
<td>3.593(1.154)</td>
</tr>
<tr>
<td>IRRGT</td>
<td>-0.123(0.846)</td>
<td>0.675(0.774)</td>
</tr>
<tr>
<td>TLV_STK</td>
<td>0.041(0.159)</td>
<td>0.237(0.153)</td>
</tr>
<tr>
<td>DIS_RD</td>
<td>-0.269(0.137)</td>
<td>0.027(0.132)</td>
</tr>
<tr>
<td>EX_PRT</td>
<td>0.026(0.645)</td>
<td>-0.169(0.647)</td>
</tr>
<tr>
<td>CRDT</td>
<td>0.001(0.000)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

LR ($X^2$) = 89***

Correct predictions = 69.2%, N = 130

1 The values in Parenthesis are Standard errors
2 ***,**,* represents the significance at 1%,5% and 10% , respectively
The income determinant function was specified in such a way that it included 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 presented in Table 3. 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 had no significant effect even at 10% confidence level.

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 raised the share of income from the nonfarm sector by 4.5% at 1% level of significance.

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 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. On the other hand, while livestock holding as a wealth variable indicated the capacity of the household to involve in a high return income sources, however, the result revealed a small unit change of a 2% marginal return.

The possibility of getting access to credit solves the liquidity problem of households because credit helps the farmers buy agricultural inputs and equipments, thereby raising 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%.
Determinants of participation and earnings in the rural nonfarm economy

CONCLUSIONS AND POLICY IMPLICATIONS

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. It identified relevant household, socioeconomic, and institutional factors influencing the level of income obtained from the rural nonfarm activities in the study area. 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 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 was small-scale, mostly free-range backyard type which lacked modern livestock husbandry practice. The same analysis showed that 46% of the sample households are found to participated in RNFE. The results showed that 21% and 24.6% of the total sample households participated in wage employment and self-employment, respectively. However, income from each activity accounted for only 11.3% and 13% of total income, which implies that most rural households participating in the nonfarm activities were 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 RNFE 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 were more likely to participate in self-business operation than male-headed households. This is an opportunity to promote greater women participation in the region. 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/herself to his/her 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, extension message could spill over to the households that did not participate in extension or were contacted by extension workers.

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, and limited 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 improve their livelihood status.

It also suggests that 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 nonagricultural 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.
ACKNOWLEDGMENT
The authors thank Harari Bureau of Agriculture for assistance in collecting the data. They also thank Dr. Hussien Hamda for his valuable technical advice in the course of this research.

STATEMENT OF NO CONFLICT OF INTEREST
We the authors of this paper hereby declare that there are no competing interests in this publication.

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