



# Does credit constraint in agriculture influence choice of nonfarm activities? Evidence from rural Nigeria

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## Abstract

Agriculture is less becoming the main source of livelihood in rural Nigeria owing to high climatic risks, poor returns to investment and lack of modern tools. Thus, rural households are beginning to diversify their livelihoods from farming into non-farm activities, as alternative income sources. However, investment in non-farm income generating activities that yield higher returns require in most cases credit availability and accessibility. A household's participation in and choice of nonfarm activities is thus expected to vary significantly between those who have access to credit and those who do not. However, recognition of the widespread nature and possibly far-reaching impacts of credit on non-farm income activities is scarce. This study examines the link between credit constraint status of rural households and their choice of nonfarm activities. Descriptive statistics, Probit and Multinomial Logit Regression models were employed for analysis. Results revealed that trading, artisanship and commercial transportation activities were the major non-farm activities engaged in by the households. A household credit constrained status also significantly influenced the choice of non-farm activities. Credit constrained households were more likely to participate in commercial transportation activities relative to other non-farm activities owing to its less capital-intensive nature. Promoting access to credit is thus pertinent and should be of utmost priority in the design of any programme for rural households in Nigeria.

**Keywords:** Credit Constraint; Non-Farm Participation; Rural; Nigeria

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## 1. Introduction

Agriculture has long been focused on as the central element for rural poverty reduction in Africa. This is because, in most African countries, agriculture is the mainstay of the economy with the highest share of GDP, as well as the main source of income for about two-thirds of the sub-Saharan population who live in rural areas. However, after many decades of focusing on this sector, growth has only been marginal and has not trickled down to the poorest of the poor (Akpan, 2010; Brownson et al., 2012). Besides agriculture being the major source of income and employment in rural areas, rural households have been found to diversify their livelihoods from farming to non-farm activities. As a matter of fact, it is rare to find a farming household who depends solely on farming as its source of income. Studies carried out in various countries have indicated that between one-third and two-thirds of farmers are involved in nonfarm activities (Zahonogo, 2011). Thus, a thorough understanding of the diversity of nonfarm income activities that rural households rely upon, as well as factors underlying the choice of such activities, is pertinent. This is so especially for farming households who are subjected to high risk due to climatic factors, price fluctuations, pests and diseases and much more that agriculture is characterized with.

Today, rural households' involvement in nonfarm activities has been found to be a key strategy to promoting and implementing rural development; reducing poverty by generating alternative income sources and indirectly reducing rural-urban migration, which is a serious problem in many transition economies (Pham, 2006). However, in Nigeria, the majority of rural households are poor and their level of poverty has been exacerbated by their inability to take up nonfarm businesses (MDG's Report, 2005). This is so because the generation of self-employment in nonfarm activities requires investment in working capital as well as the need for start-up capital. However, at low levels of income, the accumulation of such capital may be difficult, resulting in a negative effect on income generation capacity. In other words, credit availability and accessibility imply the ability to purchase the inputs needed for production as well as the accumulation of own capital to acquire the needed inputs to invest in nonfarm income generating activities that yield higher returns (Omonona et al., 2010).

The Nigerian financial system is one of the highest and most diversified in sub-Saharan Africa but not yet in a position to fulfill its potential as a propeller of economic growth and development owing to the lack of a formal national credit policy and the paucity of credit institutions. For instance, non-institutional creditors account for 70% of the total credits received by Nigerian rural population (Oboh, 2010), because the institutional lending system has failed to meet the objectives for which they were set up which include to serve the rural poor and be sustainable credit institutions.

A household's participation in nonfarm self-employment is expected to vary significantly between those who have access to credit and those who do not. However, recognition of the widespread nature and possibly far-reaching impacts of credit on nonfarm income activities is scarce and has given rise to research efforts to empirically examine the issue. This justifies the need for this study as it attempts to examine the link between credit constraints and choice of nonfarm activities among rural households in Nigeria, by identifying the various sources of credit available to rural households in Nigeria, identifying the factors that influence the

credit constrained condition of rural households and examining the effect of credit constraints on the choice of rural households nonfarm activities.

## 2. Material and methods

Secondary data used for this study was the second wave of the General Household Survey-Panel Data (2013), conducted by the Nigeria National Bureau of Statistics and supported by the World Bank, National Food Reserve Agency (NFRA), the Bill and Melinda Gates Foundation (BMGF) and the Federal Ministry of Agriculture and Rural Development (FMA&RD). The sample design was a 2-stage stratified sampling. The first stage involved the selection of Enumeration Areas (EAs) based on probability proportional to size (PPS) of the total EAs in each state and Federal Capital Territory and the total households listed in those EAs. A total of 500 EAs were selected using this method. The second stage was the systematic selection of ten (10) households from each EA to make up a total number of 5000 households consisting of 3370 rural households and 1630 urban households. Thus, the final number of households interviewed was slightly less than the 5,000 eligible for interviewing as a result of a non-response rate of about 0.3 percent. The final number of agricultural or rural households interviewed was 2431 but only 655 households constituted the study sample size owing to missing information relevant for this study.

Descriptive and econometric tools were employed for analysis. Descriptive statistics such as means, frequency distribution and percentages were used in describing the various socio-economic characteristics of farming households and that of their credit sources, while the econometric tools employed include the Probit and Multinomial Logit Regression Models.

### 2.1. Probit regression model

The Probit model is used in regression analysis when the dependent variable;  $Y$  is dichotomous (i.e. assuming only two values, either 1 or 0). Thus, it is used to estimate the probability that an observation with particular characteristics will fall into either of these two categories using the maximum likelihood method with an assumption that  $Y$  is determined by a latent unobserved continuous variable  $Y^*$ .

A household is said to be credit constrained when it cannot obtain the desired amount of credit. However, there are two cases of credit constraints: if a household could only get part of the credit he demands, then he is partially constrained (Manrique and Ojah, 2004), the other is that a household cannot get any credit when he has positive demand, so he is fully constrained (Dutta and Magableh, 2006). In this study, a credit constrained household was defined as the household who was turned down when it requested for credit from a financial institution (fully constrained). This condition is dummied 1, for a constrained household and otherwise 0; if the household was not credit constrained. Therefore,  $Y^*$  is specified as follows:

$$Y_i^* = \beta_0 + \sum_{j=1}^{13} \beta_j X_j + \varepsilon_i \quad (1)$$

$$\varepsilon_i \sim N(0, 1)$$

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

$$Y_i = 0 \text{ if } Y^* \leq 0$$

$B_j$  represents a vector of unknown parameters,

$\varepsilon_i$  represent a random disturbance term.

Where  $X_j = X_1, X_2, X_3, \dots, X_{11}$ , represent vector of random variables. The random variables (independent variables) were selected following Omonona et al. (2010); Kuwornu et al. (2012); and Obisesan, (2013). Other variables of interest such as household savings and sale value of crop yield were added for further estimation.

The probit model is expressed explicitly as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} \quad (2)$$

Where  $Y$  = Credit constrained condition (Constrained = 1, 0 if Otherwise)

$X_1$  = Age of household head (actual age in years)

$X_2$  = Age squared

$X_3$  = Gender of household head (male = 1, 0 if otherwise)

$X_4$  = Marital status of household head (married = 1, 0 if otherwise)

$X_5$  = Educational status of household head (formal = 1, 0 if otherwise)

$X_6$  = Household size (actual number)

$X_7$  = Primary occupation (Farming = 1, 0 if otherwise)

$X_8$  = Land acquisition Method (Purchased = 1, 0 if Otherwise);

$X_9$  = Household has Savings (Yes = 1, 0 if Otherwise)

$X_{10}$  = Sale value of household asset (value in naira)

$X_{11}$  = Farm size (hectares)

## 2.2. Multinomial logit regression model

The Multinomial Logit Regression model was used to estimate household's choice of nonfarm activities as a function of some explanatory variables. Also, as a variable of interest, the significance of credit constrained status of households in participating in nonfarm activities was considered. In this study, the classification of nonfarm activities by Barrett et al. (2001) was adopted. They explained the sectoral classification between "farm" and "nonfarm" activities as those primary sector production process that produce raw food products from natural resources. It also includes the use of capital and labour to produce services e.g., commerce, transportation etc. However, nonfarm activities were further disaggregated into "trading, artisanal, and commercial transportation activities" as these activities were the most common among the farming households.

Considering a random variable  $Y_i$  that takes one of the several discrete values, which is indexed 1, 2, 3, ...,  $j$ . In this study,  $Y_i$  is the response on nonfarm activity choices and it takes the values 0, 1, 2, 3 representing

‘farming activities’, ‘trading activities’, ‘artisanal activities’, and ‘commercial transportation activities’, respectively.

With respect to the model, each individual will fall into one of the categories with a certain probability. Let

$$\pi_{ij} = \Pr (Y_i = j) \tag{3}$$

This denotes the probability that the *i*th response falls in the *j*th category. In other words,  $\pi_{i1}$  is the probability that the *i*th respondent is a trader etc.

The simplest approach to multinomial data is to nominate one of the response categories as a baseline or reference cell, calculate log-odds for all other categories relative to the baseline, and then the log-odds as a linear function of the predictors. Typically, farming activities was made the reference group (as a baseline) and the odds estimated as a respondent ‘*i*’ falling into category *j* as opposed to the baseline as  $\pi_{i1} / \pi_{ij}$ .

### 2.3. Modeling the probabilities

In this study, since the response categories 0, 1, 2, 3 ..... , *j* are unordered, the most preferred way to relate  $\pi_i$  to covariates is through a set of *j*\* - 1 baseline-category logits. Taking *j*\* as the baseline category, the model is expressed as

$$\text{Log} \left( \frac{\pi_{ij}}{\pi_{ij^*}} \right) = x_i^T \beta_j, j \neq j^* \tag{4}$$

The baseline-category probability ( $Y_i = j^*(0)$ ) can be expressed as:

$$\pi_{i0} = \frac{1}{1 + \sum_{j=1}^3 \exp(x_i^T \beta_j)} \tag{5}$$

The probability of  $Y_i = j$  in relation to the baseline category  $Y = j^*(0)$  is given by the odds ratio.

$$\pi_{ij} = \frac{\exp(x_i^T \beta_j)}{1 + \sum_{j=1}^3 \exp(x_i^T \beta_j)}, j = 1, 2, 3 \tag{6}$$

where  $\pi_{ij}$  ( $j=0, 1, 2, 3$ ) = the probability associated with the nonfarm activities choices of a household *i* with  $j=0$  if household participates only in farm activities;  $j=1$  if the household participates in trading activities;  $j=2$  if the household participates in artisanal activities; and  $j=3$  if the household participates in transportation activities. According to (Greene, 2003), the natural logarithms of the odd ratio of equations (5) and (6) give the estimating equation as:

$$\ln \frac{\pi_{ij}}{\pi_{i0}} = \beta_j X_i \tag{7}$$

This denotes the relative probabilities of each of group 1, 2, and 3 to the probability of the reference group. The estimated coefficients for each choice, therefore, reflects the effects of  $X_{i's}$  on the likelihood of the households choosing the reference group.  $X_i$  is the explanatory variables, which remain constant across alternatives.

As a result, the parameter estimates measure the impact of a unit increase in the relevant explanatory variable on the log odds ratio of the particular state in relation to the baseline category. An odd ratio value of 1 indicates a lack of association between the explanatory and the outcome (that is, it leaves the dependent variable unchanged). The odd ratio value greater than 1 indicates a positive association between the explanatory variable and the outcome implying that the explanatory variable increases the dependent variable

while an odd ratio smaller than 1 represents a negative relationship implying that the explanatory variable reduces the dependent variable. The marginal effects are obtained by differentiating equations (5) and (6) with respect to the explanatory variables.

The multinomial logit regression model can be expressed explicitly as:

$$Y_1 = \alpha_1 + B_{11}X_1 + B_{21}X_2 + \dots \dots \dots B_n X_n + \varepsilon_i \text{-----(8)}$$

$$Y_2 = \alpha_2 + B_{12}X_1 + B_{22}X_2 + \dots \dots \dots B_n X_n + \varepsilon_i \text{-----(9)}$$

$$Y_3 = \alpha_3 + B_{13}X_1 + B_{23}X_2 + \dots \dots \dots B_n X_n + \varepsilon_i \text{-----(10)}$$

$$Y_0 = \alpha_0 + B_{10}X_1 + B_{20}X_2 + \dots \dots \dots B_n X_n + \varepsilon_i \text{-----(11)}$$

Where  $Y_{i=1,2,3}$  represents 3 unordered categories of nonfarm activities:

$Y_0$  = those who were involved in farming activities only (farmers)

$Y_1$  = those who were involved in petty trading, wholesale and retail trading, buying and selling of goods (trading) etc.

$Y_2$  = those who were artisans (e.g., mechanics, shoemaker, electrician, hairdresser, tailor, carpenter, etc)

$Y_3$  = those who were commercial motorcycle riders, bus drivers, etc (transportation business)

$X_1 \dots X_n$  represents vector of the explanatory variables where  $n = 1 \dots 17$

$B_1 \dots B_{17}$  represent the parameter coefficients

$\varepsilon_i$  = represents the independently distributed error terms

$\alpha$  = constant term.

The explanatory variables included in the model are as follows:

$X_1$  = Age of Household head (years)

$X_2$  = Age Squared

$X_3$  = Sex of Household head (Male =1, 0 if Otherwise)

$X_4$  = Marital Status of the Household head (Married =1, 0 if Otherwise)

$X_5$  = Number of Household member (Actual number)

$X_6$  = Area of Land Cultivated (hectare)

$X_7$  = Area of Land Owned by Household (hectare)

$X_8$  = Educational status of Household head (formal=1, 0 if otherwise)

$X_9$  = Crop yield (Value in Naira)

$X_{10}$  = Sale value of Household asset (Naira)

$X_{11}$  = Credit constraints status of Household (Constrained=1, 0 if Otherwise)

$X_{12}$  = Source of Business Start-up capital (Household savings = 1, 0 if Otherwise)

$X_{13}$  = Source of Business Start-up capital (Relatives/friends = 1, 0 if Otherwise)

- $X_{14}$  = (Poor electricity: Yes =1, 0 if Otherwise)  
 $X_{15}$  = (Poor road: Yes =1, 0 if Otherwise)  
 $X_{16}$  = Distance between respondents' home and nearest market (Km)  
 $X_{17}$  = Distance between respondents' home and nearest road (Km)

### 3. Results and discussion

#### 3.1. Socioeconomic characteristics of the households

Table 1 presents the distribution of households by selected socioeconomic characteristics.

**Table 1.** Summary of socio-economic characteristics of respondents

Variables	Frequency	Percentage
<b>Gender</b>		
Male	600	91.6
Female	55	8.4
<b>Age</b>		
≤29	28	4.3
30 - 39	151	23.1
40 - 49	194	29.6
50 - 59	134	20.5
≥60	148	22.6
<b>Household size</b>		
1 to 5	214	32.6
6 to 10	318	48.6
11 to 15	114	17.4
>15	9	1.4
<b>Level of education</b>		
No formal education	379	57.9
Primary	164	25.0
Secondary	94	14.4
Tertiary	18	2.8
<b>Marital status</b>		
Single	7	1.1
Married	587	89.6
Widowed	52	7.9

Separated/Divorced	9	1.3
<b>Major occupation</b>		
Farming	527	80.5
Non-farming	128	19.5
<b>Method of land acquisition</b>		
Inheritance	515	78.6
Purchase	28	4.3
Rent or lease	27	4.1
Used free of charge (Gift)	85	13.0
<b>Farm size</b>		
<1ha	447	68.2
1 – 5ha	192	29.3
>5ha	16	2.4
<b>Total</b>	<b>655</b>	<b>100.0</b>

Source: Author's Compilation from General Household Survey, 2012

The distribution of respondents by sex revealed that majority of the households in the study area were headed by males while female heads constituted only a minority. The age distribution showed that more than half of the respondents were  $\leq 49$  years. The average age of the respondents stood at  $48.1 \pm 13.1$  years. The household size of the respondents ranged from 1 to 24 persons. However, the average household size of the respondents stood at about  $7 \pm 3$  members per household with almost half of the households falling between household size of 6 and 10 members. Almost two-thirds of the household heads had no formal education. This is in accordance with *a priori* expectations that the level of illiteracy is high among rural dwellers (World Bank, 2008) and is expected to have an effect on the administrative productivity for credit processing. While more than four-fifths of the respondents were married, highlights of the occupational status of respondents as expected showed that a major proportion was engaged in farming as a primary occupation. This implies that, for many households in rural areas in Nigeria, agriculture is still the primary source of livelihood. The distribution of households by the method of land acquisition revealed that more than three-quarters acquired land by inheritance while ownership by leasehold accounted for the smallest proportion. Household distribution with respect to farm size showed that more than three-fifths of the respondents utilized less than 1 hectare of land for farming while only a few cultivated between 1 and 5 hectares. However, those that cultivated more than 5 hectares constituted the minority in the study area.. This low farming hectarage can be attributed to the fragmentation of landholdings (mostly due to inheritance), as well as the lack of access to modern farming inputs to cultivate large expanses of land.

### 3.2. Credit market participation

With respect to participation in the credit market, Table 2 shows that more than two-thirds (69 percent) of the households had not obtained credit from any source. Only a minority had obtained credit from cooperatives

and savings association such as Esusu, Ajo, etc. respectively. This finding contradicts the findings of Adebayo and Adeola (2008) in which cooperative societies was found to be the most dependable source of credit among the rural dwellers. Further, while none of the households had obtained credit from commercial banks, less than one percent had obtained credit from microfinance banks. This result agrees with the findings of Ayegba and Ikani (2013) that commercial banks and most microfinance banks with rural mandates are not found in the rural areas, instead, they are found in the cities servicing urban dwellers against their statutory mandate. However, almost three-tenths (27.9 percent) had obtained credit from friends and relatives. This indicates that informal credit is the most accessible source of credit to the respondents in the study area. Such easy accessibility may be owing to factors such as trust, communal relationship, and absence of interest rate and collateral. This study thus reveals the insignificant contribution of formal credit institutions to the supply of credit to rural households in Nigeria.

**Table 2.** Credit Market Participation of Households

Variables	Frequency	Percent
<b>Credit Source</b>		
None	452	69.0
Saving Association	12	1.8
Cooperatives	5	0.8
Microfinance	3	0.5
Friends and Relatives	183	27.9
Total	655	100.0

Source: Author's Compilation from General Household Survey, 2012

**Table 3.** Distribution of Households by Credit Status

Variable	Frequency	Percent
<b>Credit Status</b>		
Constrained	236	36.0
Unconstrained	419	64.0
Total	655	100.0

Source: Author's Compilation from General Household Survey, 2012

### 3.3. Credit status of respondents

Following Boucher et al. (2009), the direct elicitation approach to categorizing households into their credit constrained status was adopted for this study. Thus, households that were turned down for one reason or the other on request for credit (or loan) were classified as being credit constrained while households that showed no interest in credit or whose credit demands were met were classified as being credit unconstrained. Table 3 shows that almost two-fifths (36 percent) of the households were credit constrained while more than three-

fifths (64 percent) were unconstrained. The larger proportion of the credit unconstrained households could be attributed to the fact that majority of the households showed no interest in obtaining credit, not because they did not need credit, but because of the lack of capacity to pay the cost of credit or lack of collateral. This result is contrary to the findings of Omonona et al. (2010) and Obisesan, (2013) but agrees with the findings of Feder et al. (1990) and Fengxia et al. (2010).

### 3.4. Distribution of households by nonfarm economic activities engaged in

Table 4 shows the distribution of households by non-farm activities engaged in. It is interesting to note that, more than four-fifths (88.5 percent) of were engaged in nonfarm employment or had their own nonagricultural business in addition to farming activities. The major nonfarm activity engaged in was artisanal activities (carpentry, tailoring, mechanic etc.) followed by trading activities and transportation activities (commercial bus driving, commercial motorcycling) respectively. Only a few were engaged in other non-farm activities such as teaching, native doctor, traditional healer, pool clerk etc. This result reveals the extent of diversity of livelihoods in rural Nigeria and also corroborates earlier findings that rural households do not depend solely anymore on farming for their livelihoods.

**Table 4.** Distribution of Households by Nonfarm Activities

Nonfarm Activity	Respondents	Percentage
None	75	11.5
Trading	206	31.5
Artisanal	248	37.9
Transportation	104	15.9
Others	22	3.2
Total	655	100.0

Source: Author's Compilation from General Household Survey, 2012

### 3.5. Determinants of credit constrained status of rural households

Table 5 shows the maximum likelihood estimates of the Probit model for identifying factors influencing credit constrained condition of rural households. The significant chi-square value indicates there is a relationship between household credit status and the explanatory variables. The result showed that household size, farm size, household savings, the value of household assets and land ownership by purchase were the factors significant in explaining the credit constrained status of households in rural Nigeria. The marginal effects result is presented as follows.

The positive and significant household size variable implies that an additional household member increased the probability of being credit constrained by 1.7%. This may be attributed to the high financial demand by these families to meet consumption requirements. This result corroborates the findings of Oyedele et al. (2009) and Kuwornu et al. (2012).

**Table 5.** Result of Probit Regression Model on Factors Influencing Credit Constrained Conditions of Farming Household in Nigeria

Variable	Marginal Effect (dy/dx)	Coefficient	z-value
Age	0.008	0.020	0.74
Age squared	-0.077	0.000	-0.75
Gender	-0.043	-0.108	-0.31
Marital status	-0.023	-0.057	-0.18
Household size	0.017	0.043**	2.50
Primary Occupation	0.017	0.043	0.35
Education	-0.005	0.014	0.12
Farm size	-0.064	0.160***	-3.59
Household Savings	-0.091	-0.228**	-2.19
Land ownership	-0.238	-0.637**	-2.54
Household Asset	-4.30e-08	-1.08e-07**	-2.00

Source: Author's Compilation

\*\*\* significant at 1%, \*\* significant at 5%, \* significant at 10%

Number of Observation = 655

Wald  $\chi^2$  (16) = 43.63

Prob> $\chi^2$  = 0.0002

Pseudo  $R^2$  = 0.0564

Log pseudo likelihood = -428.38243

On the other hand, the negative farm size variable indicates that a 1% increase in farm size, reduced the probability of being credit constrained by 6.4%. This result is in consonance with the findings of Bengig et al. (2009). Household savings and value of assets also decreased the likelihood of households being credit constrained as these assets can be decumulated during times of need. Specifically, a 1% increase in household savings decreased the likelihood of households being credit constrained by 9.1%. The result supports the hypothesis that asset ownership reduces the likelihood of being credit constrained and suggests that wealthier farming household's application for credit are likely to be more favorably considered. This is owing to the fact that households' assets provide a good indicator for most financial institutions to assess their client's ability to repay prior to advancing credit (Otonge, 2003).

Land ownership was found to have a negative effect on household credit constrained status indicating a reduced likelihood of such households being credit constrained. This is expected as such land can be used either as collateral for loans or to raise capital through rent and lease. This result is consistent with the findings of Ayalew et al. (2014).

### 3.6. Determinants of rural households' participation in nonfarm activities

The estimated results of the Multinomial Logit model of the determinants of participation in nonfarm' activities were interpreted using change in probability following Rahji et al. (2008) as follows: a positive significant variable, indicates that the probability of the respondents choice of participating in a particular nonfarm

activity is associated with a higher probability while a negative coefficient indicates that the probability of the respondents choice of participating in a specific nonfarm activity is lower. Table 6 shows the log-likelihood ratio value of -713.703 and significant chi-squared value of 142.77 which implies a significant relationship between nonfarm participation and the explanatory variables. Marginal effects were estimated and is discussed as follows:

**Table 6.** Multinomial Logit Regression Result on Determinants of Nonfarm Participation

Variable	Trading			Artisanal			Commercial Transportation		
	Coeff.	z-value	Marginal Effect	Coeff.	z-value	Marginal Effect	Coeff.	z-value	Marginal Effect
Gender	-2.888***	-3.51	-0.323	-1.895***	-3.25	0.333	12.37***	4.25	0.376
Marital Status	-0.245	-1.81	0.078	-0.172	-0.28	-0.259	1.429	1.57	-0.274
Household Size	0.059*	1.79	0.013	-0.002	-0.05	0.018	0.105*	1.83	0.024
Age	0.002	0.19	-0.002	0.008	0.67	0.006	-0.041***	-3.06	-0.341
Age Squared	-0.001	-0.93	0.000	-0.001	-1.61	0.000	-0.001	-1.10	0.000
Education	0.126	0.45	-0.086	-0.636**	-2.09	-0.104	0.748**	2.14	-0.108
Farm size	-0.068	-1.14	0.007	-0.112	-1.46	0.008	0.183*	1.71	-0.124
Household Asset	-3.65e-08	-0.67	7.07e-09	6.08e-08***	2.79	9.39e-09	-4.70e-08	-0.49	6.89e-09
Crop Output	-1.44e-06	-1.12	5.48e-07	-5.63e-06***	-2.70	-5.77e-07	-2.52e-06	-1.36	4.52e-07
Electricity constraint	-0.573*	-1.78	-0.117	-0.116	0.34	-0.119	-0.215	-0.52	-0.111
Poor Road constraint	-0.563**	2.06	-0.109	0.056	-0.18	0.092	1.158***	3.48	0.038
Start-up capital1	0.704	1.12	0.005	1.023	1.28	-0.005	1.350	1.48	-0.032
Start-up capital2	1.818*	1.68	0.175	1.172	1.22	-0.135	0.599	0.75	-0.133
Credit Constraint	-1.008*	-1.72	-0.230	-0.129**	-2.11	0.088	0.171*	1.94	0.290
Dist. to Market	-2.882**	-2.32	-0.281	1.144	1.41	0.023	0.469	1.24	0.152
Dist. to Main road	-0.430	-1.22	0.062	0.245	0.93	0.078	-0.171	-0.28	-0.260

Source: Author's Compilation \*\*\* significant at 1%, \*\* significant at 5%, \* significant at 10%  
 Number of Observation - (655)  
 Prob>chi<sup>2</sup> - (0.0000)  
 Pseudo R<sup>2</sup> - (0.0909)  
 Log pseudo likelihood = -713.703

### 3.7. Determinants of participation in trading activities

Gender of the household head was significant and negatively influenced the household choice of participation in trading activities relative to farm activities (up to 32 percentage points). This implies that female-headed households were more likely to engage in trading activities compared to their male counterparts. This agrees with the findings of Islam (1997) that trading activities were particularly important opportunities for women to diversify their source of income. The negative effect of distance to market on the likelihood of participation in trading activities implies a lower probability of participation in trading activities with an increase in distance between the household and the market. This implies that proximity to market is an incentive for trading among households in the study area. Other constraints such as poor electricity supply and poor road network were also found to negatively influence household participation in nonfarm activities. Further, being credit constrained decreased the probability of participation in trading activities by 23% owing to the fact that trading activities involves some form of startup capital.

On the other hand, the size of household was significant and had a positive impact on participation in trading activities. The result showed that a 1% increase in household size would increase the probability of participating in trading activities by 1.3%. This implies that as the number of people in the household increases, the more the likelihood of a household diversifying into nonfarm activities to augment household income owing to the high consumption requirements of the household. This finding corroborates the findings of Olugbire, (2012) and Karttunen, (2009) who found a positive relationship between larger households and the likelihood of participating in nonfarm activities. Households' participation in trading activities was also found to be positively influenced by the source of nonfarm start-up capital. That is, households that obtained credit from friends and/or relatives to start up their nonfarm businesses were likely to be more engaged in trading activities relative to farming. This is in line with the findings of Reardon et al. (2006), who observed that capital from friends and families, and money lenders, enhanced households' capacity to start nonfarm activities.

### 3.8. Determinants of participation in artisanship activities

Male headed households were found to have a higher probability of engaging in artisanship activities (technicians, mechanics, electrician etc.) when compared to their female counterparts. This could be attributed to the drudgery associated with such activities as well as the notion that in Nigeria, such activities are not meant for the female gender. In the same vein, the sale value of household assets (or owned property) had a positive impact on household participation in artisanship activities, indicating that, an increase in the value of assets owned by households would lead to an increase in the probability of households' participation in artisanship activities. Since assets could be a measure of wealth (Schwarze, 2004), it implies that richer households are more likely to participate in nonfarm self-employment activities.

On the contrary, the sale value of household crop output had a negative impact on household participation in artisanship activities. That is, an increase in the value of household crop output would lead to a decrease in the probability of participation in artisanship activities relative to farming because increased household income from the increased yield will discourage participation in nonfarm activities relative to farming. Similarly, the educational status of the household head was found to be a determinant of participation in

artisanship activities in the study area. Specifically, a 1% increase in the household head's years of education, decreased the probability of participating in artisanship activities by 10.4%. This is expected because, in Nigeria, artisanship is mainly associated with low level of education. Household credit constraint status was also significant in explaining household's non-participation in artisanship activities, as being credit constrained decreased the probability of a households' participation in artisanship activities in the study area. This result again could be attributed to lack of startup capital for the purchase of tools required for their technical skill acquisition.

### 3.9. Determinants of participation in transportation activities

With respect to gender, the positive effect on participation in transportation activities implies that male heads were more likely to be engaged in commercial transportation activities when compared to their female counterparts. Again, this could be attributed to the notion that in Nigeria such activities are risky and are typical of the male gender. Similarly, a 1% increase in household size increased the probability of household participation in transportation activities by 2.4%. A household's credit status also had a positive impact on a household's participation in transportation activities, suggesting that being credit constrained increased the probability of a household participation in transportation activities (up to 29 percentage points). A plausible explanation is that motorcycles and buses for commercial purposes are owned by wealthier individuals who employ drivers who get paid a percentage of their daily income. Hence, it is easier for a credit constrained household to engage in such activity as it requires little or no capital. This agrees with the findings of Ogunrinola (2012), in which households involved in the transportation business, the majority of whom are hired drivers, lacked financial resources to set up their own enterprises. However, due to increasing participation in commercial transportation activities, many of them in the rural areas are now 'part-time farmers' while some have abandoned farming activities altogether (Odufuwa, 2006). The positive variable of poor road network implies increased participation in transportation activities in spite of the poor road network. This corroborates the findings of Oladipo (2012), in which there was increased use of the motorcycle (also known as 'Okada') as a means of transportation owing to the bad condition of the roads and the problem of mobility encountered by the rapidly growing population.

Conversely, the age of the household head was significant and had a negative impact on household participation in transportation activities relative to farming. In quantitative terms, the results show that a 1% increase in the age of the household head decreased the probability of the household's participation in transportation activities by 34%. This implies that young household heads were more involved in transportation activities relative to farming and explains the ageing farming population in Nigeria. Unemployed youths who are discouraged by the various problems plaguing the agricultural sector are quickly absorbed by the activity of transportation services, thus abandoning farming as a source of livelihood. This conforms to the findings of Oladipo (2012). Also, the negative effect of farm size on transportation activities implies that a 1% increase in the size of farmland cultivated by the household would lead to a decrease in the probability of a household's participation in transportation activities by 12.4%. This is in consonance with

earlier findings in this study that a household with larger farmland will likely engage in farming than in nonfarm activities.

#### 4. Conclusion and policy implications

This study has clearly shown nonfarm activities as a major labour absorption process in the rural areas of Nigeria, given the importance of such activities in alleviating the problem of low agricultural productivity, income, and rural poverty. The study also revealed that while credit constraints had a negative effect on a household's participation in trading and artisanship activities, it had a positive effect on the participation in transportation activities respectively. That is, credit constrained households were less likely to participate in trading and in artisanship activities but were more likely to participate in transportation activities relative to farming, owing mainly to the fact that such activities do not require any form of start-up capital. This study, however, brings to limelight the importance of credit for participation in non-farm activities and in the choice of non-farm activities which is a major source of income for rural households who are susceptible to limited farm income to support their livelihoods. Thus, given the role of credit in alleviating the problem of low agricultural productivity, income and rural poverty as well as the choice of non-farm activity as a means of survival, efforts toward promoting access to credit should be of utmost priority to policy makers and to government in the prescription of rural policies and in the design of any program for rural households.

Although this study was limited in data in terms of specification of some variables, for instance, the specific use to which credit was put into was not specified in the data, future studies could examine trends in credit constraint among farmers and its resultant effect on their productivity and welfare.

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