

Determinants of Off Farm Employment: Case of Abeshge Woreda, Guraga Zone, SNNPRS, Ethiopia

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Abstract

The aim of this study is to identify the demographic and socio-economic factors that determines off farm participation of households using cross sectional surveying data. The data used for this study is collected from four rural kebeles of farm households with the total sample size of 221, and individual household head was selected by applying multi stage sampling technique. Kebeles are selected purposively based on relative location to the nearby town as well as the type of crops produced, while households are selected randomly from stratified sample frame. In order to meet the objective of the study, ordered logistic regression model was applied. The results from the ordered logistic regression model show that off farm participation of farm households driven by push factors and seasonal variation in farm activities. Therefore, the government should intervene in rural labor market in order to improve the livelihood of rural poor farm households.

Key words: Off farm employment, rural households, ordered logit, Abeshge, Ethiopia

1.0 Introduction

Off-farm activities could be classified as wage employment (includes cash or food for work) and business or self-employment. For the last decade most researchers have given attention for rural nonfarm employment, because growth in agriculture remains hard to solve rural poverty without other source of rural growth (Lanjouw et. al, 2000). In spite of the high potential of the non-farm sector in generating employment, these are not covered by government policies and strategy of Ethiopia (Beyene, 2008). Thus, most developing countries were forced to incorporate rural nonfarm employment as a core rural development strategy in the poverty reduction strategy paper (PRSP), because shrinking farm size, declining soil fertility and consolidation in the agricultural sector cannot be successful without a non-farm sector that provides gainful fulltime and part-time employment opportunity for the growing rural population (Mulat et.al 2006; Otsuka et.al, 2008).

Empirical studies shows that nonfarm source contribute to 40-50 percent average income for rural area of Africa. According to Davis cited in Zarai et.al (2010) in Ethiopia, 20 percent of the rural income originated from nonfarm source. The main type of business activities in the rural areas are trading, weaving, tailoring, basketry, blacksmithing, pottery, selling food and drinks as well as selling firewood, charcoal and wood for construction, the return from these activities is generally low due to low purchasing power of the rural community and low level of urbanization in the country (Mulat et.al 2006).

Land scarcity and increasing fragmentation of already very small farms implies that the non-farm sector has to be developed to absorb more of the growing population. The policy to promote adoption of credit to stimulate adoption of high yielding varieties and fertilizer use has not been very successful in the fragile and drought prone Ethiopian highlands and policy makers looking for alternative development strategies for these areas. Development of non-farm income opportunities may be an alternative development strategy (Holder et.al, 2004). In rural area some households participate in nonfarm activities to take the advantage from nonfarm activities while others are pushed to nonfarm employment, because of lack of opportunity on-farm (Davis, 2003). Consequently, identifying which factor determine off farm participation decision of farm households i.e. (push or pull factor) is very important for policy maker to understand why an individual is entering the non-farm rural labor market, and each may require different policy responses. Moreover, studies on the off-farm participation decision of Ethiopian farm households are limited (Beyene, 2008). Therefore, this study adds to the literature thru finding out determinants of off farm participation of farm households in different degree of participation rate, whereas, literature on determinants of off farm participation does not consider level of participation to find out factors, which impend or enhance off farm involvement. The recommendation drawn from those researches surely becomes crude for policy makers. As a result, this paper is identified which factors (pull or push) driven force for the off farm participation of farm households. This clear demarcation makes ease intervention to take action and the likelihood to achieve policy objective is high.

Based on the above mentioned theories and fact this study was answer the following questions; Pull or push factors determine off farm participation of farm households? And does off farm employment improve welfare or intensification of rural farm households? Specifically the objectives of the paper are (1) to identify factors that affect off farm participation decision (2) to know the implication of off farm employment on intensification

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versus poverty reduction. Data was collected from four sub districts of southern nation, nationalities and people of Ethiopia, specifically, Gurage zone (South Ethiopia) to find out the determinants of off farm employment participation of farm household. The data is collected through well constructed questionnaire from 221 farm household heads; include individual and household characteristic, resource endowment, off farm labor supply, which disaggregates in to different type of off farm activities. Order logistic regression model is used in order to examine the relationship between off farm employment on farm production and productivity.

The rest of the paper is organized as follows. Characteristics of off farm employment in the study area are described in section 2, followed by revision of theoretical and empirical literatures of off farm employment. In section 4 model specification and estimation are described, followed by section 5, estimation results and discussion. Finally, the paper ends with conclusion and policy recommendation.

2.0 Data Source and Characteristic off Farm Employment

A questionnaire survey is conducted in four selected sub districts, which are *Mamedie, Michile and Tereqo, Tawula & Gefersa* and *Gihbebare* sub- districts located in the west, north east, south west and south west of Welkite town, respectively. These four sub districts were selected because of the following reason. Many studies find that relative location of household to near town have significant effect on off farm employment participation decision of household. Specifically, Gihbebare sub district is selected because it found far from welkite town and large agricultural investment was undertaken and majority of households participated in off farm activities. While, Mamedie and, Michile and Tereqo districts were selected since in these two sub districts, in addition to cereal crops production, permanent (perennial) crops are produced. Especially, in Mamedie sub district perennial crops production is the dominant one which includes Enset, coffee, chat, mango and avocado. The production process time for cereal and permanent crops are slightly different, as a result the effect on off farm employment participation on production and productivity may not the same across the sub district.

Generally, the survey includes 221 farm households chosen randomly from multi stage sampling technique. In the first stage, strata were made based on the relative location of the sub-districts (kebeles) from urban centers as well as type of crop produced. Base on this framework, two districts nearby the town and two districts far from urban centers, with a total of four sub districts are purposively selected. In the second stage, in order to select household from each sub-district the household head are stratified based on the total land he/she own in selected sub districts. Finally from each district with a proportionate sample size in each stratum, households are selected randomly from each sub district. Hence, to choose four sub districts land holding, location and form of crop production variations are considered. The survey data provides detailed information on seasonal labor allocation (for farm and off-farm activities for each plot), type of off farm employment activities and income sources (annual and permanent crops, livestock, wage employment, off-farm employment), purchase of farm inputs (fertilizer, local and improved seed for each crops, pesticide, farm machinery and hired labor), individual characteristic of the household head and household compositions. Furthermore, data on accessibility to infrastructure, credit and wage of skilled and unskilled labor were collected. The data used for this study was collected from rural households for the period of agricultural production and harvesting seasons of 2012/2013.

The data set characterizing the households is given in Table 1. From the total sample surveyed households 3.6 percent are female headed households and the remaining 96.4 percent are male. This figure does not indicate that the number of women in the study area small, rather it told as that female does not nominate as head or female does not decide on critical issue, since the culture does not courage to do so, even, they run the home operation (activities) and cover all expenditure of household members. In regarding to marital status, about 85 percent households are married and the remaining 15 percent are the sum of divorced, widowed and single respondents. The other observational characteristic of farm households is educational attainment level, 28.1 percent of sample respondent are illiterate while, 51.1, 14, 2.3 and 4.5 percent of the respondent was attend, primary, secondary certificate and diploma level of schooling respectively. On the average, the family size is 5.1, which is somewhat similar to the national average (5.0). The average dependency ratio (number of dependants over family size) is computed to be 100 percent. Except one respondent with age of greater than 64, the remaining dependent populations are age of less than 15 years old. In other word, there is one to one correspondent between ages below 15 and above 15 years old of the sample survey household population, while the mean age of the head is 39.2 years

Table 1 descriptions of farm household demographic characteristic

Variable	Mean	Std. Dev.	Min	Max
Percent male headed households	96.38	-	-	-
Percent female headed households	3.62	-	-	-
Percent of married households	85.07	-	-	-
Percent of (single, divorced and widowed) HH	14.93	-	-	-
Percent of Orthodox households	55.66	-	-	-
Percent of Muslim households	43.44	-	-	-
Percent of protestant households	0.90	-	-	-
Percent of illiterate households	27.60	-	-	-
Percent of primary educated households head	51.58	-	-	-
Percent of secondary above educated heads	20.81	-	-	-
Age of household head	39.25	9.05	17	70
Family size	5.05	2.12	1	12
Non workable days	74.38	38.71	0	209
Dependent household members	2.43	1.70	0	7

Source: Own survey 2013

Commonly farm households involves in wage employment and self-employment (own business activities). Wage employment includes paid farm work, professional (Teacher, government worker and administration), skilled laborer (manual work in construction, masonry, and carpentry). Self-employment includes petty trading (brewing local alcohol and food, grain trading), fuel wood selling, charcoal making and unskilled nonfarm work (weaving, handicrafts and milling). Eighty one out of two hundred twenty one households head or about 36.7 percent of farm households head participate in off-farm activities. While, 38 percent or eighty four farm household participate in off farm employment at least one member. Most of the households participate in self employment activities, which do not require any professional qualification except masonry and carpentry. The proportion of households participate in off-farm self employment is 54.7 percent, and out of the total petty trading accounts for 58.7 percent, skilled laborer 24.1 percent, unskilled nonfarm work 13 percent and, selling fire wood and charcoal 4.3 percent. The proportion of households that participate in off-farm wage employment is 45.3 percent. Paid farm worker take the highest share of off farm wage employment participant 47.4 percent followed by professional 39.5 percent.

In general, petty trading is the dominant type of off-farm employment 31.8 percent followed by paid farm worker 21.2 percent farm household participated.

Table 11 Farm household participation in off farm employment

Types of off farm activities	Participation rate (%)	Cumulative participation rate (%)
Farm worker	21.4	21.4
Professional	17.9	39.3
Driver	1.2	40.5
Guard	4.8	45.3
Off farm wage employment	45.3	-
Petty trading	32.1	77.4
Selling fire wood and charcoal	2.4	79.8
Unskilled nonfarm worker	7.1	86.9
Skilled laborer	13.1	100
Off farm self employment	54.7	-
Over all participation in off farm	38.0	-

Source own survey 2013

On average, (83.3) days or (665.6) hours supply (selling) labor to the off farm employment, and the proportion family labor supply to off farm employment is 44.3 percent. Labor supply to off farm employment is elevated to highest figure 35 percent during slack season (plowing period) and relatively lowest level 32 percent occur during planting and weeding times. On the other hand, most of the hiring of labor is done during the planting and weeding season, and the percentage of labor-hiring is lowest during the slack seasons.

Study shows that the share off farm income in the rural area ranging from 30 to 50 percent of farm household total income (Davies, 2002). However, the share of off farm income for the farm household is (16.2%) in survey area which is slightly lower than the national level of 20 percent cited in (Zarai et.al, 2010). The income obtained from off farm employment is spending on consumption.

The lion share which is close to 63.4 percent spread out to smooth consumption, farm inputs accounts for 14.6 percent and their marginal saving rate is 12.2 percent of off farm income. This may indicate that off farm employment is important to welfare improving rural farm households. Consequently, it has positive effect on poverty alleviation of rural poor households via labor market channel.

Table 12 Family off farm labor supply

Variables	Mean	Std. Dev.	Min	Max
off farm labor supply of households	83.27	128.53	0	540
Income generate from off farm employment	4224.3	12636.53	0	156000
Percent of off farm labor supply to family labor	44.3	-	0	-
Percent of off farm labor supply for planting	32.2	-	0	-
Percent of off farm labor supply during plowing	34.7	-	0	-
Percent of off farm labor supply during harvesting	33.2	-	0	-
Percent share of off farm income to total farm income	16.2	-	0	-

Source own survey, 2013

Studies indicate that education is matter in off farm participation decision of farm households, because of this soft facts education status of farm household categorize in to five, illiterate, primary, secondary, certificate and diploma and above. From the total farm households who are participate in off farm employment, illiterate, primary and secondary above comprise 24.7, 43.2 and 32.1 percent respectively. These figures indicate that there is no linear relationship between off farm participation and educational attainment status of farm households. While, several literatures are shows that educational status of farm households head and off farm participation decision have significant relationship, and the results from chi2 statistic proof this fact. The chi2 test statistic suggest that there is a statistically significant relationship between ordinal off farm participation and educational status household head ($p = 0.000$). meanwhile, when the education categories changed into two dummies(primary and, secondary and above) with reference category of illiterate household head, the chi2 result shows that primary education have no statistically significant relationship to ordinal off farm participation($p=0.149$), while secondary education have significant relationship to ordinal off farm participation of households. Therefore the relationship between off farm employment and education status of households is not conclusive.

Table 3 Result from chi2 test statistic for the relationship between off farm participation and educational status of households

Ordinal off farm participation	Educational status of household heads					Total
	Illiterate	primary	secondary	certificate	diploma	
Low	41	79	18	2	0	140
Medium	8	9	6	0	0	23
High	12	26	7	3	10	58
Total	61	114	31	5	10	221

Pearson chi2 (8) = 37.3241 Pr = 0.000

With regards to landholding, the data indicates that there is egalitarian type of land distribution let close to 89 percent of farmers to have usufruct right of land. The land tenure system does not allow farm households to sell their land. Nevertheless, farms can lease out a land. A few farmers (6.5 percent) of the households do not cultivate their own plot. The size of land holding is very small and the land is divided into many parcels. The average land holding and land cultivated figure per households are 1.93 and 1.77 hectares respectively.

Of the total surveyed household only 24 households (10.9) percent do not have their own land and among these farm households 18 of them (75) percent of the household participated in off farm employment and 88.9 percent of them categorize as high participants. On the other side, household who have their own land and participating in off farm employment is 32 percent. It is clearly observable that large proportion of land none owner are participated in off farm employment.

The chi2 test result shows that there significant relationship between land title holder and non holder in participating in off farm activities. Therefore, land ownership matter in the off farm participation decision of farm households.

Table 4 the relationship between off farm participation and land ownership

Off farm participation level	Land ownership status		
	No	yes	Total
None participant	2.7	60.6	63.3
Medium participant	0.9	9.5	10.4
High participant	7.3	19	26.3
Total	10.9	89.1	100

Farmer in the rural area participated in off farm activities either by push factor (inadequacy of land, liquidity constraint and surplus labor in the family) or pull factors (higher skill and experience, education, and attractive return). Most of the farm households i.e. 52.4 percent participated in off farm employment because inadequacy of land and 27.4 percent participated to purchase farm input such as fertilizer.

In contrast, some 8.3 percent households participate in off farm activities because they find it more profitable than farm work. Hence, the figures indicate majority farm households participate in off farm activities by push factors.

While, 48.2 percent household do not participate in off farm employment because of busy with farming activities. This may indicates that in rural area there is no surplus labor supply to the off farm labor market. Hence, we can Premises that off farm labor supply cannot expand without reducing the amount of labor available for agricultural activities. On the other hand, only 5.1 percent of farm household hindered from participating off farm activities because of lack of skill and experience. This gives bird eye view about the importance of education and training in participating in rural off farm employment.

Table 5 Reasons for participation in off farm employment

Reason for participating in off farm employment	Percent of farm household
Land inadequacy	52.4
To purchase farm inputs	27.4
high return	8.3
Surplus labor in the households	2.4
Other	8.3

Source: own survey 2013

3.0 Literature Review

The terms “off-farm”, “non-farm”, “nonagricultural”, “nontraditional”, etc. normally appear in seemingly synonymous ways. The basic distinctions among activities and incomes are to be made along sectoral and spatial lines (Barrett et al, 2001). According to Haggblade et al. (2007) off-farm income or employment mean off the owner’s own farm that includes wage employment in agriculture earned on other people’s farms along with nonfarm earnings from the owner’s nonfarm enterprises or from nonfarm wage earnings. Thus, off-farm income is the sum of rural nonfarm income and wage earnings in agriculture. On the other hand, nonfarm employment refers all income-generating activities except crop and livestock production and fishing and hunting, located in areas that are mainly servicing agricultural activities (Barrett et al, 2001, and Lanjouw and Lanjouw, 2001). In most literature off farm employment and nonfarm employment used interchangeably but, some others not, while the difference is that working in the other’s farms considered as off farm employment but not nonfarm employment. This study used these terms interchangeably, hence, rural off farm employment including wage employment in agriculture, self-employment, wage employment, full-time, part-time, formal, informal, seasonal, and episodic nonfarm production. And the distinction between rural and urban employment is based on the place of residence of workers, so those who commute to a job in a nearby urban center are considered to be rural workers (Lanjouw and Lanjouw, 2001).

Household in rural area participate in off/nonfarm employment either by push factor or pull factor. In poor rural areas some households will make a positive choice to take advantage of opportunities in the rural non-farm economy, taking into consideration the wage differential between the two sectors and the riskiness of each type of employment. Rising incomes and opportunities off-farm then reduce the supply of labor on-farm. However, other households are pushed into the non-farm sector due to a lack of opportunities on-farm, for example, as a result of drought or smallness of land holdings (Davis, 2003).

A farm household’s choice of whether or not to work off-farm depends on the reservation wage rate. If the reservation wage rate is less than the prevailing market wage rate net of commuting cost, the household will participate in off-farm activities (Singh et al, 1986). However, reservation wage rate that determines the households’ participation in off-farm activities is an endogenous variable (Huffman, 1980). It depends on number factors, such as farm characteristics, family characteristics and locations. Farm characteristics include

the farm size (amount of land cultivated), livestock wealth. Family characteristics include age and educational level of family members, family size, and the number of dependants (Woldehanna et.al, 2001). Finally, variables that raise the reservation wage reduce the probability and level of participation in off-farm work, but variables that raise the off-farm wage rate increase the participation.

Very few studies have been carried out empirically in Sub-Saharan Africa to identify factors that influence the decisions of rural farm households to participate in nonfarm employment (Reardon, 1997). Previous studies on Africa focus on the share of nonfarm income and employment, to magnify the role of nonfarm employment and income rural household for poverty reduction.

Huffman and Lange (1989) applied bivariate probit model to identify factors affecting off farm labor supply decision of husband and wives jointly, but the result does not support the existence of joint decision making (husband and wives) in off farm labor supply decision. Thus, applying two univariate probit estimation method is appropriate. The result from probit analysis shows that at young age the probability of husband participate in off farm work is higher, but tend to decline as they becomes older, this indicate the nonlinear of life cycle of individuals which is consistence with theory.

A husband and wives who has more schooling has a significantly greater probability of off farm work than others. The implication is that, the increase off farm wage because of additional schooling outweigh reservation wage (farming or home activities wage).

The presence of children reduces the probability of off farm participation for a husband as well as for wives, while having older children (ages 11-18) do not affect either parent's probability of off farm work. Since, child caring is more compatible with farming activities than off farm work, but having older children do not affect reservation wage of the parent's Location (distance from the near city) had negative and significant effect on off farm work. Longer distance to the nearest city reduces the probability to participate in off farm work, since longer distance to the city reduce net wage through (transportation and time cost).

Mishra and Goodwin (1997) studied the effect Farm Income Variability on the Off-Farm Labor Supply of Kansas farmer and their spouse in the USA. Simultaneous equations of Tobit estimation technique was applied in order to consider the joint decision of farmers and their spouse for off farm labor supply decision. The result of their estimation like Huffman and Lange (1989) shows that spouses' off-farm labor supply does not influence significantly the operator's off farm labor supply or other way round. Alternatively, off farm labor supply decision of a husband and wives is not jointly determined. Variability of earning and off farm experience, and farm experience and land size affect off farm labor supply positively and negatively respectively, while education and family size does not have significant effect on off farm labor supply of farmer's and their spouse. The authors suggest that the possible reason for insignificance of education is that, the academic return for farm and nonfarm activities are may be the same in the study area. In contrast to Huffman and Lange (1989), distance to town do not affect the off farm labor supply decision of parent's.

Woldehanna et.al, (2000) studied Off-farm work decisions of Dutch cash crop farmers. The result shows that Family size, general education, age and age square of the household head have a positive and significant effect on the off farm participation decision. In contrast to Mishra and Goodwin (1997) finding, Family size increases the households' desire to participate in off-farm work. Households with a larger family size have relatively higher marginal utility of income and a stronger desire to participate in off-farm work, which is consistent with the theory. However, they do not differentiate the age category in their estimation like Huffman and Lange (1989) did, since dependent and working household member have different effect on off farm labor supply decision of husband and wives. Similar to Huffman and Lange (1989) investigation, Age and age squared of the household head show a significant quadratic age pattern on the participation decision. According to Woldehanna et.al, (2000) on the average, the desire of households to participate in off farm work reaches its peak at the household head's age 41.

Abdulai and Delgado (1999) studied the nonfarm work participation decisions of married men and women in rural Northern Ghana. They applied bivariate probit model to analyze the joint as well as a separate estimate for married couples to determine probability of individual participation in nonfarm work labor market. The result suggest that at younger ages, age have positively associated with the probability of labor supply to the nonfarm sector, while at older ages, the probability of participating in nonfarm work decreases as age increases. Having additional schooling had significant and positive effect on the probability of supplying labor for nonfarm activities for both husband and wives. Because additional schooling raises an individual's off-farm wage by more than it raises his or her reservation wage (wage for farm and home activities).

Similarly, Family size increases the probability of participation in nonfarm employment for males, suggesting that, at higher levels of family labor, extra effort is directed into nonfarm work instead of into the farm. Moreover, the results indicate that well developed infrastructure and population density had positive significant effects on the probability of nonfarm work participation. Most of the finding of Abdulai and Delgado (1999) are consistent with theory. Despite the fact that, they failed to show the effect of land holding on off farm participation decision of a husband and a wife, which is the leading factor for off farm employment participation

in developing countries. And the result indicates that the presence of children had no significant effect on the participation decision of women in non-farm work, which contradict with theory as well as some other finding for example, Huffman and Lange (1989)

Yunez- naude and Taylor (2001) studied the determinants of nonfarm activities and income of rural household of in the Mexico, using probit model regression analysis. In this case the dependent variable includes net income of six activities; production of staple crops, production of cash crops and livestock, nonfarm self- employment, wage employment, migratory wage employment in Mexico and united state. The result indicated that both primary (1-6) and secondary (7-9) education positively affect the likelihood of participation both in nonfarm self- employment and wage employment. Additional member of family with complete primary education or complete secondary education is associated with positive likelihood of participating in the wage labor market, however, having additional one year schooling for the household head does not affect the likelihood of participation in any off farm activities. Furthermore, additional hector of land had negative effect on the probability of participation in wage employment. this implies the households participate in off farm wage employment due to push factors, which is in line with Reardon,(1997) and Davis,(2003) argument, while increase the number of livestock holding have a spurs participation in nonfarm activities. In sum, the finding suggest that households participate in off farm wage employment due to push factors, while the participation in nonfarm activities is due to pull factors, like having more livestock.

Ruben and v. Den Berg (2001) studied the role of non farm income for poverty alleviation in rural Honduras. Under the broad concept of poverty, they tried to determine the probability individual to participation in farm wage employment, nonfarm wage employment, and/or self employment for certain characteristic of farm household by applying logit regression model analysis. Similar to Yunez- naude and Taylor (2001) finding, the result proof that household with small land and more hillsides is more likelihood engaged in farm wage employment, while large farm size positively related to nonfarm wage employment participation.

In addition to the above, the result shows, the number of adult positively related with nonfarm wage and self employment, while credit negatively affects involvement nonfarm wage employment. In reality, engagement in nonfarm wage employment does not depend on credit, since income from nonfarm employment is a substitute for formal credit.

Like the finding of Abdulai and Delgado (1999) age and age square significantly affect participation in wage employment positively and negatively respectively. The possible reason suggest by the authors is that employment access to rural labor market increase with age, but for elderly this effect might be decline as a result of health related problem.

Unlike the finding of Yunez- naude and Taylor (2001) Education level do not influence significantly participation in self employment of household head, while secondary education affect participation in wage farm employment and nonfarm wage employment, while reading and writing does not affect farm wage employment, but nonfarm wage employment. This finding is convincing, since it is compatible with the reality. Because, most wage farm employments done by unskilled and uneducated laborer, in this situation experience is matter more than education did.

Corral and Reardon (2001) tried to explain the question, why individual primary participate in off farm activities? They analyze farm wage employment, nonfarm wage employment and nonfarm self employment separately through applying probit regression analysis. The result shows that age and age square influence the probability off farm participation for individual positively and negatively respectively, which is consistence with the finding of Abdulai and Delgado (1999), Yunez- naude and Taylor (2001) and Ruben and v. Den Berg (2001), in spite of that, the marginal effect of age square on off farm activities (the three employments) was almost zero. The authors also suggest that older person tends toward nonfarm wage employment, but the result of their estimation does not support this argument, since the marginal effect of age square is the same for all employment, while the marginal effect of age is higher for nonfarm employment.

The effect of Education (as a categorical variable) on off farm participation decision was very interesting. Starting from read and write skill category, education at all does not significantly affect farm wage employment, like influence on self employment in the finding of Ruben and v. Den Berg (2001). Specially, pre-school degree does not related significantly with all of off farm activities, while reading and writing influence positively and significantly the probability of participation in nonfarm wage employment and self employment. Primary, secondary and university degree positively associated with the probability of nonfarm employment. The reason for this result suggest by the authors was the relative entry requirement for those activities.

In contrast to Ruben and v. Den Berg (2001), and Yunez- naude and Taylor (2001) findings land size per adult negatively and significantly affects engagement nonfarm wage employment. Therefore, land scarcity was the driving force participation in nonfarm wage employment. The combined evidences indicate that inadequacy of the available land for household member leads to participate in farm wage and nonfarm wage employment.

De Janvry and Sadoulet (2001) studied the role of off-farm activities in rural households in Mexico by applied Multinomial Estimation Method. They conclude that participation in off farm activities helps reduce poverty and contributes to greater equality in the distribution of income. The result of estimation shows that education,

ethnic origin and regional availability of off-farm employment are found to affect participation in off-farm activities. Education helps the farm households in the study area to participate in the more remunerative off-farm activities.

Generally, the above empirical evidence indicates that age, education, family size, land size and location of household determine off farm participation decision. The main limitations of those empirical literatures are; Firstly, those studies failed to incorporate season as a variable to show its effect on off farm employment decision of household. Since, most households in rural area are casual worker; simultaneously cultivate their own farming as well as participate in off farm activities. Therefore, the supply of labor to off farm employment depends up on the time agricultural cultivation period. During peak agricultural work time, the available labor may be consumed in their own farm leads to lessen off farm labor supply. Secondly, those empirical evidences did not show the effect of individual and household characteristics on different participation level. Households that participate in off farm employment for some days or some months do not had logical ground to say they have the same characteristic.

Beyene (2008) tried to find out the determinants of off farm participation decision of farm households in Ethiopia. He applied bivariate probit model for male and female member of household separately to examine off farm participation decision.

The result shows that education has no significant effect on the decision of male headed farm households to participate in off-farm activities, which similar to Woldehanna and Oskam(2001) finding, while the latter categorized education in to traditional(religious) and modern. This result implies that the natures of off farm activities that are undertaken in Ethiopia do not need education, since the activities are primarily traditional and no connection with modern or traditional education. In addition to the above, the result shows that male headed households have more likelihood to participate in off farm employment than female headed household, and financial position of male household member have positive effect on off farm participation decision.

Sizes of land cultivation have negative effect on off farm participation decision of both male and female member of household. This result indicates that farm household involved in off farm work is because of push factors, which is consistence with the theory of (Reardon, 1997 and Davis, 2003). Surprisingly, in contrast with theory and most empirical research the estimated result revealed that, household which the more far away from the market has positive effect on participation decision of male members.

Woldehanna and Oskam(2001) investigate the determinants of income diversification, particularly, between wage employment and self-employment in northern Ethiopia (Tigray regional state). The authors split or divided off farm employment in to wage employment and self-employment and then applied multinomial logit model to identify determinants of household choice of off farm activities, while tobit model were used to find out factors that affect off farm labor supply of household.

In their tobit model analysis, age of the household head, the number of dependents and livestock wealth, and age square and family size are related negatively and positively to the probability off-farm wage employment, respectively. The farm household' probability and level of participation in off-farm wage employment increases with family size and decrease with the number of dependents. The implication is that, farm households are involved in off-farm wage employment due to push factors (insufficient farm and non-farm income as well as surplus labor).

The negative impact of age on hours worked in off-farm wage employment, as suggested by the authors may be explained by the fact that due to high population pressure, young farm households cannot get enough land to support their livelihood compared to older farm households. Hence the younger households have to rely on off-farm employment to support their livelihood, however, the result is contrary to the findings of (Huffman and Lange, 1989; Abdulai and Delgado 1999 and woldehanna et.al, 200) and the justification also contradict with non linear life cycle of individual characteristics.

On the other hand, farm size and education as dummy (traditional and modern) do not significantly influence the wage off farm labor supply decision of the household, which contrast with theories of (Reardon, 1997; Huffman and Lange, 1989) empirical finding of (Abdulai and Delgado, 1999 and Ruben and v. Den Berg, 2001).

Besides the above result, except livestock wealth, owned off-farm equipment and predicted wage rate of self employment, the remaining key variables that included in the model does not affect off farm self employment significantly. Livestock wealth, non-labor income and cultivated land are thought to increase the reservation wage rate (wage for farm or home activities) and then reduce off-farm employment. An increase in the area of cultivated land reduces the probability and level of off-farm self-employment.

4.0 Econometric Model Specification and Estimation

Logit regression is a nonlinear regression model that forces the output (predicted values) to be between 0 and 1. Commonly, a logit model was used when the dependent variable is binary (also called dummy) which takes values 0 or 1, because it has advantage over linear probability model. Even if, the linear probability model (LPM) which is expressed as a linear function of the explanatory variables is computationally simple. Despite its

computational simplicity, it has a serious defect in that the estimated probability values can lie outside the normal 0-1 range. Hence, Logit model is advantageous over LPM in that the probabilities are bound between 0 and 1 (Gujarati, 2004). Moreover, Logit best fits to the non-linear relationship between the probabilities and the explanatory variables, since it is nonsense to say that the probability of response variable linearly related to the explanatory variables.

In most literature binary Logit model was used by many researchers to identify the determinants of off farm participation, however, this type of analysis is crude, and it may leads biased and imperfect conclusion. To avoid this limitation I will use ordered logistic regression model. When a dependent variable has more than two categories and the values of each category have a meaningful sequential order where a value is indeed 'higher' than the previous one it is recommended to apply ordered logistic regression (wooldrige). The model treating the response variable, in this case off farm participation, as ordinal scale, but the ordinal scale is a crude measurement of underlining interval or ratio scale. In this study off farm labor supply of household is continuous, it can be measure in interval or ratio scale. As a result, this model allows finding out the determinants of off farm participation at different level of labor supply. Nevertheless, this ordinal response variable can be estimated by linear probability model, it will come up with the above mentioned nonsense result. As already noted, the purpose of this analysis is to identify which and how much the hypothesized explanatory variables are related to the dependent variable. The dependent variable, in this study is off farm employment participation in ordinal form.

Off farm Participation by household head is ordered based on the total amount of labor supply to off farm activities. If the household head employed in off farm activities less than 5 percent, between 5- 25 percent and more than 25 percent total working day, take off farm participation value of 0, 1, and 2 respectively. In the ordered logistic regression:

There is an observed ordinal variable, Y_i , in turn, Y_i is a function of another variable, Y_i^* , that is not measured, but it is continuous, whose values determine what the observed ordinal variable Y_i equals. This continuous latent variable Y_i^* has various threshold points. For this study, the regression has two cut points (threshold). Following ordered logistic model specified as

$$\left. \begin{aligned} Y_i &= 0 \text{ if } Y_i^* \leq \alpha_1 \\ Y_i &= 1 \text{ if } \alpha_1 \leq Y_i^* \leq \alpha_2 \\ Y_i &= 2 \text{ if } Y_i^* \geq \alpha_2 \end{aligned} \right\} \dots \dots \dots (3.5)$$

Where, Y_i is observed variable, Y_i^* represent latent variable and α_s are the threshold. And the latent variable Y_i^* is determined by

$$Y_i^* = \sum_{k=1}^k \beta_k X_{ki} + \varepsilon_i, \frac{\varepsilon}{X} \sim \text{logistic} \left(0, \frac{\pi^2}{3} \right) \dots \dots \dots (3.6)$$

Where: Y_i^* represents the probability of that i th household will make a certain decision, given explanatory variables (X_i);

X_i represents the explanatory variables;

β_k are parameters to be estimated;

K represents the number of explanatory variables, $i = 1, 2, 3 \dots, k$, and

ε_i is a random disturbance term which, in this case, has a logistic distribution. This reflects the fact that relevant variables may be left out of the equation, or variables may not be perfectly measured.

Given the cumulative standard logistic distribution assumption for ε , it can be derived the Conditional distribution of y given x ; simply compute each response probability (woodrige,)

$$\left. \begin{aligned} P(y = 0/x) &= p(y_i \leq \alpha_1/x) = p(X\beta + \varepsilon \leq \alpha_1/x) = \Lambda(\alpha_1 - X\beta) \\ P(y = 1/x) &= p(\alpha_1 \leq y_i \leq \alpha_2/x) = p(X\beta + \varepsilon \leq \alpha_1/x) = \Lambda(\alpha_2 - X\beta) - \Lambda(\alpha_1 - X\beta) \\ P(y = 2/x) &= p(y_i \geq \alpha_2/x) = 1 - \Lambda(\alpha_2 - X\beta) \end{aligned} \right\} 3.1$$

The parameters α and β can be estimated by maximum likelihood. For each i , the log-likelihood function is given by:

$$\ell(\alpha, \beta) = 1(y_i = 0) \text{Log}(\Lambda(\alpha_1 - X_i\beta)) + 1(y_i = 1) \text{Log}(\Lambda(\alpha_2 - X_i\beta) - \Lambda(\alpha_1 - X_i\beta)) + (y_i = 2) \text{Log}(1 - \Lambda(\alpha_2 - X_i\beta)) \quad (3.2)$$

The ordered logistic regression model specified in equation (3.14) can be estimated using maximum likelihood method. Where the dependent variable is off farm participation in ordinal form of three category and the explanatory variables are that potentially affect off participation includes individual and family characteristic of household, access to credit, relative location of household and seasonality.

5.0 Estimation Results and Discussion

5.1 Determinants Of Off Farm Participation: Evidence from Ordered Logistic Regression

In this section results from ordered logistic regression models is presented. The dependent variable is ordered off farm participation. The overall model is significant at 0.1 percent level of significance. Meaning at least one

of the parameters estimate is significantly influence ordered of farm participation of farm household and the probability to get all insignificance coefficients is 0.1 percent.

The problem of heteroscedacity was corrected by estimating the robust standard error of the coefficients and the existence of multicollinearity between explanatory variables were checked through Collin test. However, through pair wise correlation test, age and age square of the household head, and seasonal based off farm labor supply are significantly correlated. Consequently, the variance inflated factor (VIF) for these variable beyond the rule of thumb. The multicollinearity between age and age square is corrected through deduction of mean age of farm household head. While, season based off farm labor supply of farm household cannot be corrected through transformation of the variable, hence the only option is dropping the variable which is high VIF value relative to the other.

Based on this, off farm labor supply farm households during planting and weeding season (from May to August) was excluded from the model because it has been strong collinearity with off labor supply of farm households during slack agricultural season(from March to April). One can get approximately similar information from the two parameters estimate, since the pair wise correlation is 0.95 and significant at 0.1 percent. Therefore dropping the variable of off labor supply of household during planting and weeding did not make us insight full about the effect of that season, rather excluding redundant information. Generally, the existence multi collinearity has an effect on significance level via standard error of the parameter not the coefficient of the variable. The remedial measure for correcting multi collinearity problem is dropping the variable that is highly responsible for the problem (high VIF). By doing so there is no difference in significance level as well as coefficient of the parameters. Moreover, theoretical these variable have not base (ground) for their correlation, hence, the collinearity may be a matter of technical. The correlation between dummies variables are tested by coefficient of contingency, and the result shows that all the correlation coefficients are below 0.75, thus none the dummies variables are correlate significantly each other. Finally, after excluding planting and weeding of labor supply, the Collin test result of condition index is 13.7, indicates that the model coefficients and significance are stable for any variable and observation changes because it is below the minimum standard 15.

Furthermore, the proportional odd assumption or violation of parallel regression assumption was tested by applying BRANT test. In this ordered logistic regression there is only one coefficient, while actually the equations are two because three order logistic regressions have two equations. The test provides evidence that whether the two equations have similar coefficient or entertain each equation individually. The results of the test show that all coefficients except the coefficient of the number dependent household members, the remaining variables included in the model are not statistically significant at 5 percent level (no violation of parallel regression). Therefore, the coefficients of the regression are the same in the two equations. On the beginning, the effect number of dependent household members on off farm participation is not significant. So, having similar or different coefficient is less important.

Finally, how the ordered logistic model fit for off farm participation of farm household was tested through FITSTAT test. The McKelvey & Zavoina's R², which is similar meaning of OLS R², is 0.883 and the chi² is less than 0.1 percent, hence, the ordered logistic regression model is well fitted the off participation of farm households.

Estimation results for the determinants of off farm participation are presented in Table26. The results reveal that ordered participation in off-farm activities is mainly influenced by marital status (single dummy and divorced dummy), the number of adult in the household, land size and post harvesting seasons. However, age and age square of the household heads, the number of dependent family members, primary and secondary education dummies, credit and location dummies of farm households does not explain the variation in ordered off farm participation decision of farm households.

Age and age square of households head is not statistically significant at commonly accepted significance level, while age has positive but declining effects on ordered participation since the linear term has positive and the quadratic term has negative coefficients, which implies that farmers participate in off-farm activities at a decreasing rate as they age, and the turning point of age is 39. Educational dummies of the household heads does not significantly affect categorical off farm participation decision of farm households. As reviewed in literate part, education has strong effect on off farm participation decision of farm household both in developed and developing nations. While, in case of Ethiopia, education does not explain the variation ordered off farm participation decision of farm households because most of off farm activities in Ethiopia are traditional and did not require education to join. Beyene (2008) and Woldehana and Oskam(2001) find similar results. Alternatively, the academic return for farm and nonfarm activities are may be the same in the study area.

Table 6 Results from ordered logistic regression

Dependent variable is ordered of farm participation

Variable name	Coefficient	Odds Ratio	Marginal prediction(off farm participation =0)	Marginal prediction(off farm participation =1)	Marginal prediction(of farm participation =2)
Age of HH head	.0072873 (0.21)	1.007314	-0.00182163	0.00128123	0.00054039
Single household head(D)	3.120674*** (3.17)	22.66166	-0.51894559	0.01886395	0.53780947
Divorced household head(D)	2.540574*** (3.26)	12.68696	-0.44718157	0.01747733	0.42970423
Widowed household head(D)	-0.6745874 (-0.02)	0.5093666	0.1623674	-0.1239754	-0.03839191
Primary education (D)	0.2186693 (0.32)	1.24442	-0.05460456	0.03841823	0.01618634
Secondary and above education(D)	0.3383769 (0.43)	1.402669	-0.08426765	0.05696163	0.027306
Adult household member	0.4249191** (2.28)	1.529467	-0.10621767	0.07470771	0.03150997
Dependent household member	0.1591704 (1.19)	1.172538	-0.03978806	0.02798475	0.01180331
Land size	-0.6154271*** (-2.74)	0.5404101	0.15383923	-0.1082021	-0.04563712
Off farm labor supply of household between Jan -April	0.0861191*** (2.37)	1.090014	-0.02154529	0.01515378	0.00639151
Distance 11- 20 Km(D)	-0.5684354 (-0.90)	0.5664109	0.13985318	-0.1031892	-0.0366639
More than 20Km(D)	1.359972 (1.30)	3.896084	-0.31155193	0.1582278	0.15332412
Credit (D)	-0.1052947 (-0.24)	0.9000593	0.02631351	-0.0185267	-0.00778677
Age square	-0.0046001 (-0.60)	0.9954105	0.00114988	-0.0008087	-0.00034112
Total livestock	0.037073 (0.57)	1.037769	-0.0092672	0.00651804	0.00274916
Cut 1	3.504077*** (1.076048)	3.504077*** (1.076048)			
Cut2	5.916118*** (1.22899)	5.916118*** (1.22899)			
N	221		221		
Pseudo R2	0.64				
Wald chi2	82.20***				

(D) Marginal for discrete change of categorical variable from 0 to 1 * p<0.10, ** p<0.05, *** p<0.01, values in parentheses are z-values

6. Conclusion and Policy Implication

6.1 Conclusion

The survey data collected from 221 farm households reveal the fact that farmers are overwhelmingly dependent on agricultural crop income that make up an average of 83.8 percent of total income, while the average share of off farm income is 16.2 percent, which is an indication of off farm activities are not the finest choice of farm households.

The finding of the study proof that households show a tendency to participate in off farm employment is driven by push factors. The result from ordered logit model showed that participation in off farm activities is mainly explained by seasonal variation of farming activities and wealth indicator. Some level of off farm participation among households is not significantly determined by demographic and liquidity indicators, where as adult household family member is found to have significant impact on off farm participation. Therefore, households

seem opt to engage in some form of off farm activities due to demographic factors such as availability of surplus labor than needed in agriculture and insufficient land size. Hence, initially push factors determine off farm participation decision of farm households, while in the mean time participation decision may not be explained by push factors. This need further study considering time (dynamics) of off farm participation.

6.2 Policy implications

Intervention in labor market is the critical avenue for rural poverty reduction and to boost agricultural production and productivity increments. Off farm employment is the livelihood strategy for rural poor farm households. Specially, households who do not have or insufficient farm plot and high proportion of adult family members are immediately benefited from labor market correction. While, getting labor market perfection is important for both off farm employment participant and farmer. Therefore, the government should intervene in labor market via enforcing contract, crafting agreement, set minimum wage for daily farm laborer, and provide labor market information in organized forms and removing other barriers. Therefore, off farm employment is the means to escape rural people from poverty since most the income generated from off farm employment spend on household consumption.

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