The Determinants of Off-Farm Employment and the Impact of Off-Farm Employment on Food Consumption in Rural Ethiopia

By

Mhbuba Ahmad Shifa

Thesis

Submitted to the Faculty of Commerce, School of Economics

In Partial Fulfilment of the Requirements for the Degree of

Masters in Economic Science

SUPERVISOR: Murray Leibbrandt

University of Cape Town

December 2010

DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature: ----------

Date: ----------

ACKNOWLEDGEMENT

I would like to thank my supervisor, Murray Leibbrandt, for his continues and very useful guidance and support throughout my thesis with his patience and knowledge.

ABSTRACT

This study analyses the determinants of off-farm employment in rural Ethiopia using a representative sample farm households from four regions of the country. Very few previous regional case studies assess the impact of off-farm employment on household food consumption. To fill this gap the study goes on to examine the impact of participation in off-farm employment on household food consumption controlling for possible endogenous treatment selection bias. The probability of participation in off-farm employment significantly increases with increased household size and with negative income shocks. On the other hand, better farm income and plot size significantly decrease the probability of diversification into off-farm employment. The estimation results from the consumption equations suggest that households with better income, asset holdings and other farming characteristics have higher household per capita food consumption. Participation in off-farm employment is associated with less household per capita food consumption. Combining the estimation results, the main findings of this study suggest that off-farm employment in rural Ethiopia is mainly motivated by "push" factors rather than "pull" factors. Therefore, the development of rural non-farm employment opportunities has to be considered to reduce the prevalence rural poverty in Ethiopia.

TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

Ethiopia is a country in which more than 85% of the population live in rural areas. Agriculture is the dominant economic activity, as it accounts for about 84% of the total employment, around 50% of the total GDP and 90% of the total export earnings. However, the majority of the farmers are subsistence farmers. Smallholder farming constitutes around 90% of the total cultivated land area in the country and average per capita cultivated land holding is around 0.5 hectare (MoFED, 2007). For decades, the country has faced serious challenges in terms of poverty, unemployment and food security. The proportion of the population living below the poverty line is estimated to be 38.7% at national level[1]. Moreover, with an estimated annual population growth rate of about 2.6%, around 51% of the population is in the labour force while there are no adequate employment opportunities to absorb the existing labour force (MoFED , 2007).

So far, the current government of Ethiopia has implemented several policy instruments to reduce poverty and achieve sustainable food security in the country. Since 2005/06, the government adopted a five-year strategic plan for development entitled "A Plan for Accelerated and Sustained Development to End Poverty (PASDEP)". Accelerated economic growth and job creation are among the main strategies of PASDEP. In a country, where about 84% of the total employment involves mainly subsistence farming, rapid economic growth and poverty reduction require a significant increase in agricultural productivity. However, in reality the growth in agricultural productivity in Ethiopia is unsatisfactory relative to its rapid population growth (World Bank, 2007). In addition, growing problems of land shortage, land degradation and little technological progress in the agricultural sector create significant challenges in any attempt to reduce rural poverty and achieve food security.

There have been several studies, which emphasise the significance of income diversification of farm households into non-farm activities in order to reduce rural poverty (Block & Webb, 2001; Swinton et.al, 2001; Pender et al., 1999). Despite its potential role, the development of non-farm enterprises in rural Ethiopia is also unsatisfactory; being mainly characterized by stagnant performance, high market fragmentation and provides only self-employment opportunity (Loening et al., 2008). Diversification of farm households into off-farm wage

[1] MoFED 2004/05 estimate, measured by the poverty head count index.

employment is also restricted due to a lack of local off-farm employment opportunities in Ethiopia (Shiferaw et al., 2004). In addition, most available income diversification sources for rural households are directly related to local agricultural activities (Dercon, 2004). As a result, any shock that affects agricultural output will also simultaneously affect other income sources of farm households (Ellis, 1998).

Such challenges require effective government policy to encourage the development of non-farm employment opportunities for rural households in addition to the need to improve agricultural productivity in order to reduce rural poverty. Having strong and up to date empirical evidence on both the characteristics and the determinants of off-farm employment is important to implement appropriate development policy instruments in the area. There are limited number of studies that analyse the determinants of off-farm employment and the impact it has on household food consumption in Ethiopia. In addition, pervious findings are based on regional case studies except the study by Lemi (2006). The main objective of this study is to analyse the determinants of off-farm employment and the effect of participation in off-farm employment on food consumption in rural Ethiopia. The study used a representative household sample data from the 2009 Ethiopian Rural Household Survey.

The next section provides surveys of the literature review. Section 3 deals with description of the data used in the analysis and provides an overview of the key characteristics of off-farm employment activities in rural Ethiopia. Section 4 set out the estimation framework for the empirical analysis. Estimation results are discussed in section 5. The final section conclusions the paper with summary of the main findings and proposed policy recommendations.

2. LITERATURE REVIEW

2.1 The Determinants of Off-farm Employment

Theoretical farm household models suggest that individuals supply labour into off-farm employment as long as marginal return from off-farm employment is greater than the marginal return working on their own farm (Behrman, 1999). However, in practice various social and economic arrangements of a country also play a significant role in family labour supply decisions of farm households. The literatures on income diversification provide two factors as main reasons for income diversification in rural areas: the "push" or "pull" factors. Relative profitability of off-farm employment is considered as a "pull" factor. Risk and seasonality of agricultural productivity, inadequate farm income, absence or failure of factor input and credit markets are among the "push" factors (Reardon, 1997; Ellis, 1998; Barrett et al., 2001).

In general, off-farm labour supply decisions of farm households depend on household specific characteristics, farm attributes, local labour market conditions and local and overall economic conditions of a given country. However, there is no consensus on how such factors affect off-farm labour supply decisions of farm households in a particular area. It is possible that a given factor can have different impact over time and across households (Ellis, 1998). Some of the basic determinants of off-farm employment participation decisions that have been documented in the literature are discussed below:

Risk and Income Shocks

Agricultural activities in developing countries rely heavily on weather conditions that make agricultural output seasonal and risky. Risk averse individuals tend to diversify their portfolio holdings to minimize seasonality effects and risks associated with agricultural productivity. As a result, poor households are expected to diversify more as risk aversion decreases with increase in wealth (Ellis, 1998). However, entry barriers and lack of off-farm wage employment opportunities do not allow poor households to diversify their portfolio holdings as desired (Ellis, 1998; Reardon et al, 2001; Woldehanna et al., 2001). Using data from Ethiopia, Webb et al. (2001) showed that households with relatively higher income are associated with more diversification away from crop production suggesting entry barrier constraints for poor households.

Some studies suggest that risk mitigation cannot be a significant factor in explaining the existing income diversification patterns in Africa (Barrett et al., 2001). However, the effect of risk on income diversification is not conclusive in the case of Ethiopia. The study by Dercon and Krishnan (1996) suggests that risk is not a significant factor in explaining household income diversifications in Ethiopia and Tanzania. They argue that location; differences in ability and access to credit are more important factors than risk. But, the finding from Webb et al. (2001) indicates that increased perception of risk is associated with subsequent diversification. On the other hand, using quality of land as an indicator of risk, Lemi (2006) shows that poor land quality, in other words higher risk, is associated with less off-farm employment participation. He justifies this by arguing that households with poor land quality need to spend more time on the farm to secure food for subsistence. His result, could also suggest that return from off-farm income is not satisfactory relative to farm income in rural areas. The inconclusive result on the effect of risk on income diversification could be due to the use of different variables as indicator of risk in these studies.

Negative income shocks are documented as important factors in affecting off-farm labour supply of farm households. Empirical studies in developing countries show that farm households' labour supply into labour markets increases in response to idiosyncratic negative income shocks (Skoufias, 1993; Kochar, 1999; Rose, 2000; Webb et al., 2001). Similar results are also found in the case of developed countries. Using data from the United States, Kwon et al. (2006) show that off-farm labour supply for wives increase following idiosyncratic adverse income shocks to their farm income.

Education

Theoretically, the probability of off-farm labour supply of farm households is expected to increase with education. Several studies find strong evidence that education is among one of the factors which determine off-farm labour supply of farm households, particularly for female household members. Empirical evidence from developed countries suggests a significant positive relationship between education and off-farm labour supply of farm households (Sumner, 1982; Huffman and Lange 1989; Tokle and Huffman 1991; Mishra et al., 2008). Similar results are also found in some developing countries (Delgado & Abdulai, 1999; Reardon et al., 2001).

However, contrary to expectations, a study by Beyene (2008) suggests that although other human capital variables such as health and training on handicraft skills have a significant

positive effect on off-farm employment, education of farm household members has no effect on the probability of off-farm employment in Ethiopia. He argues that this could be the case since most off-farm activities in rural Ethiopia do not require formal education. The result is consistent with findings from previous studies in Ethiopia (Maertens, 2000; Woldehanna et al., 2001). These studies give an important insight as they show that a given factor could have different effects on different types of off-farm employment activities in the country. The study by Maertens (2000) in particular shows that education has a significant positive effect only for off-farm employment in skilled labour and trade sectors while it has a significant negative impact on agricultural wage-employment in Ethiopia.

Market conditions

Local output and labour market conditions are also important factors that affect off-farm employment participation of farm households. A study by Tokle and Huffman (1991) shows that off-farm labour supply decisions of farm households in the USA increases with expected decline in farm output price and decreases with high unemployment rate. Woldehanna et al. (2001) show that an increase in farm output significantly increases the probability of off-farm self-employment while significantly decreasing labour supply into wage employment. In contrast, low farm income is positively associated with diversification into wage employment. The authors suggest that in the presence of credit market constraints farm households use profit from farm output to overcome liquidity constraints to start a new business (self-employment). But, increase in farm output increases an individual's reservation wage and their demand for leisure (assuming leisure is a normal good) which leads to lower wage employment. In Ethiopia, diversification of poor households into off-farm wage employment is also restricted due to a lack of local market employment opportunities (Shiferaw et al., 2004).

Furthermore, availability of credit, transfer income and infrastructure are also important factors, particularly in the case of developing countries. Availability of credit and infrastructure increase the likelihood of off-farm employment of farm households (Delgado & Abdulai, 1999; Abdulai et al., 2001; Reardon et al., 2001; Maertens, 2000 and Beyene, 2008). Diversification into off-farm self-employment needs some kind of initial capital.

Therefore, a binding credit constraint is expected to have a significant negative impact on off-farm self-employment as entry barriers are high for self-employment (Woldehanna et al., 2001; Ellis, 1998; Barrett et al., 2001). In the case of Ethiopia, Maertens (2000) shows that

being a member of "Eqqub"[2] increases the probability of off-farm self-employment (crafts and trade) significantly while it does not affect the probability of participation in other types of off-farm employment activities. The above findings suggest that although there could be an incentive for a given farm household to diversify income because of various reasons, the development and functioning of local output, credit and labour markets are important factors in determining the capacity of diversification for a given household.

Household Size and Asset Holdings

Household asset holdings, composition and size of household demographic characteristics are also suggested as important determinants of family labour supply of farm households. In most developing counties family labour is an important and easily available disposable resource for poor farm households to maximize their utility. In this regard, the probability of participation in off-farm employment is expected to increase with family size and decrease with number of dependents in a household. On the other hand, more farm assets are expected to decrease the probability of participation in off-farm employment. Using sample households from the Northern part of Ethiopia, Woldehanna et al. (2001) show that large family size and small land size significantly increase labour supply into off-farm wage employment.

In general, the empirical results from previous studies in Ethiopia suggest that farm size, livestock holding, composition and size of household demographic characteristics are the main factors that determine the decision to participate in off-farm employment in rural areas (Lemi, 2006; Maertens, 2000; Woldehanna et al., 2001). Households with small land size and large family size participate more in off-farm employment. On the other hand, education level of household members has little significant effect on the probability of participation in off-farm employment. The significance of household demographics could suggest that family labour is the only available disposable resource for farm households in rural Ethiopia.

2.2 The Impact of Off-farm Employment on Food Consumption

Farm households maximize their utility subject to total income and time constraints. Total income of farm households is derived from both farm and off-farm activities (Huffman,

[2] "Eqqub" is a common practice in Ethiopia, where individuals create some association (group) and rise funding for their investment and/or other cash needs. For example, if 10 people participate in groups each one will pay some amount of cash. Then they will withdraw a lottery each week, month ...etc and the guy who wins the lottery will take the lump sum money. They will continue in similar way until all the participants get the lump sum money. The amount of money will be different across different groups.

1980). As a result, off-farm employment is expected to affect consumption and investment decisions of farm households through its effect on agricultural and non-agricultural income. A number of studies show that farm households use off-farm employment as a strategy to reduce overall income variation and smooth consumption (Mishra et al., 2001; Kwon et al., 2006). A study by Reardon et al. (1992) in Burkina Faso shows that income diversification is associated with higher income and consumption and more stable income and consumption patterns. Chang and Mishra et al. (2008) analysed the impact of off-farm employment on food expenditure using data from sample of farm households in the USA. Their results suggest a positive relationship between a farm operator's off-farm work decision and food consumption, while a spouse's decision is negatively associated with expenditure on food.

In the case of Ethiopia, using caloric food intake and income changes as a measure of well-being Webb et al. (2001) show that poor households gain from diversification. Lemi (2006) analyses the role of off-farm employment on poverty dynamics in rural Ethiopia. He uses poverty indices to compare poverty profiles among households with off-farm employment participants and without off-farm employment. His results show a higher poverty rate for households without off-farm employment compared to those with off-farm employment suggesting that off-farm employment has a poverty reducing effect. However, the result cannot be conclusive, as other household characteristics that determine household poverty are not considered in the analysis.

Except the study by Lemi (2006), the existing few studies analysing the determinants of off-farm employment and the welfare implication of off-farm employment in rural Ethiopia are based on regional case studies which use small sample sizes. Therefore, the main objective of this study is to add to these literatures by analysing the major determinants of off-farm employment and the impact of participation in off-farm employment on household food consumption in rural Ethiopia using data from representative sample of farm households. The methodology used is similar to the one adopted by Chang and Mishra (2008) in their study to analyse the impact of off-farm employment on food consumption in the USA.

3. DATA AND DESCRIPTIVE STATISTICS

3.1 Data

The data source for this study is the 2009 Ethiopian Rural Household Survey, which has been made available by the Economics Department, Addis Ababa University, and the Centre for the Study of African Economies, University of Oxford and the International Food Policy Research Institute.[3] The survey covers four large regions of the country: Tigray, Amhara, Oromia and SNNP (Southern Nations, Nationalities and Peoples) in order to account for the existing different farming systems in the country. Random samples of 1577 households were selected from 21 peasant associations which found in 18 different Woredas[4]. A single peasant association is selected from all Woredas except in the case of one Woreda where 4 peasant associations were selected.

The data set has information on type of off-farm activities, value of farm output, farm and non-farm income, household consumption and other demographic characteristic of household members. The data set has detailed information on household food consumption which includes amount of cash expenditure on food (including prepared food), food consumed from own stock and food consumption from gifts. Amount of food consumption from own production and gifts are not expressed in monetary values. Moreover, quantities are expressed using different local traditional measurement units. To get the value of household food consumption, first I converted local measurement units into standard metric units using the data for unit conversion factors. Then, I have used Woreda level average unit values as price estimates to get value figures, assuming a constant price per Woreda[5]. Unit value prices are calculated from available information on expenditure and quantity of consumption from the data set. Similar procedure is applied to get value of payments made in kind and transfer income[6].

[3] Funding for data collection was provided by the Economic and Social Research Council (ESRC), the Swedish International Development Agency (SIDA) and the United States Agency for International Development (USAID); the preparation of the public release version of these data was supported, in part, by the World Bank. AAU, CSAE, IFPRI, ESRC, SIDA, USAID and the World Bank are not responsible for any errors in these data or for their use or interpretation.

[4] Woreda is a lower administrative unit which includes a number of peasant associations.

[5] This approach is used by Strauss (1982). However, as Detone (1997) argues price estimates obtained in this way do not account for different quality of a give commodity. Therefore, this must be taken into account when interpreting estimation results.

[6] Woreda level output prices are available in the data set and are used to get values for all payments made in kind.

In this study, consumption from own stock and gifts is mainly restricted to consumption of major cereals. This ignores consumption of spices, vegetables and beverages that are expressed in kind for all households due to the problem of getting appropriate conversion factors to convert local traditional measurement units into standard units. However, monetary expenditure on all kind of food consumption is included. The analysis is also restricted to households that have information on crop production.

3.2 Descriptive Statistics

Farm households mainly diversify labour into both agricultural and non-agricultural employment activities. In some of the literature, off-farm employment refers to agricultural wage employment (which includes traditional labour sharing) against cash or kind payments whereas non-farm employment refers to employment in non-agricultural activities (Ellis, 1998). According to the given data set, off-farm employment is defined at the household level if any member of a given household works off the household's farm land on any kind of employment activity against payment in kind or cash. The participation period refers to both participation in 12 months and 4 months before the survey day. For the purpose of this study, off-farm employment refers to any type of off-farm employment activity, which includes both working on non-agriculture activities (including self-employment) and agricultural wage employments during four months before the survey day[7].

Table 1 presents the descriptive statistics for variables included in the analysis. About 44% of farm households have reported participation in off-farm wage employment during four months before the survey day. Participation in off-farm self-employment is reported by 40% of farm households.

[7] Information on off-farm payment is available only for off-farm employment activity during four months before the survey day.

Table 1: Descriptive Statistics for the Variables Used in the Analysis

Variable	Description	Number	Mean	Std. Dev.
Overall Off-farm emp	Over all Off-farm employment	1449	0.66	0.48
Off-farm wage emp	Off-farm wage employment	1449	0.44	0.50
Off-farm self-emp	Off-farm self employment	1449	0.40	0.49
Age_head	Age of household head	1448	52.30	14.78
Education_head	Education level of household head	1446	2.00	3.00
Total_hhsize	Total household size	1448	5.88	2.56
Individuals_age15	Number of individuals with age < 15	1448	2.39	1.84
Individuals_age65	Number of individuals with age > 65	1448	0.33	0.55
Farm_size	Household plot size	1447	1.59	1.37
Per_plot	Per capita land size	1446	0.30	0.27
Plot_size	Log of plot size	1447	0.83	0.48
HH_Asset	Household asset value	1449	3119.97	9052.57
Asset_value	Log asset value	1449	8.56	1.46
HH_income	Total household income	1449	5231.90	7940.99
Per_income	Per capita household income	1448	934.43	1389.30
Income	Log per capita income	1448	6.28	1.11
off_farminc	Total off-farm income	1449	844.32	2407.34
own_farminc	Total farm income	1449	4387.58	7223.18
Income_ratio	Ratio of off-farm income to farm income	1431	1.20	4.69
M-consm	Monthly household food consumption	1437	973.88	872.21
Per_cons	Per capita household food consumption	1448	204.17	360.76
Own_cons	Share of food consumption from own production	1227	0.577	0.246
Exp_Share	Share of food expenditure from total consumption	1573	0.461	0.304
Consumption	Log per capita food consumption	1445	4.95	0.77
Food_shortage	=1 If a hh had food shortage problem	1446	0.58	0.49
Store_crop	=1 If a household store crops currently	1441	0.84	0.37
Oxen_problem	=1 if had problem of getting oxen on time	1445	0.20	0.40
Health_problem	=1 if health Problem	1445	0.15	0.35
Labor_problem	=1 if had problem of getting labour supply	1445	0.09	0.28
Fertilizer_problem	=1 if had problem of getting fertilizer	1438	0.22	0.41
Direct_Support	=1 if a hh receive direct transfers	1435	0.09	0.29
Eqqub	=1 if a hh is a member of Eqqub	1448	0.14	0.35

Source: own calculations using data from the 2009 Ethiopian Rural Household Survey.

In addition, about 16% of farm households have participated in both off-farm wage and off-farm self-employment activities. About 66% farm households have individual participants in either off-farm wage employment or off-farm self-employment. The overall participation rate is significantly increased compared to a participation rate of 23.6% in 1997 (Lemi, 2006).

Farm households have household heads with a mean age of 52 and a mean education level of grade two. The estimated average household size is about 5.88 with mean per capita plot size being around 0.3 hectares only. These figures reflect the prevalence of small holder subsistence farming activities in Ethiopia. Households were asked whether they had experienced any food shortages during the 12 months preceding the survey day. About 58% of farm households reported that they had experienced food shortages, though the numbers of months with food shortage vary across households. A problem with getting oxen on the right time for agricultural production is reported by 20% of farm households whereas 15% of households reported a problem of getting outside labour supply and 22% of them had problem of getting fertilizer during the same period.

Yearly average household total income is estimated to be 5232 Birr with an average per capita income of 934.43 Birr[8]. The total household income includes income from off-farm employment, farm income and transfer income. Farm income includes income from crop sales and income from sales of livestock and livestock outputs. Farm income is a more important source of income in rural areas as average farm income is more than five times greater than average non-farm income. The monthly average per capita consumption is estimated to be 204.17 Birr. Household assets consist of the value of livestock and the value of other household materials[9]. The average value of household assets is estimated to be 11,433 Birr. The data on income, consumption and asset values show considerable variation across households. For this reason, a log of each of these variables is used in the estimation equations.

.

3.3 The Characteristics of Off-Farm Employment in Rural Ethiopia

Table 2 shows participation of individuals in off-farm employment by activity type. It can be seen that traditional labour sharing is the prominent kind of off-farm wage employment which constitutes about 33.6% of off-farm wage employment in rural areas. The second major employment activity is religious work followed by agricultural wage employment (against kind or cash payment) contributing about 22 and 15 percent of off-farm wage employment, respectively. Participation in professional work such as teaching constitutes

[8] The median income is 559.2 Birr. And the poverty line calculated by the government is 1075 Birr per adult per year. This implies the average household income in rural area is below the poverty line.
[9] These do not include house values and land.

only 1.94% of off-farm wage employment in rural areas. Other activities are mostly related to domestic work which includes domestic servants and guards.

Table 2: Participation in Off-farm Employment by Kind of Activity

Kind of off-farm employment	Number	Percentage
Wage employments (cash or in kind payments)		
Traditional labour sharing [a]	450	33.63
Religious work	295	22.05
Farm wage employment	202	15.1
Unskilled non-farm worker	160	11.96
Food- for –work	110	8.22
Skilled labourer	36	2.69
Professional work	26	1.94
Others	59	4.41
Total	**1338**	**100**
Self-employment		
Trade in grain/ general trade	249	26.92
Collecting, selling firewood or dung cake	145	15.68
Brewery of local alcohols	143	15.46
Trade in livestock/livestock products	94	10.16
Handicraft, pottery	91	9.84
Weaving/spinning	53	5.73
Transport (by pack animals)	42	4.54
Milling	31	3.35
Traditional healer/religious teacher	29	3.14
Others	48	5.16
Total	**925**	**100**

[a] Traditional labour sharing refers to farm work.

Source: Own calculation using data from the 2009 Ethiopian Rural Household Survey.

From Table 2, it is clear that more than 50% of off-farm wage employment activities directly involve working on agricultural activities of which 33.6 % is traditional labour sharing. Moreover, these traditional labour sharing activities are not associated with any kind of cash or in kind payments during the participation period. Lack of agriculture wage employment is consistent with the fact that smallholder subsistence farming is the dominant farming activity in rural Ethiopia where average per capita cultivated land is less than 0.5 hectares (MoFED,

2007). Regarding rural off-farm self-employment activities, about 27% of individuals participate in activities that involve grain and other general trades. Selling firewood or dung cake contributes 15.68% of off-farm self-employment followed by brewing of local alcohol which contributes 15.46% of off-farm self-employment. Brewing of alcohol and sales of firewood are employment activities that mainly involve participation of female household members. Livestock trade contributes about 10% of off-farm self-employment.

It is also evident from these figures; that more than 68% of available off-farm self-employment involves working on agricultural activities. In addition, most off-farm self-employment activities are not well developed in terms of creating employment opportunities in rural areas. The study by Loening et al.(2008) showed that non-farm enterprises in rural Ethiopia are mainly characterised by stagnant performance, which provides only self-employment.

In general, in rural Ethiopia both off-farm wage employment and off-farm self-employment are characterized by poor employment opportunities and mainly involve working on agricultural related activities. In addition, most off-farm employment activities are located within the same villages where the farm households reside. About 87% of off-farm wage employment is located in their village and only 7.7% located in another village. Similarly, around 34% of off-farm self-employment is located in their village and about 38% located in local markets.

This picture has strong implications regarding the role and significance of income diversification; especially for reducing agricultural risk and for the coping strategies adopted after idiosyncratic income shocks. It has been argued that agricultural wage employment and other employment activities which are directly related with agriculture are vulnerable to all kinds of shocks which affect agricultural production in a given area (Ellis, 1998). Therefore, the development of non-farm employment opportunities which are not highly correlated with agricultural activities are crucial in terms of reducing risks and income shocks related with agricultural output in rural areas (Ellis, 1998). There are very few of these non-agricultural non-farm employment activities in rural Ethiopia.

4. ESTIMATION FRAMEWORK

Theoretically, farm households make decisions concerning family labour supply into off-farm employment activities based on both incentive and capacity factors (Reardon, 1997). This means that conditional on the capacity to diversify, a given farm household will supply family labour into labour markets as long as the marginal return from market labour supply is greater than the marginal return from working on their own farm. As in the case of many rural areas, decisions concerning allocation of household income and other resources are made at a household level in rural Ethiopia. Table 7 in the appendix indicates the percentage of individual household members who participate in decision making on household expenditure in rural Ethiopia. For a given household, a husband or a wife makes more than 60% of the decisions regarding household income allocation. This suggests decisions regarding family labour allocation into farm and off-farm employment activities are made at a household level. Therefore, the following analysis is based on participation at a household level.

The probability of participation into off-farm employment at the household level is estimated using the standard Probit model. The specification of the Probit model is given by the following equation (Greene, 2008):

$$Z^* = X\beta + \varepsilon; \quad \text{---------- (1)}$$

$$Z = 1 \text{ if } Z^* > 0$$

$$E(\varepsilon) = 0$$

Where Z* is the latent variable which represents the propensity of participation in off-farm employment; X includes explanatory variables which affect the probability of participation in off-farm employment; Z indicates a binary dependent variable; and ε is a mean zero, normally distributed random error term. At the household level, the dependent variable assigns 1 if any member of a given farm household works in off-farm activities, during four months before the survey day. The explanatory variables in the model includes: family size, age and education level of household head; farm size; asset values; farm and non-farm incomes; and other household characteristics that can affect participation decisions in off-farm employment in rural Ethiopia (Lemi ,2006; Maertens, 2000; Woldehanna et al., 2001).

Monthly household per capita food consumption is used to analyse the welfare implication of diversification into off-farm employment activities in rural farm households. The estimation procedure is similar to the one used by Chang & Mishra (2008), in order to estimate the impact of off-farm labour supply decisions of farm households on food expenditures in the United States. Unobserved factors that affect participation in off-farm employment might be correlated with unobserved factors in the food consumption equations. Therefore, the decisions to participate in off-farm employment can be considered as endogenous treatments (Mishra et al., 2008). In this regard, the control function method is proposed as an appropriate method to estimate the endogenous treatment effect model (Vella & Verbeek, 1999).

In the first stage, a standard Probit model is used to estimate the determinants of participation in off-farm employment. Then in the second stage, ordinary least square estimation technique is used to estimate the food consumption equation with full sample, by incorporating the endogenous treatment effect. In order to control for endogenous treatment selection bias, a generalized inverse Mills ratio (GIMR) from the first stage estimation is included in the consumption equation. The following equation is estimated to analyse the impact of off-farm employment on household food consumption:

$$Y_t = X\beta + \alpha Z + \gamma\ GIMR + £ \text{---------- (2)}$$

Where, Y_t is the log monthly household per capita food consumption; X includes explanatory variables; Z is a binary indicator, which assigns 1 if a household has a member that participates in any kind of off-farm employment activities during 4 months before the survey day; GIMR is a generalized inverse Mills ratio (GIMR) from the first stage Probit estimation and £ is the random error term.

Previous studies in Ethiopia, suggested that a given factor might have different impact on different types of off-farm employment activities (Woldehanna et al., 2001; Maertens, 2000). Considering this, in this study additional analysis is provided by separating off-farm employment into off-farm wage employment and off-farm self-employment activities. To analyse the separate impact of off-farm wage and off-farm self-employment on household food consumption, a multinomial logit model is used to estimate the selection equation in the

first stage[10].Then in the second stage, the two inverse Mills ratios from the selection equation, along with the treatment effects, are included in the food consumption equation. Then the following consumption equation is estimated in the second stage using ordinary least squares estimation technique:

$$Y_t = X_1\beta_1 + \alpha_w Z_w + \alpha_s Z_s + \gamma_w GIMR_w + \gamma_s GIMR_s + \mu \quad \text{---------- (3)}$$

Where, Y_t is the log of monthly household per capita food consumption; X_1 indicates explanatory variables that affect household food consumption ; Z_w is a binary indicator, which assigns 1 if a household has an individual member that participates in off-farm wage employment activities, during 4 months before the survey day; Z_s is a binary indicator which assigns 1 if a household has an individual member that participates in off-farm self-employment activities, during 4 months before the survey day; $GIMR_w$ is the generalized inverse Mills ratio (GIMR) from estimation of off-farm wage employment equation; and $GIMR_s$ is the generalized inverse Mills ratio (GIMR) from estimation of off-farm self-employment equation.

[10] In this case, the dependent variable in the participation equation has three alternatives. In such cases, a multinomial logit model is proposed as a better alternative to estimate the selection equation in the first stage estimation (Bourguignon et al., 2004).

5. RESULTS AND DISCUSSIONS

5.1 The Determinants of Off-farm Employment

Table 3 presents the estimated marginal effects for models explaining the probability of participation in off-farm employment. The separate analyses for participation in off-farm wage employment and off-farm self-employment are included in the Table[11]. The coefficients from the multinomial logit estimates present the findings pertaining to the factors that affect the likelihood of participation in off-farm wage employment and off-farm self-employment activities, relative to the choice not to participate in off-farm work. Among household demographic characteristics, age of the household head has a significant impact only on the probability of participation in off-farm self-employment. The probability of participation in off-farm self-employment decreases initially as age of a household head increases. Woldehanna et al., (2001) get a similar result for participation decisions in off-farm wage employment. One possible suggestion from these results is that at an early age individuals are less risk averse and therefore diversify less (Weiss et al., 2005).

Although the education coefficients are positive as expected in all cases, the education level of a household head has a positive and significant effect only for participation in overall off-farm employment. A one-year increase in the education level of the household head increases the probability of participation in off-farm employment only by 1%. The weak effect of education is consistent with the fact that most off-farm employment activities in rural Ethiopia do not require formal education. As is clear from Table 1, skilled labour and professional work constitute only about 2.7% and 1.94% of the off-farm wage employment respectively. In addition, the existing off-farm self-employment activities do not require formal education. The estimation result is in line with previous findings in Ethiopia (Maertens, 2000; Beyene, 2008).

Size and composition of farm households are among the major significant factors that determine labour supply decisions of farm households into off-farm employment. Controlling for other variables, large household size significantly increases the likelihood of participation in both off-farm wage employment and off-farm self-employment activities. The likelihood of participation in off-farm employment increases by 6.7% for a unit increase in family size.

[11] The estimated coefficients are presented in Table 5 in the appendix. In the discussion part marginal effects refer only to the probability of participation in overall off-farm employment.

On the other hand, an increase in the number of dependents in the household significantly decreases the probability of participation in off-farm employment. This is consistent with the theoretical prediction that a larger family size increases available labour supply in a given household. Moreover, the fact that all land is owned by the state and the subsequent absence of a well-functioning land markets in Ethiopia, could push farm households with large family size to supply excess family labour into off-farm employment activities. However, having more children and old age individuals in the household is expected to decrease participation in off-farm employment.

In Ethiopia, animal traction power is an important input for agricultural cultivation. Although domestic animals like horses and mules are used in some areas of the country, oxen provide the main traction power in most parts of the country. The variable oxen_problem indicates whether a given farm household had a problem getting access to oxen at the right time in the previous production season. The coefficient on this variable is positive and significant in the case of off-farm wage employment and overall off-farm employment. Farm households that had a problem of getting access to oxen are 7.5% more likely to participate in off-farm employment. The results suggest that poor farm households, with constraints in agricultural inputs, participate more in off-farm wage employment activities.

Family health problems during crop production season have a negative and significant effect on participation decisions in off-farm self-employment. On the other hand, a problem of getting outside labour supply for agricultural production is associated with a lower probability of participation in off-farm wage employment. This might suggest that farm households with external labour demand do not have enough family labour for their own agricultural production. Therefore, such households might not supply family labour into off-farm wage employment activities while they can supply labour into off-farm self-employment activities.

Table 3: Predicted Marginal Effects for the Participation Equations

	Marginal Effects After Probit Model		Average Marginal Effects After Multinomial Logit Model			
	Overall off-farm emp.		Off-farm wage emp		Off-farm self-emp	
Variables	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Age_head	-0.007	-1.21	0.006	1.170	-0.010**	-2.100
Agesquare_head	0.000	0.481	0.000	-1.640	0.000**	1.900
Education_head	0.010*	1.721	0.005	1.090	0.004	0.860
Total_hhsize	0.067***	6.518	0.015	1.900	0.046***	5.330
Individuals_age15	-0.061***	-4.56	-0.023**	-2.190	-0.032***	-2.860
Individuals_age65	-0.077**	-2.315	-0.018	-0.600	-0.040	-1.330
Asset_value	-0.002	-0.103	-0.009	-0.710	0.013	0.940
Plot_size	-0.117***	-2.714	0.064*	1.750	-0.164***	-4.260
Income_ratio	0.035***	5.307	0.022***	3.800	0.040***	5.100
Eqqub_member	0.153***	4.418	-0.041	-1.150	0.180***	5.070
Oxen_problme	0.075**	2.084	0.077**	2.600	-0.016	-0.460
Health_Problem	-0.046	-1.105	0.036	1.120	-0.073***	-2.040
Labour_problem	-0.022	-0.432	-0.085*	-1.950	0.068	1.520
Fertilizer_problem	-0.009	-0.222	0.004	0.140	-0.011	-0.310
Food_shortage	0.048	1.514	0.044*	1.680	0.005	0.180
Direct_support	-0.093	-1.610	-0.072*	-1.690	0.023	0.400
Woreda2	0.024	0.214	-0.045	-0.410	0.114	0.500
Woreda3	0.134	1.517	-0.477***	-4.480	0.875***	4.310
Woreda5	-0.222*	-1.693	-0.678***	-5.130	0.735***	3.510
Woreda6	-0.14	-1.232	-0.307***	-3.080	0.453**	2.220
Woreda7	-0.054	-0.457	-0.530***	-4.840	0.753***	3.670
Woreda8	-0.119	-1.019	-0.196*	-1.930	0.310	1.480
Woreda9	0.01	0.098	-0.332***	-3.220	0.605***	2.940
Woreda10	-0.270**	-2.27	-0.494***	-4.790	0.553***	2.710
Woreda12	0.007	0.053	-0.552***	-4.620	0.782***	3.780
Woreda13	-0.128	-1.037	-0.437***	-4.200	0.611***	2.990
Woreda14	-0.079	-0.695	-0.532***	-5.150	0.740***	3.650
Woreda15	-0.07	-0.585	-0.687***	-6.030	0.858***	4.190
Woreda16	-0.092	-0.747	-0.388***	-3.710	0.578***	2.790
Woreda17	0.014	0.132	-0.368***	-3.670	0.672***	3.310
Woreda21	0.027	0.238	-0.583***	-5.040	0.856***	4.160
Woreda22	0.017	0.149	-0.504***	-4.670	0.801***	3.880
Woreda23	-0.13	-1.017	-0.452***	-4.190	0.629***	3.020

*** Significant at 1%, ** significant at 5% and * significant at 10%.
Source: Own calculation using data from the 2009 Ethiopian Rural Household Survey.

In the literature, negative income shocks are documented as important factors affecting the off-farm labour supply decisions of farm households. To account for this, a variable is included indicating whether a given farm household experienced any kind of food shortage problem, at any time 12 months before the survey day. The estimation coefficients on the Food_shortage variable are positive in all off-farm employment types, while it is significant only in the case of off-farm wage employment. This result also suggests that poor households participate more in off-farm wage employment activities, after experiencing negative income shocks. Poor farm households could be restricted from participation in off-farm self-employment activities due to liquidity constraints to start a new business.

Among farm characteristics, large farm size is associated with a lower probability of participation in off-farm employment. The predicted marginal effect indicates that a one-hectare increase in household farm size tends to decrease the probability of participation in off-farm employment by 9.8%. The result is consistent with the finding by Woldehanna et al. (2001). Their estimation results also show that labour supply to off-farm wage employment and off-farm self-employment decrease as farm size increases in the Tigray region of Ethiopia. These results could be expected in Ethiopia since all land is owned by the state and cannot be used as collateral to borrow cash. Moreover, the development of credit markets is either absent or very poor in rural areas. As a result, farm households with large farm sizes are expected to work more on their own land and less in off-farm self-employment activities, given that the return from farm work is relatively higher.

On the other hand, the higher the ratio of off-farm income to farm income is associated with a high probability of participation in all off-farm employment activities. In addition, the probability of participation in off-farm wage employment is significantly lower for households that received direct transfer supports. This means that the relative increase in farm output and getting direct transfer supports, increase an individual's reservation wage and their demand for leisure (assuming leisure is a normal good) leading to a lower off-farm employment. The result is consistent with the theoretical prediction that farm households supply labour to off-farm employment, if the marginal return from doing so is greater than working on their own farmland.

Being a member of Eqqub[12] significantly affects the probability of participation in off-farm employment activities in rural Ethiopia. Households with Eqqub membership are associated with higher probability of participation in off-farm self-employment activities. The result is not surprising as Eqqub is one-way of informal saving and raising funds for investment and other activities in Ethiopia. The finding is in line with other previous findings in Ethiopia (Maertens, 2000) suggesting farm households with relatively better sources of cash income are more likely to participate in off-farm self-employment activities.

Woreda level regional dummy variables are included in the estimations to account for location effects. Compared to Woreda1, which is found in the Tigray region of the country, the probability of off-farm wage employment participation is significantly lower except for Woreda2. But, the probability of off-farm self-employment participation is significantly higher for farm households from other regions.

5.2 The Impact of Off-farm Employment on Household Food Consumption

Two separate estimation results are provided to analyse the effects of off-farm employment on household food consumption. The first model, Consumption1, provides the effect of participation in overall off-farm employment on household food consumption. The second model looks at the separate effects of off-farm wage employment and off-farm self-employment on household food consumption. Generalized inverse Mills ratios from the participation estimations are included in the consumption equations to avoid possible endogenous treatment selection bias. The coefficient on the generalized inverse Mills ratio is significant only for participation in off-farm wage employment. The positive coefficient implies that unobserved factors that positively affect participation decisions in off-farm wage employment also have a positive impact on household food consumption. This suggests the presence of endogeneity problems between off-farm employment decisions and household food consumption.

Among others the variables which influence household food consumption are total household income and asset holdings. Increase in farm households' income and asset values are associated with higher per capita food consumption. On the other hand, the per capita food

[12] "Eqqub" is common practice in Ethiopia, where individuals create some association (group) and rise cash funding for their investment and/or other cash needs.

consumption is significantly lower for households that experienced negative income shocks during 12 months before the survey day. Household demographic characteristics are also important factors in determining household food consumption. Per capita household food consumption is significantly lower for households with large number of children that are less than 15 years of age. On the other hand, per capita food consumption increases with education level of a household head.

The main focus of these estimations is to analyse the effects of off-farm employment activities on farm households' food consumption. The estimation coefficients on the variables indicating decisions to participate in off-farm employment activities are negative and significant. This means that diversification of farm households into all off-farm employment activities are associated with less household per capita food consumption. The negative relationship might suggest that households that participate in off-farm employment activities are relatively poor with less farm income and asset holdings. But, those households with lower probability of participation in off-farm employment have sufficient asset and farm income for their food consumption.

In general, the results from this study suggest that households with a better income, asset holdings and other farming characteristics are associated with more household per capita food consumption. The per capita food consumption is lower for those households that work on off-farm employment. Combining the estimation result from the participation equation with this suggests that participation in off-farm employment could be mainly motivated due to "push" factors rather than "pull" factors in rural Ethiopia.

However, it is not straightforward to get a conclusive result on the effects of off-farm employment on household food consumption. This requires controlling for the exact motive of participation decisions and the characteristics of different off-farm employment activities in rural Ethiopia. Farm households supply family labour into off-farm employment for various reasons: to accumulate more wealth and cash income, to reduce agricultural risk or in order to survive from idiosyncratic negative income shocks, due to a lack of adequate agricultural income (Ellis, 1998). If participation in off-farm employment in rural areas is mainly motivated due to survival reasons, we expect consumption should be relatively lower for those households with off-farm employment activities. But, if the motive is mainly to

accumulate wealth and extra cash income, food consumption is expected to be higher for those households that diversify into off-farm employment activities.

In addition, the characteristics and development of off-farm employment opportunities are also important to determine how participation in off-farm employment affects household food consumption. It is clear from the data that in rural Ethiopia about 36% of off-farm wage employment is traditional labour sharing, which is not associated with any kind of payment except reciprocated labour supply on agricultural production. Moreover, the data also shows that average farm income is more than five times higher than off-farm income, suggesting the relative importance of farm income in rural Ethiopia[13]. Therefore, participation in off-farm employment cannot be necessarily associated with higher food consumption, unless participation is associated with a higher current or future household income.

[13] The median off-farm income is 260 and the median own-farm income is 2204.

Table 4: Estimation Results for the Impacts of Off-farm Employment on Food Consumption

	Consumption1		Consumption2	
VARIABLES	Coefficient	t-stat	Coefficient	t-stat
Age_head	-0.013**	-2.259	-0.005	-0.804
Agesquare_head	0.000**	2.398	0.000	0.452
Education_head	0.014**	1.979	0.021***	2.750
Individuals_age15	-0.097***	-8.757	-0.104***	-9.122
Individuals_age65	-0.021	-0.51	-0.026	-0.650
Asset_value	0.059***	3.23	0.058***	3.229
Income	0.140***	6.391	0.133***	6.045
Food_shortage	-0.106***	-2.58	-0.061	-1.390
Store_crop	0.101*	1.751	0.096*	1.692
Direct_support	0.027	0.364	0.003	0.043
Overall Off-farm emp	-0.085**	-2.254		
Off-farm wage emp			-0.011	-0.273
Off-farm self-emp			-0.066*	-1.696
Inverse mills ratio all	0.101	1.389		
Inverse mills ratio-self			-0.081	-1.305
Inverse mills ratio-wage			0.205***	3.042
Regional dummies				
Woreda2	0.100	0.503	0.047	0.264
Woreda3	-0.063	-0.383	-0.340	-1.539
Woreda5	0.164	0.966	-0.337	-1.273
Woreda6	0.281*	1.687	0.109	0.609
Woreda7	0.813***	4.808	0.483**	2.110
Woreda8	0.309*	1.908	0.211	1.278
Woreda9	0.552***	3.236	0.388**	2.082
Woreda10	0.463***	2.717	0.153	0.696
Woreda12	0.391**	2.242	0.111	0.473
Woreda13	0.169	0.96	-0.102	-0.463
Woreda14	0.828***	4.501	0.464*	1.894
Woreda15	-0.183	-1.045	-0.627**	-2.400
Woreda16	0.090	0.512	-0.143	-0.687
Woreda17	0.111	0.677	-0.096	-0.475
Woreda21	0.296*	1.706	-0.047	-0.197
Woreda22	0.301*	1.799	0.041	0.192
Woreda23	0.188	1.097	-0.082	-0.393
Constant	3.819***	15.248	3.811***	14.557
R-squared	0.339		0.330	

*** Significant at 1%, ** significant at 5% and * significant at 10%.
Consumption1- RESET test: F(3,1353)=0.78 with prob> F=0.5075 and mean VIF=5.24
Consumption2- RESET test: F(3,1351)=0.75 with prob> F=0.5230 and mean VIF=7.34
Source: Own calculation using data from the 2009 Ethiopian Rural Household Survey.

6. CONCLUSION

The objective of this study has been to examine the major determinants of off-farm employment in rural Ethiopia. In addition, the study has analysed the implications of participation in off-farm employment on household food consumption, using the data from the 2009 Ethiopian Rural Household Survey.

The main findings from this study suggest that the probability of participation in off-farm employment is relatively higher for households with lower agricultural performance and a larger family size. The higher off-farm income relative to farm income is associated with a higher probability of participation in off-farm employment activities. Farm households that experienced negative income shocks and a problem of getting agricultural inputs at the right time are more likely to participate in off-farm wage employment activities. The estimation results from the consumption equations suggest that farm households with a better income, asset holdings and other farming characteristics are associated with more household per capita food consumption. But, participation in off-farm employment activities and negative income shocks are associated with less per capita food consumption. These results could suggest that, in rural Ethiopia, it is likely that poor households diversify more into off-farm employment activities for survival reasons due to a lack of adequate farm income.

Policy Recommendations

The findings from this study suggest that participation in off-farm employment is an important means for household consumption smoothing, particularly for farm households with poor agricultural resources in rural Ethiopia. However, participation in off-farm employment for these households is restricted due to various entry barriers and a lack of well-developed wage employment opportunities. As a result, it is poor farm households that are forced to participate in off-farm employment activities with low returns and, therefore, they consume relatively less. In addition, well above 60% of the available off-farm employment activities involve working on domestic agricultural activities. This high correlation between off-farm employment opportunities and agricultural activities could pose a serious challenge for risk diversification, as agricultural output is highly volatile and depends on weather conditions in Ethiopia. This implies that policy makers should facilitate the development of non-farm enterprises and wage employment opportunities in rural areas, to reduce rural

poverty and achieve food security. The development of non-agricultural enterprises is also important as it could benefit both the demand and supply sides of the agricultural and non-agricultural sector of the rural economy. Moreover, non-agricultural enterprises, which have a lower correlation with agricultural production, could help to reduce agricultural risks. Access to financial services and development of basic infrastructures in rural areas, could be an important means to facilitate the development of small formal and informal non-farm employment opportunities.

BIBLIOGRAPHY

Abdulai, A., & Delgado, C. (1999). Determinants of non-farm earnings of farm based husbands and wives in Northern Ghana. *American Journal of Agricultural Economics*, 245-259.

Abdulai, A., & CroleRees, A. (2001). Determinants of income diversification amongst rural households in Southern Mali. *Food Policy*, 437-452.

Behrman, J. R. (1999). Labour Markets in Developing Countries. In Ashenferlter, O., & Card, D. *Hand Book of Labour Economics* (pp. 2859-2938). Elservier B.V.

Barrett, C., Bezuneh, M., & Aboud, A. (2001). Income diversification, poverty traps and policy shocks in Cote d'Ivoire and Kenya. *Food Policy*, 367-384.

Barrett, C., Reardon, T., & Webb, A. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy*, 315-331.

Beyene, A. (2008). Determinants of off-farm participation decision of farm households in Ethiopia. *Agrekon,140-159.*

Block, S., & Webb, P. (2001). The dynamics of livelihood diversification in post-famine Ethiopia. *Food Policy*, 333-350.

Loening, J., Soderbom, M., & Rijkers, B. (2008). Nonfarm Microenterprise Performance and the Investment Climate: Evidence from Rural Ethiopia. World Bank, Policy Research Paper No. 4577.

Bourguignon, F., Fournier, M., & Gurgand, M. (2004). Selection Bias Corrections Based on the Multinomial Logit Model: Monte Carlo Comparisons. *DELTA* Working Paper *No.* 2004-20.

Carswell, G. (2002). Livelihood diversification: increasing in importance or increasingly recognized? Evidence from Southern Ethiopia. *Journal of International Development*, 789-804.

De Janvry, A., Fafchamps, M., & Sadoulet, E. (1991). Peasant household behaviour with missing markets: some paradoxes explained .*The Economic Journal*, 1400-1417.

Deolalikar, A., & Vijverberg, W. (1987). A Test of Heterogeneity of Family and Hired Labour in Asian Agriculture. *Oxford Bulletin of Economics and Statistics*, 291-305.

Dercon, S., & Krishnan, P. (1996). Income portfolios in rural Ethiopia and Tanzania: choices and constraints. *Journal of Development Studies*, 850-875.

Dercon, S. (2004). Growth and shocks: evidence from rural Ethiopia. *Journal of Development Economics* , 309-329.

Deaton, A. (1997). *The Analysis of Household Surveys: A Micoeconomectic Approach to Development Policy.* Washington D.C. and Baltimore: The World Bank and Johns Hopkins University Press.

Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification. *The Journal of Development Studies, 1-38.*

El-Osta, H., Mishra, A., & Morehart, M. (2008). Off-Farm Labor Participation Decisions of Married Farm Couples and the Role of Government Payments. *Review of Agricultural Economics* , 311–332.

Goetz, S.(1992). A Selectivity Model of Household Food Marketing Behavior in Sub- Sahara Africa. *American Journal of Agricultural Economics*, 444-452.

Greene, W. H. (2008). *Econometric Analysis.* New Jersey: Prentice Hall.

Huffman, W.(1980). Farm and Off-Farm Work Decisions: The Role of Human Capital. *The Review of Economics and Statistics*, 14–23.

Huffman, W., & Lange, M. (1989). Off-Farm Work Decisions of Husbands and Wives: Joint Decision Making. *Review of Economics and Statistics*, 471–480.

Jacoby, H. (1992).Productivity of Men and Women and the Sexual Division of Labor in Peasant Agriculture of the Peruvian Sierra. *Journal of Development Economics* ,265-287.

Jacoby, H.(1993).Shadow Wages and Peasant Family Labour Supply: An Econometric Application to the Peruvian Sierra. *Review of Economic Studies*, 903-921.

Key, N., Sadoulet, E., & de Janvry, A. (2000). Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics* , 245-259.

Kochar, A. (1999). Smoothing Consumption by Smoothing Income: Hours-of-Work Responses to Idiosyncratic Agricultural Shocks in Rural India. *Review of Economics and Statistics*, 50–61.

Kwon, C., Orazem, P., & Otto, D. (2006). Off-farm labour supply responses to permanent and transitory farm income. *Agricultural Economics*, 59–67.

Lemi, A. (2006). The Dynamics of Income Diversification in Ethiopia: Evidence from Panel Data. University of Massachusetts Boston, Economics Department Working Paper No. 3.

Maertens, M. (2000).Activity portfolios in Rural Ethiopia: Choices and Constraints. A paper presented at the American Agricultural Economics Association 2000 Annual meeting.

Mishra, A., & Chang, H. (2008). Impact of off-farm labor supply on food expenditures of the farm household. *Food Policy*, 657-667.

Mishra, A., & Sandretto, C. (2001). Stability of Farm Income and the Role of Nonfarm Income in U.S. Agriculture. *Review of Agricultural Economics, 208–221.*

Mishra, A., & Goodwin, B. (1997). Farm Income Variability and the Off-Farm Labour Supply of Farmers and Their Spouses. *American Journal of Agricultural Economics*, 880-887.

MoFED (Ministry of Finance and Economic Development). 2007. Ethiopia Building on Progress: A Plan for Accelerated and Sustained Development to End Poverty (PASDEP). Annual Progress Report.

Pender, J., Place, F., & Ehui, S. (1999). Strategies for sustainable agricultural development in the East African highlands. EPTD discussion paper, International Food Policy Research Institute (IFPRI).

Reardon, T. (1997).Using evidence of household income diversification to inform study of rural nonfarm Labour market in Africa. *World Development*, 753-747.

Reardon,T., Delgado, C., & Matlon, P. (1992). Determinants and effects of income diversification amongst farm households in Burkina Faso. *Journal of Development Studies*, 264-296.

Reardon,T., Berdegue, J.,& Escobar, G. (2001). Rural Nonfarm Employment and Incomes in Latin America: Overview and Policy Implications. *World Development* ,395-409.

Rose, E. (2000). Ex ante and ex post labour supply responses to risk in a low-income area. *Journal of Development Economics*, 371-388.

Shiferaw, B., Holden, S.,& Pender, J.(2004). Non-farm income, household welfare, and sustainable land management in a less-favoured area in the Ethiopian highlands. *Food Policy*, 369–392.

Skoufias, E. (1993). Seasonal Labour Utilization in Agriculture: Theory and Evidence from Agrarian Households in India. *American Journal of Agricultural Economics*, 20–32.

Strauss, J. (1982). Determinants of food consumption in rural Sierra Leone : Application of the quadratic expenditure system to the consumption-leisure component of a household-firm model. *Journal of Development Economics*, 327-353.

Sumner, D.(1982).The Off-Farm Labour Supply of Farmers. *American Journal of Agricultural Economics*, 499–509.

Swinton, S. (2001). Strategies for Sustainable Development of Less-Favoured Areas: Discussion. *American Journal of Agricultural Economics*, 1241-1242.

Tokle, J., & Huffman, W. (1991). Local economic conditions and wage labour decisions of farm and rural non-farm couples. *American Journal of Agricultural Economics*, 652–670.

Woldehanna, T., & Oskam, A. (2001). Income diversification and entry barriers: evidence from the Tigray region of Northern Ethiopia. *Food Policy*, 351-365.

Yotopoulos, p., & Lau L. (1974). On modelling the agricultural sector in developing economies: An integrated approach of micro and Macroeconomics. *Journal of Development Economics*, 105-127.

Vella, F., & Verbeek, M.(1999). Estimating and Interpreting Models with Endogenous Treatment Effects. *Journal of Business & Economic Statistics*, 473-478.

Weiss, C., & Mcnamara, K. (2005). Farm Household Income and On–and Off-Farm Diversification. *Journal of Agricultural and Applied Economics* ,37-48.

World Bank.2007. World development report 2008: agriculture for development.

APPENDIX

Table 5: Estimation Results for the Determinants of Off-farm Employment

	Probit Estimation		Multinomial Lgit Estimation			
	Overall off-farm emp.		Off-farm wage emp.		Off-farm self-emp.	
Variables	coef	Z-stat	coef	Z-stat	coef	Z-stat
Age_head	-0.019	-1.209	0.015	0.415	-0.048*	-1.736
Agesquare_head	0.000	0.481	0.000	-1.105	0.000	1.195
Education_head	0.027*	1.720	0.051	1.564	0.042	1.464
Total_hhsize	0.190***	6.500	0.273***	4.449	0.357***	6.400
Individuals_age15	-0.171***	-4.554	-0.288***	-3.712	-0.292***	-4.097
Individuals_age65	-0.217**	-2.314	-0.278	-1.338	-0.330*	-1.882
Asset_value	-0.004	-0.103	-0.030	-0.328	0.056	0.691
Plot_size	-0.333***	-2.715	-0.036	-0.141	-0.889***	-3.797
Income_ratio[a]	0.099***	5.195	0.310***	4.430	0.342***	4.897
Eqqub_member	0.481***	3.859	0.266	0.982	1.067***	4.598
Oxen_problme	0.219**	2.001	0.562**	2.573	0.151	0.723
Health_Problem	-0.128	-1.126	0.043	0.189	-0.370*	-1.715
Labour_problem	-0.062	-0.437	-0.446	-1.467	0.179	0.674
Fertilizer_problem	-0.024	-0.223	-0.001	-0.004	-0.057	-0.278
Food_shortage	0.135	1.521	0.364**	1.970	0.178	1.070
Direct_support	-0.253*	-1.667	-0.492*	-1.729	-0.080	-0.239
Regional dummies						
Woreda2	0.069	0.211	0.020	0.035	0.615	0.481
Woreda3	0.426	1.307	-0.899	-1.439	4.287***	3.694
Woreda5	-0.580*	-1.748	-2.962***	-3.780	2.682**	2.308
Woreda6	-0.374	-1.284	-0.944*	-1.840	2.018*	1.772
Woreda7	-0.150	-0.469	-1.725***	-2.759	3.292***	2.852
Woreda8	-0.318	-1.061	-0.534	-1.032	1.430	1.229
Woreda9	0.030	0.097	-0.640	-1.161	2.955**	2.566
Woreda10	-0.703**	-2.306	-2.099***	-3.741	2.073*	1.814
Woreda12	0.019	0.053	-1.804**	-2.407	3.413***	2.871
Woreda13	-0.341	-1.082	-1.454**	-2.503	2.648**	2.301
Woreda14	-0.214	-0.718	-1.781***	-3.146	3.200***	2.811
Woreda15	-0.191	-0.604	-2.620***	-3.943	3.478***	3.014
Woreda16	-0.249	-0.776	-1.174**	-2.050	2.587**	2.223
Woreda17	0.039	0.131	-0.704	-1.302	3.285***	2.879
Woreda21	0.078	0.234	-1.802***	-2.621	3.810***	3.265
Woreda22	0.049	0.147	-1.360**	-2.168	3.699***	3.152
Woreda23	-0.347	-1.061	-1.516**	-2.538	2.719**	2.326
Constant	0.790	1.393	0.170	0.143	-2.663*	-1.822
Log-likelihood	-785.85			-1249.8		
McFadden R^2	0.157			0.256		

Note: *** Significant at 1%, ** significant at 5% and * significant at 10%.

Table 6: Separate Probit Estimates for Factors Affecting Off-farm Employment Participation.

	Overall off-farm emp		Off-farm wage emp		Off-farm self-emp	
Variables	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Age_head	-0.019	-1.209	-0.002	-0.124	-0.028*	-1.805
Agesquare_head	0	0.481	0	-0.638	0	1.538
Education_head	0.027*	1.72	0.029**	2.008	0.014	0.977
Total_hhsize	0.190***	6.5	0.147***	5.303	0.149***	5.322
Individuals_age15	-0.171***	-4.554	-0.180***	-5.012	-0.108***	-2.963
Individuals_age65	-0.217**	-2.314	-0.145	-1.494	-0.138	-1.443
Asset_value	-0.004	-0.103	-0.036	-0.873	0.027	0.637
Plot_size	-0.333***	-2.715	0.023	0.193	-0.532***	-4.286
Income_ratio	0.099***	5.195	0.031***	3.128	0.034***	3.688
Eqqub_member	0.481***	3.859	0.141	1.255	0.559***	4.848
Oxen_problme	0.219**	2.001	0.198*	1.902	-0.058	-0.538
Health_Problem	-0.128	-1.126	-0.009	-0.079	-0.243**	-2.153
Labour_problem	-0.062	-0.437	-0.299**	-2.096	0.247*	1.751
Fertilizer_problem	-0.024	-0.223	0.172	1.634	-0.014	-0.131
Food_shortage	0.135	1.521	0.282***	3.208	0.016	0.178
Direct_support	-0.253*	-1.667	-0.421***	-2.787	0.138	0.792
Regional dummies						
Woreda2	0.069	0.211	0.33	1.053	0.468	0.726
Woreda3	0.426	1.307	-0.126	-0.415	2.893***	4.809
Woreda5	-0.580*	-1.748	-1.696***	-4.95	2.253***	3.697
Woreda6	-0.374	-1.284	-0.609**	-2.175	1.547***	2.613
Woreda7	-0.15	-0.469	-1.396***	-4.443	2.471***	4.105
Woreda8	-0.318	-1.061	-0.381	-1.331	1.070*	1.773
Woreda9	0.03	0.097	-0.371	-1.255	1.969***	3.274
Woreda10	-0.703**	-2.306	-1.213***	-4.131	1.842***	3.095
Woreda12	0.019	0.053	-0.596*	-1.919	2.751***	4.536
Woreda13	-0.341	-1.082	-1.144***	-3.805	2.012***	3.363
Woreda14	-0.214	-0.718	-1.349***	-4.634	2.406***	4.051
Woreda15	-0.191	-0.604	-1.604***	-5.213	2.776***	4.606
Woreda16	-0.249	-0.776	-0.816***	-2.647	1.917***	3.174
Woreda17	0.039	0.131	-0.538*	-1.882	2.233***	3.769
Woreda21	0.078	0.234	-0.993***	-3.178	2.802***	4.606
Woreda22	0.049	0.147	-0.901***	-2.841	2.614***	4.291
Woreda23	-0.347	-1.061	-0.885***	-2.809	2.056***	3.358
Constant	0.79	1.393	0.63	1.135	-2.115***	-2.768
Log-likelihood	-785.85		-826.51		-777.21	
McFadden R^2	0.157		0.167		0.203	

Table 7: Participation in Household Decision Making

Decision Maker	Buy cereals and grains?	Buy meat and fish?	Buy clothing for men?	Buy clothing for women?	Buy for medical expenses?	Pay for school fees?
Wife	36.56	12.64	7.8	30.32	10.84	10.32
Husband	16.05	46.68	49.97	21.23	40.71	38.36
Wife and husband jointly	15.86	9.67	9.54	16.77	19.42	14.64
Wife with other family members	7.61	7.22	5.35	7.68	6.32	5.74
Husband with other family members	1.23	1.23	1.93	1.35	1.03	1.23
Any children	0.84	0.77	1.1	0.97	0.71	0.77
The head	16.51	15.86	11.35	15.29	15.81	12.89
Adult children	2.45	2.58	2.97	2.39	2.19	1.81
Head and children	0.39	0.45	0.45	0.39	0.39	0.32
Head and other family member	1.23	1.16	0.97	1.23	1.16	0.84
The head with non-family members	0.19	0.19	0.19	0.13	0.19	0.06
Others	1.08	1.55	8.38	2.25	1.23	13.02
Total	**100**	**100**	**100**	**100**	**100**	**100**