Off-farm Labour Supply Decision of Households in Rural Nigeria: A Double hurdle model Approach

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Abstract

This study used the double hurdle model to examine the off-farm labour supply decisions of rural households in Nigeria. The approach allows the joint modeling of the decision to participate in off-farm activities and the intensity of participation. The study used a cross-sectional data obtained from the RIGA database collected from 14,512 rural households. The results indicate that individual and household characteristics (notably, size and composition of households, educational level, access to infrastructure and location variables) influence the decisions of rural households to undertake off-farm work; while socio-economic and institutional variable such as access to credit, wealth status and wage rate are the major determinants of the intensity of participation. In terms of sign and magnitude, a number of the variables had effects which are different in the participation and intensity of participation, justifying the separation of the participation decision. It is evident from this study that the rural off-farm sector plays an important role in ameliorating the challenges confronting households posed by dwindling farm income resulting from low productivity which is associated with rural poverty. Therefore, government policies should be directed not just at agricultural development but also at promoting the off-farm sector.

Background

About seventy five percent of the world's poor live in rural areas in developing countries and are majorly dependent on agriculture and related activities for their livelihood. Most of these countries like Nigeria have continued to experiment with various economic development paradigms in search for sustainable economic development (World Bank, 2008). The economies of these developing countries are still basically agrarian despite the discovery of petroleum in some like Nigeria. However, despite this substantial role that agriculture plays, the rural off-farm sector in these economies is increasingly gaining prominence (Barret et. al., 2001; Abulai and CroleReess, 2001; Matshe and Young, 2004; Haggblade et. al., 2007). This is made possible by the fact that agriculture alone is not capable of providing sufficient means of livelihood and route out of poverty for majority of

the rural households and results in these households engaging in a number of of economic activities thus diversifying their income sources aimed at minimizing the dwindling income from agriculture. In view of this, off-farm activity has therefore become a major income diversification strategy predominant among rural households in developing countries. It offers employment for the growing rural labour in the form of wage and self employment activities. As a result, an integral part of the development plan of these counties is to simultaneously increase agricultural productivity and at the same time enhance participation of rural households in the off-farm sector, albeit this target remains a difficult one to achieve.

Nigeria has an estimated population of over 170 million people, about 48 per cent of which live in the rural areas (FAOSTAT, 2013). Despite the country's abundant natural resource, recent surveys show high incidence of poverty. According to the Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010, the incidence of poverty in the country is as high as 61.2 per cent which is an increase of 9.6 percent from the 51.6 percent it was in 2004 (NBS, 2012). This high incidence of poverty is not unconnected with the reiterated shocks in the socioeconomic, political and weather conditions that have continued to threaten agricultural productivity which has remained the source of livelihood for majority of the rural households. The challenges confronting agriculture alongside the increasing popularity of the rural off-farm sector has changed the status of a significant population in rural Nigeria from on-farm 'specialisers' to 'diversifiers' into off-farm activities. Such adjustments have been observed to have positive impact on size of income, level of income distribution and welfare of rural households. Rural households are therefore observed to in addition to cultivating crops on their farms work as wage labourers on other farms, or operate small businesses.

In the light of the above, an attempt at analyzing the determinants of farm household participation in off-farm activities will serve an invaluable purpose in informing policy aimed at improving the livelihood of Nigerians especially the rural poor. The role of the off-farm sector as a source of employment, income, on-farm expansion and escape route out of poverty is well documented in the literature especially in developing countries (see for example, Woldenhanna and Oskam, 2001; Matshe and Young, 2004; Oseni and Winters, 2009; Hagglabade et. al., 2010; Awoyemi, 2011).This study analyzes the off-farm labour supply decisions of rural households in rural Nigeria. Specifically, it examines the determinants of off-farm labour market participation and the intensity of participation decisions of rural households.

However, despite the importance of the off-farm sector in the component of the rural economy in Nigeria, there have been limited empirical studies regarding rural households. The few studies available have analyzed off-farm labour supply decision of rural households using a single equation approach[1] (see for example, Oluwatayo, 2009; Oseni and Winters, 2009; Awoyemi, 2011; Olugbire et. al., 2011). This study applied the double hurdle model to examine the off-farm labour supply decision of rural households in the study area. The

[1]Did not attempt to separate the participation decision from the intensity of participation decision regarding them as being determined by the same set of factors.

double hurdle is favored as the estimation technique as it allows the joint modeling of the two labour supply decisions of rural households: (i) the decision as to whether or not to participate in off-farm activities, and (ii) conditional on participation, the amount of time allocated to off-farm work. The approach is more realistic because it distinguishes the participation decision from the intensity of participation. The use of the model in this study was justified using econometric methods.

The Theoretical Model

The basic agricultural household model (see for example, Singh et. al., 1986), with its modifications provides the theoretical basis for exploring labour supply decisions of rural households. Based on a number of factors such as the imperfection in input substitution, binding constraints in off-farm employment, household preference and market failure which are common in developing economies like in the study area, a non-separable agricultural household model is adopted. The household is assumed to maximize utility U, from a set of consumption goods C, and time allocated for use in the home (also referred to as leisure time) H, and a taste shifter a, which includes, for example, age, education, and other household characteristics. The utility function is presented as:

$$maxU = U(C, H; a) \tag{0.1}$$

The utility function is assumed to be quasi-concave, continuous and non-decreasing in consumption goods and leisure. The utility function of a household is maximized subject to some constraints such as: (i) the household time endowment, which it chooses to allocate among farm work T_f, off-farm work T_o, and leisure T_l:

$$\sum T_f + T_o + T_l = T \tag{0.2}$$

(ii) farm production technology given by:

$$Q = Q(O, X, L_h, A, K, L_f, Z) \tag{0.3}$$

where O denotes the output, X represents farm variable inputs (such as seeds and fertiliser), L_h is hired farm labour, A is fixed inputs such as land,L_f is on-farm family labour hours is the capital Z, denotes farm characteristics and location.

and (iii) budget constraint given by:

$$Y = \pi(p, v, +W_m T_m + R) \tag{0.4}$$

where household income Y is related to the restricted conditional profit function π, which is dependent on price of the farm output p, off-farm income W_m from off-farm work time T_m and R is non-labour income.

Assuming regularity in profit and utility functions, an optimum allocation of household time can be obtained from substituting the constraints into the utility function and taking the derivative. Assuming an interior solution given the focus on off-farm work, the necessary condition for a maximum are:

$$-\frac{\partial U/\partial T_f}{\partial U/\partial Y} = \frac{\partial \pi}{\partial T_f} = W_s \quad and \tag{0.5}$$

$$-\frac{\partial U/\partial T_O}{\partial U/\partial Y} - \frac{\lambda}{\partial U/\partial Y} = W_o \tag{0.6}$$

where λ denotes the Lagrange multipliers associated with non-negativity constraints of working off-farm. Equation 5 shows the marginal rate of substitution of on-farm family labour for money income should be equated to the shadow price of such labour. For households who decide to undertake off-farm work, equation 6 states that the marginal rate of substitution of off-farm work for income should be equal to the wage rate.

For a household, the decision whether to participate in off-farm employment depends on a comparison of the market wage rate W_o and its reservation wage[2] W_r such that:

$$T_o = 0, \ if \ W_r \geq W_o \quad and \tag{0.7}$$

$$T_o = 1, \ if \ W_r > W_o \tag{0.8}$$

The reservation wage is an endogenous variable, which will depend on a number of exogenous variables in the model such as farm prices (both input and output price), fixed

[2]The reservation wage for off-farm work is the marginal value of the household's time when all of it is allocated to the farm labour and leisure activities.

farm inputs, individual and household characteristics. Generally, variables that raise the reservation reduce the probability of off-farm participation, while variables that raise the market wage rate, tend to increase the probability of off-farm participation.

Econometric Model

The data used in this study is a micro-level data on household off-farm labour supply and similar to other household surveys, some households have no observed off-farm time allocation, hence a preponderance of zeros. As noted by Armemiya (1985), such a condition requires making an all important decision of the appropriate statistical tool to handle such mass of zero observations failure of which can result in biased and inconsistent estimates.The ordinary least squares would have been an obvious choice, however applying it to analyse our data would result in biased estimates especially in the presence of many zeros which represent non-participation by households (Amemiya, 1984; Wooldridge, 2010). Instead there exist a number of econometrics approaches to deal with the issue of preponderance of zeros in the data with most of these approaches classed as limited dependent variable estimation techniques.

A number of the empirical studies aimed at estimating labour supply decisions of rural households have assumed that the same process determines the participation and intensity of participation decisions of the households. For example in the context of this study, if a household characteristic is identified to exert a positive effect on the intensity of participation in off-farm wage activities, it then follows that the same factor will inevitably result in predicting participation decision of such a household. As much as this scenario may be true, there is no reason to be certain. For some other factors there might exist a subset of the rural population in the study area who would not take up off-farm work. This situation and the preponderance of zeros in our data is the motivation in seeking a model that is capable of treating the participation decision as a *two-tier* process.

One of such approach commonly used is the standard Tobit model. However, despite it's wide application, the Tobit model has a number of draw backs which is observed in the restrictive nature of its basic assumptions as it applies to this study. It assumes that all zero observations on the hours of off-farm work are a result of corner solution only. Hence, a rural households is an off-farm sector participant who has chosen to supply positive hours of work at the current level of exogenous variable, say wage. Furthermore, it imposes restriction in the model to assume a single process determines the probability of participation and intensity of participation.Thus in the context of this study any variable that increases the probability of participation must also increase the the conditional mean of the positive hours of off-farm work[3]. Also, its strong normality and homoscedasticity assumptions adds to the list of restrictions. This strong restrictions by the model may not be applicable to our study[4]. According to Cameron and Trivedi (2010), the failure of the

[3]A number of the explanatory variables have been observed to have vaying effect on the participation and intensity of participation decisions

[4]For example a rural household may be less likely to take up off-farm work, but once the decison is arrived at to participate, the household may spend more time in off-farm work than others

normality and homoscedasticity assumptions have serious consequences for the estimates of the Tobit Model.Given these limitations of the standard Tobit model, it therefore becomes necessary to explore models that are more flexible. This has led to several generalizations of the standard Tobit model which has resulted in various estimation methods[5]. These class of models according to Wooldridge (2002) permits separate process to determine the participation decision ($y = 0$ *versus* $y > 0$) and the amount decision (the magnitude of y when is positive).

Such alternative is provided in the double hurdle model.The model which is credited to the seminal paper of Cragg (1971) relaxes the assumption that the zeros and positive values come from the same data generating process. It is set-up in this study to explain the process of household off-farm labour decision where such decision is decomposed into separate components: (a) off-farm sector participation decision (whether to participate or not); and (b) an intensity of participation decision (length of time spent in off-farm work). Therefore, for a household to be observed as a *participant* (i.e for a positive observation to be recorded), such a household must cross two *hurdles*. Rural households who fall at the fist hurdle are referred to as *non-participants*. Crossing the first hurdle qualifies a household as a *potential participant*. If we observe positive hour of off-farm work, then such a household has crossed the second hurdle. The motivation for such decomposition is the need to allow for the factors determining the decision of households to participate in off-farm activities to be different from the factors that determine the intensity of participation in these activities making the two parts of the model functionally independent[6].The model is formed out of assuming the existence of a pair of latent variables designed to present the utility a household derives from participation in off-farm work and the utility derived from hours of off-farm work. The model therefore contains two equations stated as:

$$\begin{aligned} d_i^* &= z_i^{'}\gamma + \varepsilon_i \;\; \varepsilon_i \sim N(0,1), \;\; i = 1, 2, \ldots, n, \\ y_i^* &= x_i^{'}\beta + u_i, \;\; u_i \sim N(0, \sigma^2), \;\; i = 1, 2, \ldots, n, \\ y_i &= \begin{cases} y_i^* if \;\; y_i^* > 0 \;\; and \;\; d_i^* > 0 \\ 0 \;\; if \;\; y_i^* \leq 0 \;\; or \;\; d_i^* \leq 0, \end{cases} \end{aligned} \tag{0.9}$$

where the errors ε_i and u_i are assumed to be independently distributed. In contrast to the Cragg's specification of the double hurdle model, a number of studies[7] have relaxed the independent error term assumption and opted for specification of the model with a correlation coefficient of ρ leading to a double hurdle model with dependent error terms. The choice of explanatory variable to include in each stage of the model tends to be

[5]This is confirmed in Amemiya (1984), models and estimation methods for censoring and truncation are now so numerous and diverse that it is difficult for econometricians to keep track of all the existing models and estimation methods and maintain a clear notion of their relative merits.

[6]Applying the model to this study, the first part would determine whether a household participate in off-farm activities or not, and the second part determines the number of hours spent in off-farm work given that the household participates.

[7]see for example Garcia and Lebeaga, 1996; and Jones, 1992

challenging as noted by a number of previous studies who have argued that there is no standard procedure to be followed in variable inclusion in the double hurdle model. Unlike in the case of other two tier model such as the Type 2 Tobit model where exclusion restriction is a necessity for the model to be identified, the case of whether the covariates in the participation and intensity of participation model should be different is unresolved in the literature. While some studies such as Jones (1992) and Ghadim et. al., (1999) have recommended the need for an exclusion restriction to properly identify the model, others such as Pudney (1989) have played down the importance for an exclusion restriction and instead recommended that the participation equation should contain psychological covariates while the intensity of participation equation should contain economic covariates. This study tows the line of Pudney (1989) and included socio-demographic variables hypothesised to influence the probability of participation in the participation equation, and the intensity of participation contained economic variables expected to influence the amount of labour supplied to off-farm work conditional on the decision to participate, with some variables in both equations. Same as in the Tobit model, the standard double-hurdle model is estimated based on the assumption of homoscedasticity and bivariate normality of the error terms. Such assumptions may be costly when the data is found not to fit leading to inconsistent maximum likelihood estimations (Aramazar and Schmidt, 1982; Robinson, 1982). Considering that most often the dependent variable is often highly skewed in survey data as it is in this study, it becomes necessary to test if these assumptions hold and if not make efforts to address presence of heteroscedasticity and non-normality of the error terms. For all the models, a Lagrange multiplier tests was used to test the null hypothesis of homoscedasticity ($\alpha = 0$).

There now exist ways of dealing with the situation where the normality assumptions is found not to hold. One of such which is applied in our study is the Box-Cox transformation of the dependent variable (as outlined in Yen, 1993; and Jones and Yen 2000). The Box-Cox transformation on the dependent variable y is given by:

$$\begin{aligned} y_i^T &= (y_i^\lambda - 1)/\lambda \quad if \quad \lambda > 0 \\ &= log(y_i) \qquad if \ \ \lambda = 0 \end{aligned} \tag{0.10}$$

where λ is an unknown parameter to be estimated. The relationship between the observed dependent variable and the latent variable as shown in equation 9 is given by:

$$\begin{aligned} y_i^T &= y_i^* if \ \ y_i^* > -1/\lambda \ and \ d_i > 0 \\ &= 0 \ otherwise \end{aligned} \tag{0.11}$$

The Box-Cox transformation relaxes the distributional assumption. Its application to the double hurdle model yields a Box-Cox double hurdle model which relaxes the normality assumption of unobserved errors made in the standard double hurdle model.The double

hurdle model and the Box-Cox version can be estimated using maximum likelihood estimation which is the method employed in this study using the econometric software STATA[8]. The user written syntax *craggit* by William (2009) was employed in estimating the double hurdle model, while the Box-Cox double hurdle model was estimated with the commands written by Moffat (2005).

Data

The data used in this study was obtained from the Rural Income Generating Activities (RIGA) database. The database was constructed from a pool of Living Standard Measurement Study (LSMS) and other household surveys which have been made available by the World Bank through collaboration with Food and Agriculture Organisation (FAO). The broad objective of the RIGA database project was to examine income generating activities of rural households across a range of developing countries. Nigeria is among African countries selected in constructing the RIGA database project alongside Ghana and Malawi. The Living Standard Survey in Nigeria from which the project drew data from was conducted between September, 2003 and August, 2004 with the aid of the National Bureau of Statistics. The survey which covered the entire 36 states of Nigeria and the Federal capital territory had a total sample size of 19,158 households. This population comprised 14,512 rural households and 4,646 urban households. A multi-stage stratified random sampling technique was employed in collecting the data through a well-structured questionnaire. Each household was visited seven (7) times at a weekly interval.

The data contain both a number of individual and household characteristics and is focused on labour supply decisions of the households to off-farm activities. The dataset contained information on households whether they participate in off-farm work or not. The question on off-farm participation were in two-fold (i) do you work off-farm? and (ii) if yes, how many hours do you sepnd in a week in off-farm work? An immediate issue observed in the data was the zero observation (non-participants) resulting in off-farm wage being only observed for the participating section of our population hence a potential sample selection problem. The suspected sample selection results from the possible action of people to self select themselves into off-farm employment, hence whether off-farm wage is observed or not depends on their labour supply decisions (Wooldridge, 2002, P. 552). There was need therefore to account for the non-randomness of our sample, failure of which may cause the estimates of the parameters to be biased (Reuben, 1974). To prevent such selectivity bias, the Heckman's two stage model was employed . The wage offer equation was estimated based on the Heckman's two stage method and an inverse Mills ratio (λ) computed from the probit regression of the probability of participation and formed part of the wage estimation equation (Maddala, 1983; Wooldridge, 2002). The wages are predicted from the wage function including the inverse Mills ratio, λ as one of the explanatory variables in the model. The off-farm wage was predicted using the log wage equation with the

[8]STATA version 11.0, Stata Coperation, College Statation, Texas.

inverse Mills ratio as:

$$lnw_i = \beta_1 X_i + \ \lambda_i + \ e_{i1} \tag{0.12}$$

where β_i is the vector of estimated parameters, X_i is a vector of explanatory variables (which includes age and educational level of of household head, wealth index, location dummies and the inverse Mills ratio), λ_i is the inverse Mills ratio computed from the probit estimation and e_i is the error term. If λ is significant, then using the censored sample only in the estimation of labour supply decision would have resulted in sample selection bias and justifies the process employed for correction. Rather than the observed wages obtained from dividing earnings by number of hours of work , the predicted wages lnw_i tends to be more ideal for use in the intensity of participation model. This is because any error in the number of hours worked are inversely related to the wage rate estimated. Therefore if observed wage rate were used in the intensity of participation models, the estimated elasticity of labour supply with respect to wages will be biased towards minus one (Sahn and Alderman, 1988). Therefore, in line with the popular approach, predicted values of wage were employed in intensity models instead of the observed wage rates (Rosenzweig, 1980; Skoufias, 1994; Adulai and Delgado; 1999).

The variables used in this study together with their definition, means and standard deviations are presented in Table 0.1. Following from the theoretical model, the variables have been grouped into personal and household characteristics, farm production factors, socio-economic and institutional variables and geographical location variables. The dependent variables in the participation and intensity of participation hurdles of the model are participation and hours of off-farm work, respectively. The individual and household characteristics included in the model are gender, age and level of education of household head, gender of household head, adult equivalence household size and number of dependants in the household. The age and age square of the household head are included in the model to account for general experience, with the later intended to control for non-linear life cycle effect. It is hypothesised that age would negatively affect the probability to participate in off-farm work, hence the younger household heads are more likely to take up off-farm work than older household heads. Gender of the household head is an important driver of off-farm diversification decisions of rural households. This is tied to the fact that males and females as heads of households have different responsibilities in the livelihood generation and home management. Hence in line with previous studies (see for example, Canagarajah et. al., 2001; Woldehanna and Oskam, 2001; Bhatta and Arethun, 2013) gender of the household head is included and hypothesised that its effect on the probability of participation and intensity of participation will be positive implying that the male household heads will be more likely to be involved in off-farm work than the females.Educational level of the household head is included to denote human capital, in line with previous studies (such as de Janvry and Sadoulet, 1997; Abdulai and Delgado, 1999; Matshe and Young, 2004) that confirmed that it plays an important role in labour allocation decisions of households. It is hypothesised that education will have a posit-

ive effect on decision to participation in off-farm work and the intensity of participation. The size of dependants which comprise both the young (below six years) and elderly (above 75 years) members of the household as it included in our model is hypothesised to have a mixed effect on the probability of participation.Adult equivalence household size is another important household characteristic variable included in our model and its hypothesised to positively influence the probability of rural households to undertake off-farm work and the intensity of participation.

Farm characteristics that form part of our models includes size of arable land under cultivation, and value of agricultural output. Both size of land under cultivation and the value of agricultural output (both crop and livestock) are included in the intensity of participation model to establish the relationship between on-farm and off-farm labour supply decisions of households. Since primarily majority of the rural households are farm households who are involved in crop and livestock production, it is expected that an increase in the size of land under cultivation and agricultural output will translate into less hours of off-farm work. It is therefore hypothesised that increase in on-farm activities depicted by increase in the size of land under cultivation and higher output will reduce both the probability of participation and the intensity of participation conditional on the decision to participate.

The socio-economic and institution variables comprised credit assess, access to non-labour income, indexes depicting access to infrastructure and wealth. Access to credit have been identified as an important factor in off-farm sector business start up especially in the case of self employment activities and useful in funding transaction cost for wage activities especially in developing economies like Nigeria were the credit market is undeveloped. Hence is hypothesised that access to credit will positively affect the probability of participation in off-farm work and the intensity of participation conditional on the decisions to participate. Also non-labour income that accrues to households in the from of remittance is included in the intensity of participation model. Non-labour income denotes total cash income net income from the farm, wages, and salaries. It is hypothesised that if leisure is a normal good, an increase in the value of non-labour income could increase the the probability of more leisure being demanded at the expense of off-farm work. An index of wealth depicting assets of rural households were created and included in the intensity of participation model. It was created from various assets owned by a rural household using the principal component approach as outlined in Filmer and Pritchett (2001)[9]. The assets considered in constructing the wealth index included ownership of items such as household durables (TV, refrigerator, etc.) and infrastructures (running water, brick walls etc.). The mean of the index was defined at or near zero and a higher value indicating a higher asset position. The asset base of a rural household is expected to provide opportunities for them to invest in off-farm enterprises, hence it is hypothesised to positively influence off-farm sector participation. Using the same approach an index of access to infrastructure was computed. It comprise of access to both public goods such as electricity, telephone etc. and proximity to schools, health centres, urban areas etc. The mean of the index

[9]Filmer and Pritchett (2001) argued that using such approach creates an index that is a reasonable measure of household wealth and comparable to the use of consumption expenditure

is defined at or near zero with a higher value indicating a higher infrastructural access. Rural household access to infrastructure is expected to increase the proximity to off-farm sector opportunities and hence hypothesised to positively influence the probability of off-farm participation. The wage from the off-farm sector considered an evaluation of the household human capital stock was included in our model in the form of predicted wage rates as discussed above. It is included in both the off-farm wage and self employment intensity of participation models to capture the response of rural households to economic incentives in the off-farm sector and hypothesised to exert a positive influence.

Finally, two regional dummy variables were included in our model to account for broad differences across the various regions of the country. Such difference among other things are the prevailing wage rates, rate of poverty and local labour market conditions such as the rate of unemployment in the region.

Table 0.1: Variables contained in the double hurdle model

Variable	Definition	Mean	SD
Dependent Variable			
Numhrs	Number of hours spent in off-farm wage activities	35.919	12.95
Numhrs	Number of hours spent in off-farm self activities	38.99	14.11
Explanatory Variables			
Individual and household characteristics			
Gender	Dummy, gender of household head (1 if male, 0 female)	0.81	0.35
Age	Age of household head (in years)	47.44	14.60
Age square	Age square of household head (in years)	7.72	0.911
Education	Education of household head (in years)	4.31	5.04
Household size	Adult equivalence household size (no. of person(s))	6.79	2.26
Dependants	Number of household members <15 year & >75 years	3.45	2.83
Farm production characteristics			
Land cultivated	Area of land under cultivation (in hectares)	1.22	1.16
Agric. output	Value of agric. output (in Naira[a])	0.22	0.31
Socio-economic and institutional variables			
Infrastructure	Index for access to infrastructure	0.01	0.02
Wealth	Average wealth index	-0.04	-0.03
Credit	Dummy, access to credit (1 access, 0 otherwise)	0.17	0.12
Non-labour income	Amount of remittances (in Naira)	1130.22	602.99
Wage	Hourly off-farm wage (in Naira)	90.22	42.30
Location variables			
North_west	Dummy for location, 1 if in north west and 0 otherwise	0.20	0.40
South_west	Dummy for location, 1 if in south east and 0 otherwise	0.16	0.37

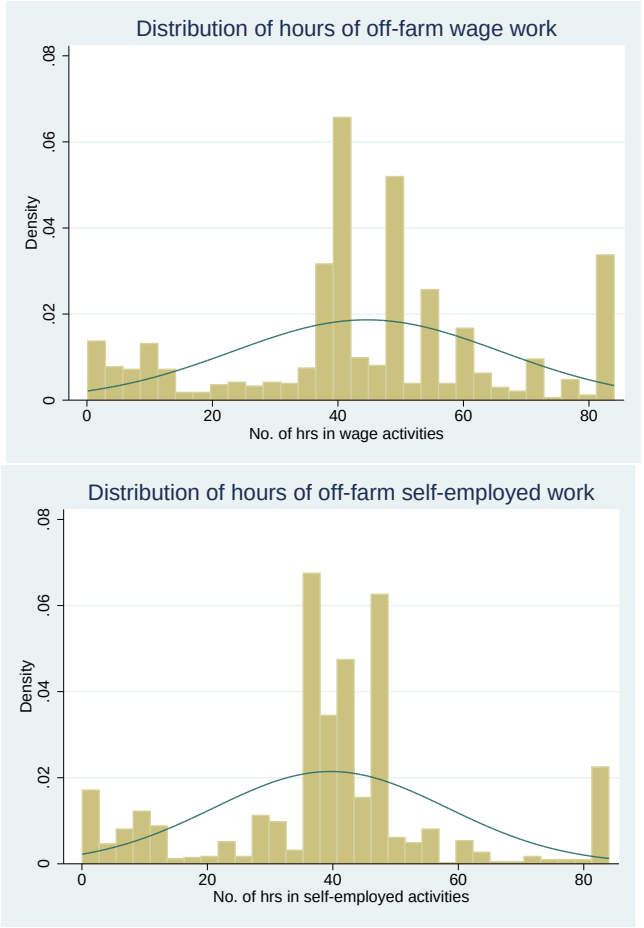
Author's computation (2013). [a]Naira is Nigerian currency unit and US$ 1 = 160.06 Naira in August, 2013.

The descriptive statistics shows that 37 percent of the rural households in the study area were involved in at least one off-farm activity with the off-farm self employed activities recording the highest rate of participation while the farm wage activities was the least activity participated in by the households.

Results

The appropriateness of the model in terms of fitting our data was determined by first exploring the normality and homosecdasticity assumption of the error term made in our original double hurdle model specification. In an attempt to feel the distribution of the dependent variable, a histogram is plotted over the participant population and is shown in Figure 0.1. As expected the dependent variable shows a strong positive skew. The long tail to the right as evident from the histogram causes us to suspect the validity of the normality assumption regarding the error terms which is prime in obtaining consistent estimates from the maximum likelihood estimations.

Figure 0.1: Histogram Showing Hours of Wage and Self-employed Off-farm Work



Beyond the graphical examination of the data, the normality and homoscedasticity assumptions were put to test by means of a Lagrange multiplier test as outlined in Cameron and Trivedi (2010 P.550). The test were conducted after the estimation of the standard Tobit and double hurdle models and the result is shown in Table 0.2 [10]. The result in both models have computed chi-square values χ^2 higher than the corresponding critical values

[10]though only result of the post Tobit estimation is shown because both results are only slightly different

at the 1 per cent significance level. This results confirms that both the normality and homoscedasticity assumptions made in the standard Tobit and double hurdle models fails to hold in our study. To address the outcome from the tests, a Box-Cox transformation was applied. True to expectation the transformation had a considerable effect on the distribution of the dependent variable by reducing its positive skewness. Secondly, the likelihood ratio test of comparing the restricted Tobit model with the double hurdle model as presented in Table 0.2 returned a likelihood ratio test statistics of computed chi square, $\chi^2 = 2199.22,\ atd.f. = 15\ and\ \ p - value < 0.001$ greater than the critical chi square $value = 31.73$. This outcome confirms that the restrictive assumptions implied by the Tobit model is rejected at the 1 percent level of significance. Hence, the participation and hours of work decision of the rural households are not based on the same decision making process and the double hurdle model is the most appropriate for our data. Thirdly, the independence of the error term in the double hurdle model, that is the null hypothesis of the covariance term $\rho = 0$ was also tested and the results is also shown in Table 0.2. It is evident from the result that the computed likelihood ratio statistic chi square value (χ^2) is greater than the critical values at the stated degree of freedom implying that the null hypothesis of zero covariance is rejected in both the standard and Box-Cox versions of the double hurdle model at the 1 percent level of significance. This outcome suggest that the popular independent double hurdle model is rejected and the dependent variant of the model is favoured in this study confirming that the participation and intensity of participation decisions are related.

Table 0.2: Results of the Likelihood Ratio Statistics

	Wage employment			Self employment		
Test type	*Computed* χ^2	*Critical* χ^2	*Decision*	*Computed* χ^2	*Critical* χ^2	*Decision*
Tobit restriction	2199.22	$\chi^2(0.01, 15) = 31.73$	reject Tobit	2311.22	$\chi^2(0.01, 19) = 34.11$	reject Tobit
Covariance test	0.722	$\chi^2(0.01, 1) = 0.039$	reject	0.801	$\chi^2(0.05, 1) = 0.0720$	reject
$(\rho = 0)$			independece			independece
Normality	7091.93	$\chi^2(0.01, 2) = 22.47$	reject	7160.93	$\chi^2(0.01, 2) = 25.69$	reject
Homoscedasticity	3051.93	$\chi^2(0.01, 2) = 34.67$	reject	2922.93	$\chi^2(0.01, 2) = 29.44$	reject

Source: Author's computation (2013)

Finally, a check for possible presence of multicollinearity was conducted by means of a variance inflation factor of all the variables in the estimated models. The results of the off-farm wage and self employment presented in Table 0.3 showed that the highest value is approximately 3.0, implying that multicollinearity it's not a concern in the estimated models.

To provide a common ground for comparison with the other restricted models, the same set of explanatory variables were employed in the double hurdle model. Maximum likelihood estimates of the Box-Cox double hurdle models of intensity of household participation in off-farm wage and self employment works are presented in Table 0.4. The parameter σ_{12} was significant at the 1 percent level in both models, implying a rejection of the

Table 0.3: Variance Inflation Factor (VIF) for variables in the off-farm wage and self-employment models

	VIF	VIF
Variable	Wage employment	Self employment
Gender	1.62	1.21
Age	1.53	1.24
Age square	2.10	1.97
Education	1.67	1.49
Household size	2.40	2.62
Dependant	1.11	1.27
Infrastructure	3.09	2.11
Land cultivated	1.33	1.45
Wage	2.09	1.77
Credit	1.17	1.33
Agric. output	2.60	2.41
Non-labor income	1.27	1.13
Wealth	1.99	1.41
Northwest	1.01	1.21
Southwest	2.31	1.95

independence of the errors and further affirming the result of the likelihood ratio test discussed earlier. The Box-Cox parameter (λ) had the value of 0.714 in the off-farm wage and 0.662 in the off-farm self employment models which are significantly different from 0 and 1 at the 1 percent level of significance. This result implies that the standard double hurdle and generalised Tobit models are rejected in both cases.The estimates of a number of the explanatory variables in our models further justifies the use of two-step approach in modelling labour supply decisions of rural households, as is obvious that the effect of these variables are more complicated than the Tobit model could handle. This is for example seen in the effect of gender of the household head on the probability of participation and hours of off-farm self employment activities conditional and unconditional on participation. Female headed households are less likely to undertake off-farm work than male headed households, but conditional on participation, female headed households are seen to supply more hours of to off-farm self employment activities than male headed households. Hence gender is seen to exert an opposite effect on the hours of off-farm self employment activities conditional on participation. Such inference would have been disguised if a Tobit model or a single equation regression was employed in our estimation.

The results of maximum likelihood estimates of the off-farm wage and self employment activities Box-Cox double hurdle models shows the effect of the explanatory variables in each of the selection and intensity equations on the the probability of participation and the intensity of participation. However, these results are complicated by the dependence between the two hurdles and also by the Box-Cox transformation of the dependent variable making the interpretation of the coefficients difficult. Hence, to give more intuitive interpretation to our results and in line with previous studies (see for example Yen, 1993; Yen and Jones 1996; Jones and Yen, 2000), the marginal effects of the explanatory vari-

Table 0.4: Maximum Likelihood Estimates of the Box-Cox double hurdle model

	Wage	employment	Self	employment
Variable	Participation	Intensity	Participation	Intensity
Constant	0.9772*	1.229*	0.6712**	1.7015**
	(0.229)	(0.4901)	(0.3150)	(0.5211)
Gender	0.2416***	0.1730***	0.1395***	−0.3134***
	(0.0406)	(0.0948)	(0.0438)	(0.0887)
Age	0.0125**	0.0449**	0.0791	0.0548
	(0.015)	(0.0105)	(0.001)	(0.003)
Age square	−0.0297	−0.1730	0.0014	0.003
	(0.0656)	(0.0948)	(0.0004)	(0.0015)
Education	0.5426**	0.4569**	0.3137*	0.1514*
	(0.2259)	(0.1943)	(0.112)	(0.0624)
Household size	0.1552*	0.1760*	0.0475	0.1395
	(0.0419)	(0.0112)	(0.015)	(0.0438)
Dependant	0.0488	0.1730	0.0177	0.0304
	(0.0242)	(0.0948)	(0.0126)	(0.027)
Infrastructure	0.1363***	0.0342***	0.1418***	0.0271**
	(0.0121)	(0.0214)	(0.0127)	(0.0144)
Land cultivated	−0.3594**	0.2099**	−0.4047**	0.0969***
	(0.0211)	(0.1440)	(0.0224)	(0.0425)
Wage	0.3306***	0.5882***	0.0113***	0.0580*
	(0.1489)	(0.1222)	(0.0034)	(0.0036)
Credit	0.0257	0.0366	0.0302**	0.3771**
	(0.0085)	(0.1499)	(0.0091)	(0.1494)
Agric. output	0.2743***	0.2199***	−0.2598***	0.5124**
	(0.1190)	(0.0792)	(0.0454)	(0.244)
Non-labour income	0.1153**	0.3012**	0.0273**	0.0199**
	(0.0169)	(0.1912)	(0.0039)	(0.023)
Wealth	0.0168**	0.1349**	0.0599**	0.1809**
	(0.0081)	(0.0411)	(0.0034)	(0.0421)
North-west	0.1720***	0.1420***	0.2137**	0.0992**
	(0.0812)	(0.1022)	(0.0379)	(0.0192)
South-west	0.2423***	0.27113***	0.1626**	0.2911**
	(0.0352)	(0.0522)	(0.0253)	(0.1444)
σ_{12}		0.4112		0.5332***
		(0.0594)		(0.0990)
λ		0.7145		0.662
		(0.1214)		(0.0961)
Log-likelihood		−4649.598		−4169.587

ables are examined further by calculating the elasticities. The parameter estimates were used to compute the elasticities of the probability of participation, conditional level and unconditional levels of participation for the Box-Cox double hurdle model, along with the standard errors for these elasticities were computed and are presented in Table 0.5. The standard error for the elasticities were computed using the delta method. The significant of the marginal effects of the explanatory as presented in Table 0.4 variables are the determinant of the levels of significance of the computed elasticities. The implication of the result as presented Table 0.5 are discussed in the next subsection.

Off-farm Wage Employment Activities

From the results presented in Table 5, the individual and household characteristics observed to influence the probability of participation and number of hours supplied to off-farm wage employment activities conditional and unconditional on the decision to participate by the households are gender, age, age square and level of education of the house head, and access to infrastructure. The outcome in terms of the sign and statistical signi-

ficance of the estimate of some of this variable are as expected.Gender of household head has a positive effect on the probability of off-farm wage participation and the number of hours supplied to off-farm wage activities conditional and unconditional on participation. This outcome suggest that male headed households are more likely to be involved in off-farm activities and would supply more hours into off-farm wage activities once the decision to participate has been made than female headed households. This may be attributable to the domestic commitment of women within the households thereby reducing the time that would have being spent in off-farm work.

The age of the household head have a quadratic effect on the off-farm sector participation of rural households. This implies that rural households conditional on participation in wage activities will spend more time in off-farm wage activities as they grow old, however at a decreasing rate. This outcome may be due the fact that older heads of the household have more experience and connection needed to enhance there participation in off-farm wage activities, however that is seen to decline as they grow older.Consistent with expectations,education of the household measured in number of school years show a significant and positive influence on the probability of participation, conditional and unconditional levels of off-farm wage work. Hence, an additional year of education in the household will results in the shift of labour into off-farm wage activities with a hope of getting higher returns thereby increasing both the probability of participation and the number of hours spent in off-farm wage activities. This result is consistent with findings of previous studies such as Lanjouw et. al., (2001) in Tanzania; Elbers and Lanjouw, (2001) in Ecuador; de Janvry et. al., (2005) in China and Awoyemi, (2011) in Nigeria.

Probability of rural households participation in off-farm wage activities increase with an increase in the adult equivalence household size. This is made possible by the statistical significant and positive effect the household size exerts on the decision to undertake off-farm wage activities. But conditional on off-farm wage participation, it is observe not to have any effect on the number of hours spent in off-farm wage activities. This result on the effect of household size is similar to the one obtained by Bedemo, et. al., (2013) who reported an insignificant effect of household composition on the number of hours of off-farm work.

The presence of dependants in the form of children and aged in the household though positive have no statistical significant effect on both the probability of participation and the condition and unconditional levels of participation in off-farm wage activities. This outcome is consistent with findings of a number of previous studies in rural areas of developing countries that hold the view that child care and off-farm work participation are not necessarily competing activities (see for example, Skoufias 1994; Abdulai and Delgado, 1999; Matshe and Young, 2004). However, household access to developed infrastructural facilities is observed to be associated with higher likelihood of participation and hours of off-farm wage activities work. This could be attributable to the reduction in the cost of information and transportation leading to a lower transaction cost and hence an increase in incentive and opportunities in off-farm wage activities. Farm characteristics are represented in the off-farm wage model by size of arable land under cultivation and

the value of farm output. As expected, the effect of land cultivated and value of farm output on the probability of off-farm wage participation wage is negative and statistically significant. Same effect is seen in terms of the number of hours of off-farm wage work.

This result which is quite a popular finding among previous studies on labour supply (see for example Abdulai and Delgado, 1999; Woldehanna and Oskam, 2001; Bedemo et. al., 2013) confirms that rural households with small landholding and farm output which is the case among majority of households in the study area depend on the opportunities in the off-farm sector to escape poverty by supplementing income from the farm.

The result further revealed that variables that denote economic incentive in the off-farm wage model; off-farm wage, access to credit, non-labour income and the wealth status of rural households are important variables in the participation and hours of wage work decisions. As shown in Table 5, an increase in the predicted off-farm wage rate will increase both the probability of participation and the number of hours committed to off-farm wage work. The wage elasticity of the probability of participation, number of hours of off-farm wage employment is 0.12, 0.62 and 0.66, respectively. This shows that though the own wage elasticity of the hours of off-farm wage employment is positive, it is inelastic. Therefore, a 10 per cent increase in off-farm wage rate will cause the probability of off-farm wage participation to increase by 1.2 per cent and hours of wage work to increase by 6.2 and 6.6 per cent, conditional and unconditional on participation, respectively. This outcome suggest rural households have an upward-sloping off-farm labour supply curve and that higher off-farm wages rates will result in a condition where the substitution effects outweighs the income effects resulting in increased supply of labour to off-farm wage activities.This finding is similar to the results obtained by Woldehanna and Oskam (2001) in their study in Ethiopia who found own wage elasticity of labour supply for off-farm wage to be positive and inelastic with a value of 0.46.

Non-labour income available to rural households in the form of remittances exerts a negative effect on the probability of participation and the number of hours of off-farm wage employment. This situation is attributable to the ability of such income to ease increase in the liquidity and ease the constraint on household income which reduces the need to undertake off-farm wage activities. This outcome signifies that that the leisure time of the households is a normal good. The index denoting the wealth status of rural households is seen to positively influence the probability of participation in off-farm activities, but has an opposite effect on the number of hours of off-farm wage work. This result implies that rural households that are relatively well-off are more likely to undertake off-farm work, however conditional on the decision to participate, they spend less time in off-farm wage activities. This is understandable as the motive of these group of households in deciding to diversify into the off-farm sector is believed to basically be to multiply their assets and/or reduce risk and the off-farm wage activities is not a suitable avenue to achieve such goals. Similarly access to credit which is another form of economic incentive variable included in our model is seen to have the expected positive sign, but it is statistically not significant, hence has no effect on both the probability of participation and the intensity of off-farm wage participation.

Finally, the result shows that the geographical location of the rural households influences not only the decision to undertake off-farm activities but also the intensity of participation in off-farm wage activities conditional on participation. This is shown in the statistically significance of the two locational dummy variables included in the model. It is evident from the results that there is higher probability of participation and number of hours of off-farm wage work in the North-west region than in the South-west region. Such difference in the level of involvement in wage activities could be attributed to a number of factors, principally the high rate of poverty and unemployment in the North-west region[11].

Table 0.5: Elasticity Estimates for the Box-Cox double hurdle model

	Wage employment			Self employment		
Variable	Prob.	Cond. mean	Uncond. mean	Prob.	Cond. mean	Uncond. mean
Gender	0.0762***	0.2106***	0.2734***	0.0229**	−0.1968**	−0.2072**
	(0.0234)	(0.0574)	(0.0711)	(0.0068)	(0.0529)	(0.0712)
Age	0.0092**	0.0144**	0.0392**	0.0092	0.1092	0.1224
	(0.00277)	(0.0026)	(0.0057)	(0.00277)	(0.0602)	(0.0578)
Education	0.1441**	0.5904**	0.6124	0.111*	0.5537*	0.5747*
	(0.0516)	(0.0478)	(0.0955)	(0.0499)	(0.0339)	(0.0326)
Household size	0.1681*	0.6461*	0.6704*	0.089	0.4786	0.5111
	(0.0445)	(0.0753)	(0.1081)	(0.0321)	(0.0766)	(0.1882)
Dependant	0.0034	0.0283	0.2950	0.0033	0.0211	0.0209
	(0.0012)	(0.0024)	(0.0061)	(0.0079)	(0.0274)	(0.0322)
Infrastructure	0.0775***	0.1458**	0.1555***	0.0526**	0.1012**	0.1194**
	(0.0219)	(0.0039)	(0.0097)	(0.0314)	(0.0511)	(0.0554)
Land cultivated	−0.1200**	−0.5019**	−0.5342**	−0.1702***	−0.7522***	−0.8012***
	(0.0824)	(0.0841)	(0.0946)	(0.0611)	(0.1209)	(0.0833)
Wage	0.1162***	0.6224***	0.6620***	0.0069*	0.0483*	0.0514*
	(0.0421)	(0.0923)	(0.1062)	(0.0027)	(0.0412)	(0.0514)
Credit	0.0530	0.1352	0.1815	0.0535**	0.1194**	0.1230**
	(0.0177)	(0.0212)	(0.0514)	(0.0177)	(0.1192)	(0.1074)
Agric. output	−0.1129***	−0.5417***	−0.5594***	0.1204**	0.6349**	0.6452**
	(0.0599)	(0.1034)	(0.0999)	(0.0477)	(0.0992)	(0.1223)
Non-labor income	−0.0862**	−0.1692**	−0.1793**	0.0599**	0.1124**	0.1299**
	(0.0337)	(0.0617)	(0.0492)	(0.0167)	(0.0288)	(0.0375)
Wealth	0.0583**	−0.1377**	−0.1622**	0.1130**	0.5011**	0.5225**
	(0.0142)	(0.6912)	(0.5152)	(0.0440)	(0.1903)	(0.2033)
North-west	0.0081***	0.0430***	0.0477***	0.0094**	0.0302**	0.0317**
	(0.005)	(0.0261)	(0.0291)	(0.0047)	(0.0195)	(0.0212)
South-west	0.0069**	0.0217**	0.0250**	0.0057**	0.0457**	0.0527**
	(0.0047)	(0.0142)	(0.0291)	(0.0019)	(0.022)	(0.0262)

Source: Author's computation (2013). Note: ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively. Standard errors in parentheses.

Off-farm Self Employment Activities

Table 5 shows that the participation and intensity of off-farm self employment activities is influenced by some individual and household variables included in the model. In terms of the gender effect, same as in the case of off-farm wage, male headed households are more likely to make the decision to undertake off-farm self employment than households headed by females. However, conditional on such decision, female headed households have higher preference for off-farm self employment and hence spent more hours working in off-farm self employment activities than male headed households. Such preference could be the result of a number of factors among which is the physical demand of alternative off-farm

[11]The region has the highest rate of poverty as compared to other regions in Nigeria NBS (2012).

activities like farm wage activities and the flexibility of off-farm self employment especially the small and medium sizes that dominant the rural economy.

The result does not provide any significant effect of the age variable on both the probability of participation and number of hours of off-farm self employment. Although the sign of the estimates of age is plausible, they are not significantly different from zero. This suggest that self employment activities unlike off-farm wage activities is popular among all age groups of household heads. This outcome is quite evident in the rural economy, where there is a form of self employment for various age grades[12]. In contrast to findings by a number of previous studies that the level of education of household head is not an important determining factor in off-farm self employment, it is evident from our result that reverse is the case in rural Nigeria. The level of education of the household head exerts a significant and positive influence on the probability of participation and the number of hours spent in off-farm self employment activities. This could be attributable to the fact that a number of self employment activities require some level of education (not necessarily higher education) to start up and efficiently manage[13].

Both household size and number of dependants which depicts household size and composition have no effect on the probability of participation and the number of hours committed to off-farm self employment actives. Unlike alternative off-farm activities such as farm wage or off-farm wage activities, majority of the self employment activities are managed by the household heads and require more of starting capital and entrepreneurial experience than additional labour made possible by the increase in household size . Also, the availability of members of the extended family which is the case in most rural households in Nigeria, provide the extra care and attention needed for the additional number of dependants, hence is not surprising that it has no effect on off-farm self employment participation.

Same as in off-farm wage activities, access to well developed infrastructure will increase the likely of participation and the number of hours of off-farm self employment. Improvement in the state of facilities such as power, roads, telecommunication etc. in and around the rural economy is capable of providing more opportunities in the off-farm sector and attract rural households to explore such opportunities. This is evident in the turn around in the mobile phone communication technology in Nigeria specifically between 2001 and 2009[14]which has made it possible for millions of mobile call centres to spring up both in urban and rural areas in the country and serves as a major employment option in the off-farm self employment portfolio. Both the size of arable land under cultivation and the output from the farm have decreasing effect on the probability and intensity of off-farm self employment activities. This is evident in the statistically significant negative sign of both estimates. Both conditions are capable of increasing the reservation wage of a rural

[12]The youths are seen to be involved in activites like GSM call centres, retailing consumables etc., while the adults are involved in activities like weaving, blacksmith etc.

[13]Off-farm self employment activites such as operating GSM call centres, retailing, especially health related products require some level of education to start up and manage

[14]The country has presently up to 90 million mobile subscribers, the largest in Africa from just 450, 000 subscribers in 2001, iHubResearch (2012).

household, hence reduce the number of hours spent in off-farm self employment activities. A 10 per cent increase in the size of land under cultivation for example, will reduce the probability and conditional and unconditional levels of off-farm self employment by 1.7 per cent, 7.5 per cent and 8.0 per cent, respectively.

Consistent with expectation, access to credit facilities by rural households will increase the likely and scale of off-farm self employment activities. Such credit facilities are either not available or its cost is unnecessarily high because of the absence of complete credit institutions in developing economies like Nigeria. The 'lucky' few rural households who are beneficiaries of government soft micro-finance loans are more likely to invest in off-farm self employment activities. This claim is supported by Barret and Reardon (2001), who reported that households with access to credit facilities would more likely diversify outside agriculture to reduce risk. Same as in off-farm wage activities, the elasticity of the probability of participation and levels of labour supply to off-farm self employment activities shows a positive responds to its own wage rate. The values of the elasticities are however lower than in the case of wage employment activities and inelastic.

Access to non-labour income in the from of remittance exerts a significant positive effect on the probability of off-farm sector participation and the number of hours of off-farm self employment activities. This suggest that an increase in the amount of non-labour income that accrues to the household will reduce the likelihood of off-farm sector participation and a reduction in the number of hours spent in off-farm self employment activities. This could based on the ability of such income to relax the liquidity constraints faced by household hence reduces the search for supplementary income source in the form of off-farm self employment activities. This finding corroborates that of previous studies such as Abdulai and Delgado (1999), Corsi and Salvioni (2000), and Marian and Johan (2004).

The wealth index is statistically significant and has a positive effect on the probability of off-farm sector participation. Conditional on participation, wealthy households would prefer to spend more hours in off-farm self employment activities. This result emphasis the important role household wealth play in the decision to explore off-farm activities and the inability of poor households to meet the asset requirement of some off-farm activities such as self employment tends to hold them back from fully exploring the opportunities provided in the off-farm sector. This outcome echoes the findings of Oseni and Winters 2009 who reported in their studies in Nigeria that households with greater wealth and assets are more likely to undertake off-farm work.

Finally, the two dummies denoting geographical location of the rural households influences shows a positive effect on the decision to undertake off-farm activities and the intensity of participation in off-farm self employment activities conditional on participation decision. There is however higher probability of participation and the number of hours of off-farm self employment activities for households in the South-west region than those in the North-west region. Such regional difference could be based on the fact that the South-west region recorded the lowest poverty rate hence households are more capable of meeting the asset requirement of off-farm self employment activities and hence are seen to be more likely

to participate and spend more hour in such activities.

Conclusions and Policy Recommendations

This study examined the off-farm labour supply decisions of rural farm households in Nigeria. The analysis which was based on the theoretical model presented here, used the double hurdle model approach. The use of the approach in this study as opposed to a single or restrictive approach as is the case in the Tobit model was justified using the data and econometric methods.

Results of the study revealed the importance of individual and household characteristic in the form of household size and composition, educational level, infrastructural access and geographic locational factors in influencing the off-farm participation decision of rural households; while the hours of off-farm work decisions are major driving by socio-economic and institutional variables such as wealth status, access to credit, wage rates and also geographical location. The result further shows that like agriculture, the rural off-farm sector has it's own challenges which is capable of limiting the extetent to which rural households explore its potentials. This is evident in the significant role factors such as access to credit and wealth status play in the decisions to participate and choice of off-farm activity type. Finally, the study confirmed that factors that drive both participation and intensity of participation are a mix of 'push' and 'pull' factors.

It is evident from this study that the rural off-farm sector plays an important role in ameliorating the problems of low agricultural productivity leading to low farm incomes which is associated with rural poverty. Therefore, government policies should be directed not just at agricultural development but also at promoting the off-farm sector. Hence, a farm and off-farm led growth should be pursued within the rural economy as a means to bring about the needed escape route out of poverty.

Access of rural households to basic infrastructure like power, road network and telecommunication is observed from the study to be a very significant factor that drive rural households to undertake off-farm work based on the opportunities it is capable of creating. With such knowledge, efforts should be made by both government and non-governmental organisations at enhancing the state of infrastructure in rural areas which will in addition to making an impact on their well-being create more opportunities in the off-farm sector for rural households to explore.

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