



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

1 Does Off-farm Income Alleviate Poverty and Income Inequality? Evidence from Rural Nigeria.

M.K Ibrahim* and C.S Srinivasan

Department of Food Economics & Marketing, University of Reading, United Kingdom

Contributed Paper prepared for presentation at the 88th Annual Conference
of the Agricultural Economics Society, AgroParisTech, Paris, France

9 - 11 April 2014

Copyright 2014 by [author(s)]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

*[Corresponding author: School of Agriculture, University of Reading, Reading, United Kingdom; m.k.ibrahim@reading.ac.uk]

Abstract

This study employed Nigeria's household data from the RIGA database to examine the effect of off-farm income on rural poverty and income distribution. Specifically, the study employs the Foster, Greer and Thorbecke (FGT) poverty measurement indices to examining the effect of off-farm income on rural poverty and Gini decomposition techniques for the effect of off-farm income on rural income distribution. Our findings suggest that off-farm income as a part of total household income significantly contributed towards reducing the incidence, depth and severity of poverty as evident in the outcomes of the poverty measures for the wage and self employment activities. Same cannot be said for rural income inequality, as off-farm income on aggregate level is observed to increase rural income inequality. Results of the decomposition by income sources revealed that with the exception of self-employment income, other off-farm incomes have unequalising effect on income distribution, an outcome attributed to entry barriers which prevents poor households from undertaken the lucrative kind of off-farm work. Programmes of government and non-governmental organisations aimed at growth and development of the off-farm sector needs to have an aspect well targeted at the poor rural households to assist them in removing the entry barriers, placing them in a better position to maximise the opportunities in the off-farm sector.

Keywords [Off-farm, Rural Poverty, Income Distribution]

1.1 Introduction

More than three-quarters of the poor live in rural areas in Sub-Saharan Africa and the proportion is barely on the decline (IFAD, 2011). This explains why poverty reduction and income redistribution have continued to be a major policy issue in countries of this region. Nigeria has a high incidence of poverty reported to be 61.2 per cent, which is an increase of 9.6 percent from 2004 (NBS, 2012). This has been attributed to various challenges facing agriculture which is the major source of employment and accounts for a significant share of household income especially in rural Nigeria. The challenges takes the form of reiterated shocks in the socio-economic, political and climatic conditions. These factors and many more has lowered their on-farm productivity resulting in dwindling farm income. This scenario vis-a-vis the opportunities created in the off-farm sector resulting from the gains in some reform programmes of the government have changed the status of a significant population in rural Nigeria from on-farm *specialist* to *diversified* rural households. Such adjustments is expected to have an impact on the size of household income, income distribution, and poverty status of rural households.

The role income from the off-farm sector participation play in both poverty alleviation and income distribution among rural households has been the subject of study by a number of previous studies (see for example, de Janvry and Sadoulet, 2001, and van den Berg and Kumbi 2009). The empirical evidence provided by these studies, however appears mixed especially in terms of whether off-farm income reduces rural poverty and has an equalising effect or not on the level of income distribution. However, a common view shared by a number of the studies is that entry barriers pose a challenge to off-farm sector participation especially for poor rural households preventing them from exploring the high return kind of off-farm activities. The implication is that these poor rural households do not earn significant income from the off-farm sector capable of enhancing their well being. Consequent upon this scenario, a good understanding of the role the off-farm sector plays in enhancing the welfare of rural households in Nigeria is a pertinent tool for a good policy recommendation on the promotion of the off-farm sector. This study therefore examines the effect of off-farm income on poverty status and income distribution in the context of rural Nigeria. The objective of the study is therefore two folds: (1) to examine the effect of off-farm sector participation on the poverty status of rural households, and (2) to examine the effect of off-farm sector participation on rural income distribution. In both objectives the effect of the off-farm sector is disaggregated into self employment and wage employment activities to account for perceived heterogeneity in the nature and kind of activities in which rural households undertake.

1.2 Data Description

The data used in this study was obtained from the Rural Income Generating Activities (RIGA) database¹. The database was constructed from a pool of Living Standard Measurement Studies and other household surveys by the World Bank in collaboration with Food and Agriculture Organisation (FAO). The Nigerian Living Standard Survey (NLSS) from which the project drew data from in the case of Nigeria was conducted between 2003 and 2004 with the aid of the National Bureau of Statistics (NBS)². The survey employed a two-stage stratified random sampling technique to collect data with a well structured questionnaire. The survey covered the entire states in Nigeria with a sample size of 19,158 households which comprised of 14,512 rural and 4,646 urban households. The data contain information on the labour allocation decisions of rural households, household income and consumption expenditure, sales of farm outputs, household compositions, individual and household characteristics, access to credit and geographical location characteristics. All monetary values in the dataset are measured in the Nigerian currency called *Naira*³. Total household income is defined as the sum of net income from six sources: crop income, livestock income, off-farm self-employment income, off-farm wage employment income, transfer income and other incomes⁴.

1.3 Methodology

The first objective of the study aimed at examining the effect of off-farm income on the poverty status of rural households was achieved using the Foster, Greer and Thorbecke (FGT) poverty measurement indices as proposed by Foster et. al., (1984). For the second objective of the effect of off-farm income on income inequality we employed the Gini decomposition technique as presented in Lerman and Yitzhaki (1985). The effect of off-farm income was first considered at aggregate level, and then decomposed by income sources. In both cases, a standard selection model was employed to predict the counterfactual income distribution for households in the absence of off-farm work. We therefore briefly present the standard selection model.

1.3.1 Standard Selection Model

The approach employed to examine the effect of off-farm income involves comparing the observed household income distribution with a counterfactual income distribution in the

¹The RIGA project among other things had the objective of creating household-level labour and income aggregates using a consistent methodology and surveys from more than 15 countries.

²The NLSS data collected in 2003/2004 is the most detailed nationwide household survey data that could be used by RIGA when the database was been constructed.

³During the survey period, 1 US dollar is equivalent to approximately 133 Nigerian Naira.

⁴Made up of income in the form of rents received from assets owned by rural households such as land, machinery and housing.

absence of off-farm work. This implies what the incomes of rural households would have been if they had not undertaken off-farm work. Hence we consider the income obtained from the off-farm sector as a *potential substitute* for farm income and then predict per capita income for all the households excluding income from the off-farm sector. The predicted income equation then forms the basis for estimating the effect of off-farm sector participation on the poverty status of households when the income from the off-farm sector is included in per capita household incomes. This entails the estimation of a model of farm income for households involved in farm activities only (i.e off-farm non-participants), and employing the estimates for the off-farm participating rural households. Similar to the approach adopted by a number of previous studies (see for example, de Janvry et. al., 2005 and Zhu and Luo 2008), a standard selection model (Heckman, 1979) is employed in estimating the farm income for households in class 0. The model is made up of a probit, the participation equation:

$$\begin{aligned}
 P_i^* &= \alpha Z_i + \varepsilon_i \\
 P_i &= 1(P_i^* > 0) \\
 P_i &= 0(P_i^* \leq 0)
 \end{aligned}
 \tag{1.1}$$

where P_i^* denotes a non-observed continuous latent variable and P_i is an observed binary variable, Z_i is a vector of explanatory variables of the participation equation. Then the estimation of the two income equations for off-farm participants and non-participants alongside the inverse Mills ratio, λ_i obtained from equation 1 in order to account for suspected selection bias⁵. The income equations take the form:

$$\log y_i = \beta_1 X + \gamma_1 \lambda_{1i} + \mu_{1i} \text{ for } P_i = 1
 \tag{1.2}$$

$$\log y_i = \beta_0 X_i + \gamma_0 \lambda_{0i} + \mu_{0i} \text{ for } P_i = 0
 \tag{1.3}$$

where y_i denotes the household income, X_i is a vector of explanatory variables, λ_{0i} and λ_{1i} corresponds to the inverse Mills ratio for the participating and non-participating households, respectively. The estimates from the income equations is then used to predict the income of the off-farm sector participants under the condition of engaging in farm work only.

⁵The inverse mills ratio measures the expected value of the contribution of the unobserved characteristics to the probability of participation conditional on the observed participation

1.3.2 Poverty Measures

Based on the predicted household income, we can examine the effect of income from the off-farm sector on the poverty status of rural households using the Foster-Greer-Thobcke (FGT) indices⁶. The general form of FGT poverty measure is defined by:

$$P_{\alpha}(y, z) = \frac{1}{n} \sum_{i=1}^q \left(\frac{z - y_i}{z} \right)^{\alpha} \quad (\alpha \geq 0) \quad (1.4)$$

where y_i denote household incomes, z denotes the predetermined poverty line⁷, n is the total population, q is the number of poor households (whose income lies below the poverty line), and α denote poverty aversion, and larger values of α represent increase in the relative weight on the poorest among the poor population. Three indices of the FGT; head count ratio, poverty gap and squared poverty gap were employed.

1.3.3 Income inequality Measures

Also following from the predicted income, the approach employed here considers income obtained from the participation in off-farm sector as a form of exogenous transfer which is an addition to the existing household income⁸. It involves measuring the level of contribution of off-farm income to total income by decomposing total household income and examining the distribution and contribution of each income source to total income inequality. The Gini coefficients for household income with and without off-farm income is estimated. The estimates are then compared to gain an insight into whether off-farm income would increase or reduce income inequality.

We employ the Gini decomposition technique as among other things it satisfies a set of axioms as proposed by Cowell (1995) and Ray (1998)⁹. The conventional Gini coefficient (G) takes the form¹⁰:

$$G_0 = \frac{2cov[y_0, F(y_0)]}{m_0} \quad (1.5)$$

⁶Though there exist a wide range of poverty measures that have been employed in poverty measurement literature (see for example, Sen, 1976). For reason of its popularity and more importantly its additively decomposable properties and satisfaction of the basic properties laid down by Sen (1976), we consider the FGT credited to Forster et. al., (1984) appropriate for use in this study.

⁷The poverty line here is stated based on the per capita expenditure of households and regards households with expenditure less than two-thirds of the mean per capita household expenditure are poor while those above are non-poor.

⁸similar approach were employed in studies by Adams, 1994, Stark, 1991 and Zhu & Luo, 2008.

⁹This set of axioms includes anonymity, population principle, relative income principle, principle of transfer and decomposability.

¹⁰As stated in Pyatt, Chen and Fei, (1980) and Lerman and Yotzhaki, 1985.

where G_0 is the Gini coefficient of total household income, y_0 denotes total household income, $F(y)$ is the cumulative distribution of total incomes in the household, and m_0 represents the mean household income. If we let $y_1, y_2 \dots y_k$, denote the K components of household income, then using the properties of the covariance and $y = \sum_{k=1}^K y_k$ enables Gini decomposition by income sources:

$$G_0 = \frac{2 \sum_{k=1}^K cov [y_k, F(y_0)]}{m_0} \quad (1.6)$$

Dividing and multiplying each component, k by $cov(y_k, F_k)$ and by the mean income of source, m_k yields Gini decomposition by income sources:

$$G_0 = \sum_{k=1}^K R_k G_k S_k \quad (1.7)$$

where R_k denotes the Gini correlation between income from source k and total income, G_k is the Gini index corresponding to income source k , and S_k denotes the share of income source k in total household income, that is $S_k = \bar{y}_k / \bar{y}_0$.

As highlighted by Stark, Taylor, and Yitzhaki (1986), the relationship among the three terms as shown in equation 1.7 enables us to decompose the effect of any income source on income inequality : (i) the importance of the income source in total household income, S_k (ii) the equal or unequal distribution of the income source, G_k and (iii) the correlation of the income source with total income R_k , which implies the extent to which the income source does or does not favour the poor households.

Similar formulation can be employed in examining the effect of a small change in any of the income on income inequality holding other incomes constant (Lerman and Yitzhaki, 1985). Consider a small change in rural household's income from source k to be equal to $e_k y_k$, where e_k is close to 1 and y_k is the income from source k . Based on equation 1.7, the partial derivative of the overall Gini (G_0) with respect to a percentage change (e) in income source k following is given by:

$$\frac{\partial G}{\partial e_k} = S_k (R_k G_k - G_0) \quad (1.8)$$

were G_0 denote the Gini coefficient of total income inequality before the income change. Similarly, we can also examine the effects on inequality as a result of a small percent change in income source. This is obtained by dividing equation 1.7 by G_0 and the outcome

corresponds to relative effect of a marginal change in income source k on the Gini for total income, which yields:

$$\frac{\partial G/\partial e_k}{G_0} = \frac{S_k R_k G_k}{G} - S_k \quad (1.9)$$

It also corresponds to the income source k 's original income inequality contribution minus source k 's share of total income. It could therefore be deduced from the results obtained from the decomposition that so long as off-farm income possess an influence in total household income, then (i) if the Gini correlation between off-farm income and total household income, R_k , returns a negative or zero value, then an increase in off-farm income will translate to a decrease in income inequality (ii) if the Gini correlation turns out positive, then the effect it possess on income inequality will be dependent on the sign of $R_k G_k - G_0$.

1.4 Results and Discussion

Tables 1.1 and 1.2 presents the descriptive statistics of the variables in the models. It highlights the difference in terms of the observable characteristics between off-farm sector participants and non-participants, and poor and non-poor households.

It is evident from the results that there are statistically significant difference between both sub-groups across the range of household characteristics, asset endowment and locational characteristics. On average rural households involved in off-farm activities are seen to be more educated with about 5 years in school, have greater access to credit and infrastructural facilities. In terms of access to formal credit, though the participants are observe to have higher access, there is generally low levels of credit available to rural households. Based on geographical location, rural households in the southern region of Nigeria are more involved in off-farm activities than their counterpart in the northern region. In terms of the poverty status as presented in Table 1.2, non-poor rural households are seen to be more educated, higher access to formal credit and more endowed in terms of arable under cultivation and livestock unit. This finding is supported by Reardon (1994), who argued that poor households that lack access to credit may be constrained by limited access to off-farm income. Based on location, there are more poor households located in rural areas in the northern region of Nigeria with the Northwest having the highest population of poor households and the least is in the south west¹¹.

¹¹This result corroborates with the poverty profile report of NBS (2010) which identified the Northern region, specifically the North west as the poorest while the South western region had the least poverty rate in the country.

Table 1.1: Descriptive statistics for status of off-farm sector participation

Variable	Non-participants		Self employment Participants		Wage employment Participants		Difference in means (non-participants vs. self employment)		Difference in means (non-participants vs. wage employment)	
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
<i>Household characteristics</i>										
Age	47.54	14.80	47.27	14.24	44.27	12.22	0.26	12.22	3.27**	0.26
Education	3.20	3.38	4.51	2.91	5.69	3.10	2.38***	3.10	2.49***	2.38***
Hsize	4.78	2.81	4.88	3.06	4.98	2.04	0.09	2.04	0.20	0.09
Dependants	3.22	1.91	3.47	2.11	4.20	2.31	0.25*	2.31	0.98**	0.25*
Migration	0.04	0.02	0.13	0.07	0.17	0.11	0.09**	0.11	0.13**	0.09**
Credit	0.14	0.11	0.32	0.17	0.21	0.17	0.18***	0.17	0.07**	0.18***
Association	2.92	1.98	3.10	2.08	3.19	2.11	0.18	2.11	0.27	0.18
Infrastructure	0.01	0.00	0.07	0.02	0.03	0.01	0.06**	0.01	0.02**	0.06**
<i>Household asset</i>										
Land	0.98	0.34	1.21	0.62	0.87	0.21	0.23**	0.21	0.11*	0.23**
Livestock	0.45	0.21	0.69	0.27	0.61	0.29	0.24***	0.29	0.16***	0.24***
<i>Locational</i>										
North east	0.18	0.39	0.13	0.34	0.13	0.34	0.34	0.34		0.34
North west	0.22	0.41	0.15	0.36	0.15	0.36	0.36	0.36		0.36
South south	0.13	0.33	0.18	0.38	0.18	0.38	0.38	0.38		0.38
South west	0.10	0.30	0.24	0.43	0.24	0.43	0.43	0.43		0.43
South east	0.13	0.33	0.15	0.36	0.15	0.36	0.36	0.36		0.36

Note: ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively; ^aHousehold per capita expenditure, exchange rate: US\$1= 155 Naira in 2013.

Table 1.2: Descriptive statistics for poverty status of rural households

Variable	Description	Non-poor		Poor		Difference in means
		Mean	Std.	Mean	Std.	
Household characteristics						
Gender	Headed household (1 if male, 0 if female)	0.83	0.41	0.80	0.37	0.03
Age	Age of household head (in years)	47.80	16.79	47.30	16.44	0.50
Education	Education of household head (in years)	5.30	4.46	3.16	3.14	2.14***
Hsize	Household size	2.69	2.20	5.17	2.82	2.47**
Dependants	Dependency ratio	0.59	0.31	0.55	0.22	0.05
Migration	migration network (1 if yes, 0 otherwise)	0.25	0.11	0.14	0.10	0.11**
Credit	Access to credit (1 if yes, 0 otherwise)	0.45	0.28	0.21	0.13	0.24**
Association	Number of association belonged to	3.10	2.08	2.92	1.98	0.18
Infrastructure	Index for access to infrastructure	1.15	0.64	0.72	0.44	0.43**
Household asset	<i>Endowment</i>					
Land	Area of land under cultivation (in hectares)	1.55	1.02	1.22	0.84	0.33***
Livestock	Total livestock unit	133.22	98.20	24.13	12.04	109.09***
Locational	<i>characteristics</i>					
North east	1 if household is located in north east, 0 otherwise	0.08	0.27	0.20	0.40	
North west	1 if household is located in north west, 0 otherwise	0.07	0.25	0.23	0.42	
South south	1 if household is located in south south, 0 otherwise	0.22	0.42	0.15	0.36	
South west	1 if household is located in south west, 0 otherwise	0.15	0.36	0.07	0.25	
South east	1 if household is located in south east, 0 otherwise	0.31	0.46	0.14	0.34	

Note: ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively; The poverty line is defined by the 2/3 of total household per capita expenditure.^bHousehold per capita expenditure, exchange rate: US\$1= 155 Naira in 2013.

1.4.1 Results of Selection Equation

The results of the estimation of the participation equation using the probit model is presented in Table 1.3. The result revealed that the number of years of education in the household play a significant role in the decision to undertake off-farm activities. Similarly, the adult equivalence household size is observed to be positively related to the decisions to undertake off-farm activities. As expected both access to basic infrastructural facilities and credit were significant and positively influenced the decision to participate in off-farm work. In terms of the geographical location, it is evident from the result that rural areas in all the geographical regions in Nigeria were observed to be involved in the off-farm sector with varying degree of involvement.

Table 1.3: Estimates of the farm income equation

Variable	Selection equation	Class 0 participate in farm activities only Regression A	Class 1 participate in off-farm activities Regression B
Land cultivated	-0.110** (-2.02)	0.109*** (2.23)	-0.114*** (-2.47)
Level of education	0.124*** (2.34)	-0.042 (1.09)	0.127*** (2.31)
Level of education squared		0.019 (1.02)	0.039** (1.67)
Dependants	0.041 (1.12)	0.145*** (2.12)	0.110** (2.09)
Household size	0.094** (2.11)	0.1701*** (2.65)	0.143** (2.22)
Credit	0.022** (1.99)	0.209*** (3.05)	0.124** (2.20)
Infrastructure	0.107*** (2.41)	0.012* (1.52)	0.094** (1.99)
Membership of co-operative	0.009* (1.64)		
Migratory network	0.081** (2.10)		
North west	0.152*** (2.55)		
South west	0.110** (2.30)		
South south	0.132** (2.27)		
Inverse Mills Ratio		0.792** (2.08)	0.812*** (2.11)
Constant term	-1.722*** (-2.55)	6.221*** (13.09)	5.722*** (15.24)
R^2	0.233	0.520	0.389

Note: t-statistics are in brackets, ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively.

The result of the estimations of the income equations for each of the two classes of rural households is also in Table 1.3. It is evident from the result that the amount of land owned and cultivated by rural households has a significant effect on the level of household income. However in terms of the sign of the estimate, household income is seen to increase with amount of land cultivated, while an opposite relationship is observed in the case of households who undertake off-farm work. Adult equivalence household size increases the level of farm income. Similarly, the number of dependants present in a household is observed to have a positive effect on farm income. The level of education in the rural household is observed not to positively influence the income for households involved in farm activities only, suggesting the low return to education under the traditional farming system. The results shown in regression A are employed in predicting the income of off-farm participating rural household if they have opted not to undertake off-farm activities.

1.4.2 Results of Poverty Measures

Poverty measures obtained from the distribution of the predicted income of households involved in off-farm activities if they had remain in farming only is compared to the one from the distribution of the observed household income and the result is shown in Table 1.4. The difference between the pre- and post participation in off-farm work signifies the effect of participation on the poverty status. It is evident from the result that participation in the off-farm sector contributes in raising the average per capita income of households in rural Nigeria. This is evident in the estimates of all the poverty measures which reveals that participation in the off-farm sector - either in self employment or wage employment activities - have reducing effects on the incidence, depth and severity of poverty. In addition the rates of variation in all the poverty indices are negative, further confirming that participation in the off-farm sector by households reduces rural poverty.

Based on the poverty headcount ratio, participation in the off-farm activities reduces the percentage of poor households by 11.2 percent, while in terms of the kind of off-farm sector activities rural households undertake, off-farm self employment is observed to reduce the percentage population of poor households by 5.11 percent, and participation in wage employment activities reduces the percentage of poor rural households by 4.06 percent. A further reduction in poverty is observed in the estimates of the poverty gap and squared poverty gap. Based on the results of the poverty gap, participation in off-farm activities have resulted in a drop in the percentage of poor rural households by 5.2 percent which translates to reduction of 20 percent in relative sense. This implies that the population of poor rural households who has on average an income shortfall of the poverty line has been reduced by 20 percent by virtue of their participation in the off-farm sector. Similarly, off-farm self-employment participation resulted in a reduction of 2.52 percent which translates to 9.65 percent reduction in poverty gap, while undertaken wage employment resulted in a drop in poverty gap by 2.11 percent.

Table 1.4: Poverty indices for part participating and non-participating rural households

<i>Poverty indicators</i>	<i>With off-farm participation</i>			
	<i>No off-farm participation (A)</i>	<i>(Self employment + Wage employment) (B)</i>	<i>Rate of change (B-A)</i>	<i>With self employment (C)</i>
Headcount ratio	55.21	44.09	-11.12	50.10
Poverty gap ratio	26.12	20.92	-5.2	23.60
Severity ratio	14.20	11.59	-2.61	13.29
				<i>With wage employment (D)</i>
				51.15
				<i>Rate of change (C-A)</i>
				-5.11
				<i>Rate of change (D-A)</i>
				-4.06
				24.01
				-2.11
				12.86
				-1.34

Note: Column (A) used the predicted income equation to measure poverty status excluding off-farm income for all rural households; Column (B) is a measure of the poverty status of all rural households when both incomes from off-farm self employment and wage employment activities are included in the household income; Column (C) is a measure of the poverty status of all rural households when incomes from only off-farm self employment is included in the household income; Column (D) is a measure of the poverty status of all rural households when incomes from only off-farm wage employment is included in the household income. Poverty calculation done using a poverty line which is 2/3 of the total household per capita expenditure.

The implication is that participation in self employment activities has resulted in reducing the income shortfall of poor households by 9.65 percent, while such reduction is put at 8.07 percent for participation in wage employment activities. In the case of the squared poverty gap, participation in the off-farm sector resulted in a reduction of the severity of poverty among rural households by 2.61 percent which translates to a reduction of 18.4 percent. Effect of self employment and wage employment activities on the severity of poverty are 6.40 percent and 9.43 percent, respectively. Interestingly, as observed in the case of poverty head count and depth where self employment is observed to have more impact on poverty than wage employment, the opposite is the case in terms of the severity of poverty. The estimates of the poverty severity which assigns higher weights to the poorest of rural households is an indication that participation in wage employment activities has greater potentials to enhance the welfare of the poorest rural households.

It is evident from the results of the poverty measures that participation in the off-farm sector frees more income for rural households expenditure and hence alleviate poverty in rural Nigeria. The level of poverty reduction as shown by the headcount and poverty gap is higher for rural households involved in self employment activities, however in terms of the severity of poverty, participation in wage employment is seen to have a greater impact on welfare of rural poor than self employment. It follows that while off-farm self employment has greater capacity to reduce the incidence and depth of poverty, participation in wage activities have the potential to benefit more of the poorest households in rural Nigeria.

1.4.3 Results of Income Inequality Measures

The estimates of the Gini coefficient obtained from the distribution of observed household income is compared to the predicted income and the result is presented in Table 1.5. It is evident from the results that the Gini index of the observed income which corresponds to the household undertaken off-farm work is higher than that of the predicted income which implies the absence of off-farm activities. The implication of this outcome is that participation in off-farm activities increases income inequality. With off-farm sector participation, the Gini coefficient estimates of household income is observed to increase by 4.4 per cent¹². Since off-farm income is examined here at an aggregate level and at such may mask the effects of income components on income inequality, we disaggregate to examine the role income components play on income inequality.

Table 1.5: Gini Coefficients With and Without Income from the Off-farm Sector

	With off-farm income	Without off-farm income	Diference	Percentage effect
Gini index	0.578	0.552	0.026	4.4

Note: All computations are based on annual net per capita incomes.

¹²To some extent our findings corresponds to what has been reported in other similar studies especially in developing countries (see for example, Babatunde and Qaim, 2001 in Nigeria; Canagarajah et. al., 2001 and Senadza, 2011 in Ghana, Adams, 2001 for Jordan).

The results of the decomposition of the overall Gini coefficient by farm and off-farm income sources is presented in Table 1.6. Based on the share of the income sources in the total household income for each of the income sources, S_k , farm income constitutes the principal source of income for rural households (60 per cent) with crop income accounting for the largest share of the on-farm income (46 per cent). The contribution of income from the off-farm sector to the household income stands at 34 percent with income from self employment activities constituting the largest share of income at 20 percent. Meanwhile, transfer income from both public and private sources represent approximately 3 percent of household income. This is followed by the overall Gini coefficient for income sources, G_k . The overall Gini coefficient of 0.537 is only slightly higher than the 0.518 value of Gini coefficient reported for rural Nigeria by NBS (2005). The value also corresponds to the range of Gini coefficients that have been reported for other developing countries¹³. In terms of the income sources, the values of the Gini coefficient reveal that the inequality in the distribution of off-farm income (0.898) is higher than in farm income (0.525).

As observed by Stark et. al., (1986), the distribution of an income and its share in the total income is only a part of its effect on the overall income inequality as the location of the recipients of various income categories is another important consideration. Hence, R_k presents the Gini correlation between income sources and total income. It is evident from the result that in addition to the high inequality in the off-farm income sources especially the distribution of income from wage employments, they are also highly correlated with total income ($R_k = 0.77$). The implication is that rural households at the upper end of the of the income distribution (non-poor households) are the greater recipients of income from the off-farm sector. In contrast, income from both crop and livestock production have a lower correlation with total income (0.31 and 0.25, respectively), an indication that farm income is more popular and equitably distributed among rural households across the income groups.

Similar effects are observed in the relative concentration and percentage contribution of income sources to total income. The relative concentration coefficients of income sources, g_k obtained shows that income from farm production sources; crop and livestock incomes are inequality-decreasing, while income from the off-farm sector sources with the exception of self employment source are inequality-increasing at various magnitudes. Similar effect is observed in terms of the percentage contribution to overall rural income inequality, where the aggregate contribution of the on-farm sources of income is 24.3 percent as compared to the huge contribution of 43.7 percent from off-farm income sources. It therefore follows that the observed increase in income inequality stemming from off-farm income sources is clearly driven by all income sources with the exception of income from self employment activities. Interestingly, despite the high inequality in the distribution of self employment income as observe from the value of the Gini coefficient, it contributes less to inequality than income from the on-farm sources with a more equal distribution. This further confirms that a high Gini coefficient does not necessarily translate to an income source having an unequalising effect on income distribution. Hence, an income source

¹³See for example, Adams, 2001 in Egypt and Senadza, 2011 in rural Ghana

may be unequally distributed yet in favour of the poor rural households as is the case with self employment income. In addition, transfer income sources comprising of public and private transfer is observed to have the highest value in terms of the Gini coefficient (0.980) and Gini correlation correlation with total income (0.819). Similar to the situation obtained in the case of wage employment incomes, the distribution of transfer incomes are more favourable to rural households at the top of the income distribution (non-poor households).

Table 1.6: Share of rural income generating activities in total income

Income sources	Share in total income S_k	Gini coefficient for income source G_k	Gini	Relative	Percentage
			correlation with total income rankings R_k	concentration of income source g_k	contribution to total income inequality $S_k G_k R_k / G$
<i>Total farm income</i>	0.603	0.525	0.412	0.403	24.3
Crop income	0.459	0.436	0.306	0.258	13.6
Livestock income	0.047	0.519	0.251	0.243	1.1
<i>Total off-farm income</i>	0.341	0.898	0.767	1.282	43.7
Self employment income	0.202	0.659	0.489	0.601	13.2
Wage employment income	0.120	0.971	0.795	1.437	17.3
Transfer income	0.027	0.980	0.819	1.49	2.8
Other income	0.034	0.993	0.566	1.047	3.6
Total		0.537			

Note: All estimates are based on annual net per capita incomes. The relative concentration of income source, $g_k = G_k R_k / G$, where G is the Gini coefficient of total income and income sources with coefficient greater than one contributes to increasing overall inequality, while those with values less than one contributes towards reducing total inequality.

1.4.4 Effect of changes in off-farm income on income inequality

Furthermore, we examine the the effect of a small change in income sources on rural income inequality. The impact of a 10 percent increase in each of the income sources as indicated by the income source elasticities are presented in Table 1.7. A 10 percent increase in farm income for all rural households is observe to reduce the Gini coefficient of total income inequality by 3.6 percent while the same increase in off-farm income sources results in an increase in the Gini coefficient by 0.9 per cent. As is the case in the Gini decomposition in the previous section, a 10 per cent increase in the self employment income is observe to reduce Gini coefficient by 0.7 per cent, while other off-farm income sources are observed to increase the Gini coefficient.

It is evident from our results that a number of off-farm income sources especially the non-labour income is unequally distributed favouring more of the non-poor rural households resulting in an unequalising effect on rural income distribution. However, these outcomes does not really undermine the very important role income from the off-farm sector play in the livelihood of rural households and the need to support its growth in rural Nigeria. Especially as income from both wage and self-employment activities has proven to contribute to reducing rural poverty and widening income gap, respectively. Rather, such

Table 1.7: Effect of a 10% change in income source on income inequality

Income sources	Percentage	
	change in Gini	Std. error
<i>Total farm income</i>	-0.360	0.0131
Crop income	-0.323	0.0126
Livestock income	-0.036	0.0004
<i>Total off-farm income</i>	0.096	0.0046
Self employment income	-0.070	0.0023
Wage employment income	0.053	0.0032
Transfer income	0.001	0.0009
Other income	0.002	0.0002

Gini decomposition and bootstrapping of the standard errors was achieved with the aid of a stata command, *descogini* as described in Lopez-Feldman (2006).

unequalising effect is attributable to a number of constraints in the form of entry barriers which prevents the non-poor households from fully exploring the opportunities in the off-farm sector, a view also shared by a number of previous studies (see for example, Reardon et. al., 1994; Reardon, 1997 and Woldenhanna and Oskam, 2011). Off-farm wage employment activities especially the skilled kind of activities require some level of education and skill to be employable. The cost of acquiring such level of education and skill tends to be out of reach of poor rural households, leaving the non-poor households who can afford such to maximise the opportunities in the most productive kinds of wage employments. The unskilled kind of wage activities which would have offered the respite for the poor rural households is also riddled with the high transaction cost incurred from searching and assessing the jobs. Similar condition is observed in terms of access to other forms of off-farm income such as transfer income, especially the public transfers. The absence of relevant target mechanisms to ensure transfer income from the government programmes aimed at enhancing the welfare of poor rural households actually gets to them have resulted in the non-poor households 'hijacking' such incomes resulting in a widening income gap¹⁴. In the case of private transfers in the form of remittances, majority of the poor rural households lack the necessary migratory networks to benefit from this source of income as against their non-poor counterparts who benefit significantly from remittance. These among other factors explains why a number of off-farm income sources will not contribute to reduce rural poverty and actually worsen rural income inequality.

¹⁴This is evident in government initiatives such as the In Care of the Poor Cash Transfer (COPE).

Conclusion

This study focuses on the effect of off-farm sector participation on the poverty status of rural households and rural income distribution. Understanding of the role the off-farm sector plays in enhancing the welfare of rural households in Nigeria is a pertinent tool to inform policies on the promotion of the off-farm sector which is capable of bringing about rapid rural development. One of the contributions of this study is that it employs a national representative dataset which is lacking in previous related studies especially in the study area. The methodology applied predicted counterfactual income information for off-farm sector participants. The empirical results revealed interesting outcome as regards the role of income from wage employments in alleviating rural poverty of the poorest rural households and the equalising effect of income from self employment activities on rural income distribution. This highlights the very significant role the off-farm sector play in rural development. A number of the off-farm income sources however were observed to increase rural income inequality, however, this was attributed to entry barriers that prevent poor rural households from maximising the opportunities in the off-farm sector. Therefore, any effort made towards enhancing the growth and development of the off-farm sector needs to have an aspect of such targeted at the poor rural households to assist them in removing the hurdles identified. Such will place them in a position to compete favourably with the non-poor rural households for the lucrative kinds of off-farm activities which is currently dominated by the non-poor rural households and contribute towards reduction in poverty and a more equitable distribution of income.

References

- Adams, R.H. (1994). Non-Farm Income and Inequality in Rural Pakistan: A Decomposition Analysis. *The Journal of Development Studies*, 31(1).
- Adams, R. H. (2001). Nonfarm Income, Inequality and Poverty in Rural Egypt and Jordan. *Policy Research Working Paper Series No. 2572*. World Bank.
- Babatunde, R. O., & Qaim, M. (2010). Impact of off-farm income on food security and nutrition in Nigeria. *Food Policy*, 35(4), 303–311.
- Canagarajah, S., Newman, C., and Bhattamishra, R. (2001). Non-farm Income, Gender, and Inequality: Evidence from Rural Ghana and Uganda. *Food Policy* 26:4. pp. 405-420
- Cowell, F., (1995). *Measuring inequality*. (second edition), LSE Handbooks in Economics Series. Harvester: Prentice Hall.
- de Janvry, A. and Sadoulet, E. (2001). Income Strategies among Rural Households in Mexico: The Role of Off-farm Activities. *World Development* 29(3).
- de Janvry A, Sadoulet E, Zhu N (2005). The role of nonfarm incomes in reducing poverty and inequality in China. *CUDARE working paper 1001*, Berkeley: University of California.

- Foster, J., Greer, J. and Thorbecke, E. (1984). A Class of Decomposable Poverty Measures. *Econometrica* 52(3): 761-766.
- Heckman, J. J. (1979). Sample selection as a specification error. *Econometrica*, Vol. 47, No. 1, pp. 153-161.
- International Fund for Agricultural Development (2011). Rural Poverty Report 2011.
- Lerman, R. and S. Yitzhaki (1985). Income Inequality Effects by Income Source: A New Approach and Applications to the United States. *The Review of Economics and Statistics* 67(1).
- National Bureau of Statistics. (2005). Poverty Profile for Nigeria. Abuja: NBS.
- National Bureau of Statistics. (2010). Poverty Profile for Nigeria. Abuja: NBS.
- National Bureau of Statistics, (2012). The Nigeria Poverty Profile Report. Federal Republic of Nigeria, Abuja, Nigeria.
- Pyatt, G., C. Chen, and J. Fei. 1980. The distribution of income by factor components. *Quarterly Journal of Economics* 95: 451-473.
- Ray, D. (1998). *Development Economics*. Princeton: Princeton University Press.
- Reardon, T., Crawford, E., and Kelly, V. (1994). Link Between Non-Farm Income and Farm Investment in African Households: Adding the Capital Market Perspective. *American Journal of Agricultural Economics* 76 (5).
- Reardon, T., (1997). Using evidence of household income diversification to inform study of the rural non-farm labor market in Africa. *World Development* 25(5).
- Senadza, B. 2011. Does Non-farm Income Improve or Worsen Income Inequality? Evidence from Rural Ghana. *African Review of Economics and Finance* 2 (2): 104 –121.
- Stark, O. (1991). *The Migration of Labor*. Oxford, Basil Blackwell.
- van den Berg, M., Kumbi, G.E., 2006. Poverty and the rural nonfarm economy in Oromia, Ethiopia. *Agricultural Economics* 35 (Suppl), 469 – 475.
- Woldenhanna, T. and Oskam, A. (2001). Income Diversification and Entry Barriers: Evidence from the Tigray Region of Northern Ethiopia. *Food Policy* 26:4. pp. 351-365.
- Zhu, N. & Luo, X. (2008). The impact of remittances on rural poverty and inequality in China, *Policy Research Working Paper* 4637, World Bank.