

# **Rural Non-Farm Incomes and Poverty Reduction in Nigeria**

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## Abstract

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The study examines some of the factors which determine the type of non-agricultural activities in rural Nigeria an individual engages in. It is argued that diversification from subsistence farming and support for rural on-farm employment opportunities could be poverty-reducing. It has been noticed that an increase in foreign remittances reduces the incidence, depth and severity of poverty in developing countries. This study considers remittances as a source of income which could possibly reduce poverty in the rural sector of the economy. We focus on the non-farm sector because of its potential for development and poverty alleviation in Nigeria.

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# 1. Introduction

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With a population of over 140 million (NBS, 2006), on a land area of 924,000 square kilometres, Nigeria has great potential for development in terms of human and material resources. The rural economy remains largely agriculture-based in a tropical climate with a variety of vegetational belts ranging from the forest in the south to the Sahel Savannah in the north. It also has diverse natural resources including minerals, oil and gas. The great diversity of Nigeria's ecological zones and mineral resources offers a challenging environment in which poverty-focused programmes could succeed. However, despite Nigeria's enormous size and the obvious importance of its economy in Africa, it has over the years experienced attributes of declining capacity utilization in the rural sector, large budget deficits and rising unemployment. In addition, the worsening poverty situation in the country is a cause for concern. A key element in the history of the country's rural development efforts is that agriculture has been viewed as a basis for rural development, an approach which has neglected the contributions of other sectors in improving the quality of life of rural dwellers, and subsequently hindered the scope for a multisectoral and integrated approach to rural development programming. As a result, the benefits of development have bypassed large segments of rural societies in which an estimated 85% of the country's extreme poor belong (FMARD, 2001). Thus, the number of poor people in rural Nigeria has exceeded the capacity of agriculture to provide sustainable livelihood opportunities. Although there is potential for out-migration, urban centres cannot be assumed to be capable of providing adequate livelihood opportunities for all those unable to make a living in agriculture. Urban centres in Nigeria have limited absorptive capacity because of the poor level of industrialization.

The country's past development efforts have divided it into two distinct socioeconomic dichotomies: The urban and rural sectors, each of which shows great diversity in natural resource endowments and the quality of life of their respective inhabitants. While the rural sector carries 70% of the country's population and the bulk of its natural resources, its communities are subsisting under poor conditions devoid of opportunities and options within environments lacking in basic facilities such as roads, water supply and sanitation, energy and communication. The above scenario emerges from decades of callous neglect of the rural sector, and urban-biased development strategies. Table 1 presents an analysis of the poverty situation in Nigeria over 24 years (1980-2004).

It is evident that 59% of urban and 70% of rural households had become poor by 1996. The total poor rose from 27.2% in 1980 to 65.6% in 1996, an increase of 141.2%. However, between 1996 and 2004, the total poor declined by 17.1% to 54.4%. It is also evident that despite the decline in the proportion of the population in poverty between 1996 and 2004, in absolute terms the population in poverty rose from 67 million to 68.7 million (Aigbokan, 2008).

**Table 1: Population and poverty (1980-2004)**

Year	Estimated population (million)	Population in poverty (million)	Poverty level (%)
1980	65	17.7	28.1
1985	75	34.7	46.3
1992	91.5	39.7	42.7
1996	102.3	67.1	65.6
2004	126.3	68.7	54.7

Source: NBS, 2006.

## Rural non-farm activities in Nigeria

One important pathway towards livelihood sustainability involves avoidance of long-term dependency on only one or two income sources (Block and Webb, 2001). In Nigeria, off and non-farm incomes represent an important element in the livelihood of the poor. In several areas the population density and the depletion of natural resources are such that agriculture cannot possibly remain the only, or even the main, source of income. Haggblade (2005) remarked that although agriculture remains the backbone of most rural economies, given the scale of rural non-farm earnings, the simplistic notion of rural economies as being purely agricultural is clearly obsolete. In fact, observations show that in many areas, own crop production is no longer the main source of income of rural households. The share of agriculture in gross domestic product (GDP) declined from 47.6% in 1970 to 30.8% in 1980 (Aigbokhan, 2000) and by 2001 the share of agriculture was 34.4% (NBS, 2006). Furthermore, the Federal Office of Statistics (2002) (now known as the National Bureau of Statistics) reports that the days when agriculture was the foremost occupation and second to none in Nigeria have passed. The situation is likely to continue as pressure on the land increases with the growth in population. It is therefore essential for stakeholders in the development initiative to be more interested in what could make non-farm activities more profitable and sustainable. Perhaps this could be achieved through better coordination of planning and implementation across the boundaries of occupational groups and through building alternative conceptual frameworks to facilitate opportunities for improving livelihoods. Moreover, the shortcomings of previous attempts at national development underscore the imperatives of a national policy on integrated rural development as a means of evolving and adopting an approach through which rural development would synergistically be linked with national development efforts in all spheres. This in turn makes diversification almost inevitable. Diversification is essentially the process by which households construct increasingly diverse livelihood portfolios, making use of increasingly diverse combinations of resources and assets (Niehof, 2004).

The rural non-farm (RNF) activity in Africa, particularly in Nigeria, is fairly evenly divided across commerce, manufacturing and services, which are linked directly to agriculture, and largely to informal rather than formal (Reardon, 1997). Haggblade et al. (1987) found services, commerce and restaurants to be the fastest growing non-farm sectors. Perhaps more importantly, non-farm activity is typically positively correlated with income and wealth in rural Africa, and could offer a pathway out of poverty if non-farm opportunities can be seized by the rural poor (Barrett et al., 2001). Given the key



role diversification can play in stabilizing incomes and alleviating rural poverty, governments in developing countries have become increasingly interested in promoting increased output of diversification (Lanjouw, 2001). Thus, it is important to create an economic environment that can engender diversification of activities and incomes among the rural majority.

The relationship between the incidence of poverty and rural non-farm activities could be easily discerned when the sector offers employment opportunities to the poor with remuneration levels that are sufficiently high to lift them out of poverty. Lanjouw and Lanjouw (2001) suggest that non-agricultural activities could be divided into two groups of occupations. High labour productivity/high income activities, and low labour productivity/low income activities which serve only as a residual source of employment – in other words, a “last-resort” source of income. Reardon et al. (2001) remarked that poor households and poor zones often lack access to the better-paying non-farm employment that would alleviate their poverty. This study examines some of the factors which determine the type of non-agricultural activities in rural Nigeria an individual engages in. It is argued that diversification from subsistence farming and support for rural on-farm employment opportunities could be poverty-reducing. It has been noticed that an increase in foreign remittances reduces the incidence, depth and severity of poverty in developing countries (Bhasin and Obeng, 2005). This study considers remittances as a source of income which could possibly reduce poverty in the rural sector of the economy. We focus on the non-farm sector because of its potential for development and poverty alleviation in Nigeria.

## The research problem

A large body of literature suggests a potentially strong relationship between the rural non-agricultural sector and rural poverty. Ellis (2000) argues that household-level diversification has implications for rural poverty reduction policies since it means that conventional approaches aimed at increasing employment, incomes and productivity in single occupations, like farming, may be missing their targets. Lanjouw (1998), using data for Ecuador in 1995, demonstrates that non-farm activities provide a back-stop source of income to poor rural households whose options in agriculture have been exhausted, thereby providing a safety net that prevents the poor from sliding deeper into poverty. In a study on rural poverty, Mwabu and Thorbecke (2001) argue that since rural people derive a livelihood in one form or another from non-farm activities, increasing profitability and the range of these activities would improve living conditions in rural areas.

The poor diversify into the non-farm sector in order to smooth income and consumption patterns, which would otherwise be seasonal; to increase their income; to reduce risk (by spreading income risk across several activities); and to improve their long-term income prospects (by acquiring skills or assets, for instance). Beyond this, diversification in rural incomes may also affect gender relations. Women may become more marginalized if they are more constrained than men in their access to non-farm opportunities, or they may be empowered by new opportunities to earn an income and develop skills and networks. At

the more aggregate level of households, communities or regions, scarcity of productive resources and specialization according to comparative advantage accorded by superior technologies, skills or by greater endowments leads to considerable inter-individual diversity in activities and incomes. So no matter the unit of analysis, diversification is ubiquitous.

A quick run through the literature suggests some of the causes of income diversification. Generally, the increase in the non-farm component of the rural workforce has been attributed to both developmental and distress factors which sometimes operate in a mutually reinforcing way (Vaidyanathan, 1986). The developmental factors like agricultural modernization and commercialization, increased demand for non-crop goods and services, urbanization, growing literacy and even welfare-oriented policy interventions leading to increased job opportunities, have tried to pull the labour force away from agriculture towards more lucrative non-farm activities. At the same time, distress factors like poverty, unemployment/underemployment due to the inability of agriculture to absorb the surplus labour, and even frequent natural calamities like drought, have tried to push the rural households into various non-farm activities to supplement their farm income and employment. Ellis (1999) argues that the removal of constraints to and expansion of opportunities for diversification are therefore desirable policy objectives because they give individuals and households more options to improve livelihood security and to raise their own living standards.

The study aims to identify some of these constraints and to explore the roles that the non-farm sector can play in supporting a push for higher growth and poverty alleviation in the rural areas of Nigeria. What is more, an improved understanding of diversification behaviour may help the policymakers in the following ways: First, in the identification of effective means of targeting transfers to the poor or the food insecure; and second, in the removal of impediments to the smooth functioning of factor markets in labour, land and capital that condition on- and off-farm investments, thereby providing a window into households' revealed preferences among livelihood strategies and the feasible set of strategies among which different households can choose. The study of diversification behaviour offers important insights to what interventions might be effective in reducing poverty and vulnerability (Barrett et al., 2001).

## Justification

For a long time lack of understanding of the key income sources of poor people has sometimes led to the inadvertent misdirection of poverty reduction policies to the rural non-poor. It follows that the incorporation of livelihood criteria that capture the diversity of income sources could result in projects that are more attuned to the livelihood strategies of the poor and which, therefore, are more accurate in reaching them. But official data often give little indication of households' and individuals' sources of livelihood because of the informal nature of many activities, sensitivities about providing information on income, and a tendency for surveys to neglect secondary sources of employment or income. To put it differently, the importance of non-farm employment has been neglected in most rural development policies and programmes. Attention is usually focused on income derived from agricultural production, while options for improving household food

security and reducing poverty through improved cropping systems, which are financed with non-farm income, receive little attention.

An assessment of the growth potentials of the RNF sector needs to start with an attempt to establish the quantitative importance of the sector in the rural and the overall economy. Once this is done, two crucial questions that need to be asked are: (i) whether the RNF activities provide a sufficiently promising means of engendering rural-based growth of the economy by efficiently utilizing surplus labour; and (ii) whether these activities are productive enough to ensure the rural poor a decent income and level of living, or are rural non-farm activities of a mere residual nature to which people turn merely as a last resort? The second question also relates to the debate concerning the so-called “push-versus-pull” factors underlying the sectoral shifts of the rural labour force (Lanjouw, 2001).

Additionally, livelihood diversity results in complex interactions with poverty, income distribution, farm productivity, environmental conservation and gender relations that are not straightforward, are sometimes counter-intuitive and can be contradictory between alternative pieces of case study evidence. Rural poverty reduction policies need, therefore, to be better informed on the nature of these interactions. This study seeks to address some of these problems and provide useful information about Nigeria in this regard.

Further, this interest in diversification in Nigeria illustrates not only the current reality that many rural households are engaged in a diverse set of livelihood activities, but also that despite the reliance on agriculture as the driving force of the rural economy, over half of the population remains in poverty. In view of this dependency on agriculture and the concomitant level of rural poverty, investigations into the nature of livelihood diversification also clearly reflect the desire to better understand the potential that diversification offers for livelihood enhancement and poverty reduction. In particular, analysing the relative importance of wage and self-employment is crucial for better targeting of programmes designed to alleviate rural poverty (Woldenhanna and Oskam, 2001). What is more, academics are increasingly aware, either by professional inclination or through the pressures of donor funding for their research, of the need to influence policy and action. This is a commitment to changing “mindsets” amongst government officials, planners, donors and NGOs; developing specific rationales for intervention at various levels; and working out procedures for monitoring and evaluation.

This study therefore provides insight into the nexus of poverty and rural non-farm income. Gaining a good understanding of the determinants of participation in off-farm activities and of the levels of income achieved in these activities, as well as the extent to which it has led to poverty reduction by different categories of farm households, is essential for the design of the new approach to rural development and is thus the focus of this study.

## Objectives

The general objective of this study was to assess the impact of rural non-farm income on poverty and income distribution in Nigeria. The specific objectives were:

- (1) to present descriptive characterization of rural poverty patterns in Nigeria;

- (2) to identify and estimate empirically the key determinants of income diversification strategies in Nigeria; and,
- (3) to examine the differential impact of various types of non-farm income on poverty and income distribution.

## Concepts and definitions

The literature on farm and non-farm issues is plagued by definitional problems and inconsistencies, thereby making comparative analysis difficult (Gordon and Craig, 2001; Barrett et al., 2001). The farm/non-farm distinction revolves around sectoral classifications derived from standard national accounting practices, while the on-farm/off-farm distinction reflects the spatial distribution of activities, with off-farm income generated away from one's own land (Barrett and Reardon, 2000). The use of location for classification is due to limitations in the design of the survey data. Farm wage income and non-farm wage income data were collected as employment income. Reardon et al. (2001) define "non-farm" as activity outside agriculture (own-farming plus wage employment in agriculture), hence in manufactures and services. According to standard national accounts definitions, agriculture produces raw agri-food products with one of the production factors being natural resources (land, rivers/lakes/ocean, air); the process can involve "growing" (cropping, aquaculture, livestock husbandry, woodlot production) or gathering (hunting, fishing, forestry). Manufactures are production processes that use raw physical intermediate inputs (such as maize, milk, iron, wood or the elements of fertilizer) and turn them into manufactured goods (such as maize flour, cheese, pails, furniture and fertilizer). Services are processes that produce services (transport, commerce, banking and so on) using physical capital and labour.

Non-farm household enterprises income refers to any source of income not generated through agricultural activities and encompasses own account workers and working proprietors of unincorporated enterprises. These include profits earned from non-farm enterprises owned by the household or individually operated cottage industries like handicrafts, petty trade, transport, small industry, services and miscellaneous non-farm activities. The enterprise could be run within or outside the premises of the proprietor. Agricultural income includes profits from all crop and livestock production and by-products. Wage employment income includes monetary income earnings of household members in their supply of labour to farm and non-farm work.

## Patterns of income-generating options for rural Nigeria

Following the principle of revealed preference, observed diversification patterns provide important indirect evidence as to what households consider their most attractive options, given the constraints they face and their preferences. In so far as one can identify some livelihood strategies that clearly dominate other strategies, the pattern of diversification opens an important window into how smallholders respond to emerging income-generating opportunities. It also offers an overview of the non-farm sector in rural Nigeria. As remarked by Barrett et al. (2000), four distinct rural livelihood strategies could be identified. Some

rural households depend exclusively on their own agricultural production for income, which is the full-time farmer strategy, here termed agriculture. Others combine own production on-farm with wage labour on others' farms, which we refer to as the farmer and farmer worker strategy. The other two strategies combine farm and non-farm earnings. It is good to note that in recent times, the broad-based nature of national survey data provides more opportunity to include more occupational groups in the analysis. In this study we focus on the full-time farmer strategy (agricultural), farmer worker strategy (wage employment), non-farm household enterprise strategy (self-employment) and remittances.

## 2. Literature review

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Based on the successful experience of some southeast Asian countries, the promotion of non-farm rural activities is currently proposed as an alternative measure for rural poverty reduction (Barrett et al., 2001). In a review of about 100 farm household survey studies from the 1970s to the 1990s, (Reardon et al., 1998) find an average share of non-farm income to be 42% of total rural household income in Africa, 40% in Latin America and 32% in Asia. A broad comparative review of a process described as *de-agrarianization* in sub-Saharan Africa concluded that perhaps 60%-80% of rural household income in the late 1990s was derived from non-farming sources, in comparison with an approximate 40% in the 1980s (Bryceson, 1999). It is also important to note that migration for work elsewhere is one typical mode of diversification in the livelihoods of the rural poor that has arguably been inhibited by politicians and undervalued by policymakers (de Haan, 1999). Studies conducted by Ellis et al. (2002) in Dedza District of Malawi revealed that just under 50% of household incomes were derived from own production of crops and livestock, and over 50% from other sources comprising non-farm self-employment, remittance income or safety net transfers. This 50:50 split between own farm income and non-farm income is consistent with other findings on rural income portfolios across sub-Saharan Africa (Ellis and Bahigwa, 2001; Ellis and Mdoe, 2002). Recently, the potential role of non-farm employment has been emphasized, looking for options to enhance household expenditures and investment opportunities through selective engagement in the labour market (Lanjouw and Lanjouw, 1995; Reardon, 1997). It could be argued that this probably informed the policy wisdom that the promotion of rural non-farm employment and rural micro-enterprises, which aim to stimulate the rural non-farm sector, will enhance rural income and, as a result, reduce social and political tensions. Block and Webb (2001) found that wealthier Ethiopian households tended to have more diversified incomes and that those with initially more diversified incomes also had a greater increase in both income and calorie intake. This indicates that inequality may increase over time due to differential access to non-farm income. The view has also been expressed that non-farm activities reduce the Gini coefficient of total income in the rural areas, hence are income-equalizing (Reardon, 1997). Barrett et al. (2001) conclude that the poor have no other option but to diversify out of farming and into unskilled off-farm labour, whether in agriculture or not. In this study we are in part concerned with this option and its implications on rural household welfare. However, increasing livelihood diversification may not reduce rural poverty. In some instances, diversification is a strategy for coping with poverty rather than a mechanism for escaping from it. The asset-poor households tend to engage in low-return activities that ensure food security without increasing incomes (Mwabu and Thorbecke, 2001). Empirical studies in rural Africa

show that there is a strong positive relation between non-farm income share and total household income (Reardon, 1997). Non-farm income was very unequally distributed; however, asset poverty appeared to inhibit entry into remunerative non-farm earnings.

Quite a number of decomposition techniques are used to disentangle and quantify the impact of various causal factors in studies on poverty and inequalities. Commonly used techniques are the decomposable poverty measures - especially the Foster et al. (1984) family of indexes - which enable the overall level of poverty to be allocated among subgroups for the population such as those defined by geographical region, household composition, labour market characteristics or education level (Thorbecke and Jung, 1996; Shorrocks, 1999). Decomposition techniques could also enable researchers to distinguish the between-group effect due to differences in average incomes across subgroups (males and females; rural and urban), from the within-group effect due to inequality within the population subgroups. Of note in recent studies (Kaboore, 2004) on decomposition is the application of the Shapley technique. This method provides satisfactory standard decomposition which assigns contribution to the explanatory factors. To the best knowledge of the author, this method has not been widely used or is still poorly understood in Nigeria. This study intends to provide useful information and bridge the literature gap in this area of poverty study in Nigeria.

## Poverty, non-farm links: Theoretical exposition

The classical development economic models of Lewis (1954) and Ranis and Fei (1961) presumed that agricultural labour could be shifted to the industrial sector without any reduction in total agricultural output. They called these economies "surplus labour economies", implying that the shadow wage in agriculture is nil and that labour is immobile. Sen (1966) developed a model that made it possible under certain conditions to have a positive marginal product of labour and still no loss in output when labourers are removed. There have been controversies over how well labour markets in developing countries function and whether it is a good approximation to represent them as perfectly competitive markets in economic models. Theoretical models with perfect labour markets and missing labour markets can give very different policy conclusions with respect to the impact of various policy instruments, technological change and exogenous shocks on land management decisions of farm households (Kaimowitz and Angelsen, 1998; Holden and Binswanger, 1998). Empirical studies in rural Africa (Reardon, 1997; Bryceson and Jamal, 1997; Little et al, 2001; Barrett et al., 2001) have revealed that non-farm sources may account for as much as 40%-45% of average household income and seem to be growing in importance. Non-farm activity has been found to be positively correlated with income and wealth and may offer a pathway out of poverty. The unequal distribution of non-farm income indicates, however, that there are substantial entry barriers and steep investment requirements to participation in non-farm activities capable of lifting the poor out of poverty (Barrett et al., 2001). Such entry barriers are particularly high for self-employment activities. The significance of the entry barriers in wage-employment is less clear and some studies indicate that push factors have a strong impact on the degree of involvement in wage-employment.

Hymer and Resnick (1969) made a pioneering attempt to develop an economic model

of a subsistence economy that explicitly considered non-farm activities. The authors assumed that products generated by such non-farm activities (known as Z-goods) were not good quality products; they were oriented mainly towards self-consumption or were bartered in local markets. In other words, the so-called Z-goods were rated as inferior products, and their consumption was concentrated in low-income populations. The key prognosis from this model was that activities producing Z-goods would decline as a result of economic growth. This prognosis, therefore, led to a lack of interest in rural industrialization policies (Falabella, 1985). There is thus no obvious rationale for governments to promote the sector nor to be concerned about negative repercussions on the rural non-agricultural sector arising from government policies directed at other objectives (Lanjouw, 2001). However, following the successful rural industrialization experience of Japan, Taiwan and Korea, the view that Z-goods are inferior and that the activities producing them would decline with economic growth have been questioned. Hence, Ranis and Stewart (1993) have provided additional elements to support a situation in which the rural non-farm sector has a chance of surviving and expanding. The authors introduced the modern Z-goods concept which employs modern techniques and which faces an increasing urban and foreign market demand.

To look at this from other perspective, let us assume a farm household economy with perfect markets where individuals are willing to participate in off-farm work as long as their marginal value of farm labour (or reservation wage) is less than the off-farm wage rate (Becker, 1965; Gronau, 1991; Woldenhanna and Oskam, 2001). This implies that poorer farm households have incentive to diversify their income sources into off-farm activities because they earn a lower marginal value of farm labour. However, there can be entry barriers in the off-farm labour market because off-farm activities may require investment in equipment purchase or rent, skill acquisition and license fees. Hence, if entry barriers in the off-farm labour markets are formidable, the capacity to diversify income sources into off-farm activities will be lower for poorer farm households. This suggests that individual assets and wealth can affect the type of non-farm activities a household picks up. As a result less wealthy farmers may spend most of their time in low-paying off-farm activities for which the entry barrier is very low. Therefore, the actual participation of farmers in off-farm activities (income diversification of household) may largely depend on the incentive and their capacity to participate (Reardon, 1997).



## 3. Methodology

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### Data

Data used for this study were from the World Bank-assisted 2004 National Living Standard Survey conducted by the National Bureau of Statistics (NBS) (2003). The survey was designed to provide an estimate at both state and local government levels. A two-stage stratified sampling method was adopted. At the first stage, from each of the 36 states and the Federal Capital Territory (FCT, Abuja), a cluster of 120 housing units called enumeration areas (EA) were randomly selected. The second stage involved random selection of five housing units from the selected EAs. A total of 600 households were randomly chosen in each state and the FCT, coming to 22,200 households in all (NBS, 2003). Preliminary analysis of the data shows that out of the 22,200 households that were targeted, only 13,612 completed the questionnaire for the income sources.

The questionnaires were designed to obtain information from various members of the household, including husbands, wives and adult children. Topics addressed in the questionnaires include: demographic characteristics of all household members; age, sex, education, state, non-farm and off-farm employment; family size and sources of household income. However, in this study analysis of data was limited to samples from the rural sector.

### Variables used and a priori expectation

Empirical studies have documented that the reservation wage rate that determines the individual's participation in off-farm activities is an endogenous variable (Lass et al., 1991). It depends on farm characteristics (farm size, livestock wealth, other farm assets like tractors, tube-wells, water pumps etc.), family characteristics (age and educational level of family members, and family composition), location, and exogenous household incomes (farm income, which depends on farm and location characteristics; non-labour income such as transfer income and rent income from property) (Woldenhanna and Oskam, 2001).

Variables that raise the reservation wage reduce the probability and level of participation in non-farm work, but variables that raise the off-farm wage rate increase the participation. Age, education, location, farm and non-farm equipment may affect both the reservation and the off-farm wage. Hence the direction of influence on off-farm work participation depends on the relative strength of these forces. Farm income, livestock wealth and other income may also improve farm households' access to off-farm work if there is a credit constraint. Hence their impact on the off-farm work participation can be positive.

Age of household head  $\tilde{n}$  (AGE) and (AGESQD): The age composition is important in

a household in the determination of the attitude towards work. As a person gets older, he or she is less likely to be employed in the non-farm sector. Access to the local labour market is expected to increase with age, but for the elderly this effect could decline in importance, probably because while experience increases access, health problems could decrease it. Income per capita and age of household head can therefore be assumed to have a positive relationship to the 25-45 age range, and a negative relationship beyond this bracket. This relationship could be reflected if we square the variable AGE (i.e. AGESQD).

**Sex (SEX):** Given the gender differential in access to and control of resources in Nigeria, in a sense one may argue that men will be more motivated to diversify than their female counterparts because they seem to have more access to and control of resources in the same system. Women are more disadvantaged in education than men, which tends to limit women's opportunity to take high productivity high-return non-farm employment. Women are also prone to gender discrimination in job opportunities for religious reasons. For instance, Muslim women in *ipurdahî* are forbidden from taking jobs outside the home, no matter how profitable or suitable the job. What is more, one may argue that women who seem to be poorer will be more motivated to diversify their livelihoods than males.

**Education (EDU):** According to human capital models, education is an important dimension of non-homogeneity of labour. Hence, high educational attainment may imply a larger set of employment opportunities and, specifically in a rural context, a better awareness of the full potential of new agricultural technology and associated practices. Compared with the uneducated, all persons who have been educated are more likely to find employment in the non-farm sector.

**Household size (HSZ):** Family size and structure affect the ability of the household to supply labour to the non-farm sector. It is expected that rural non-farm income share of the total income for the large household would be more than that of the small household.

## **Analytical techniques**

### ***Rural non-farm incomes and welfare distribution***

Descriptive statistics are used to illustrate both the importance of non-farm employment and the broad pattern of participation in non-farm opportunities across different groups of the population. In order to understand which income groups benefited most from non-farm activity, we look at changes in income shares from various activities. Once again, the interest is in determining how incomes from rural non-farm activities are distributed across the rural households.

### ***Incidence of poverty by major occupations***

In an attempt to answer whether the movement to rural non-farm occupation is poverty-reducing, we drew upon the results to show how and to what extent participation in non-farm activities contributed to the income of the rural poor.

The standard Foster-Greer-Thorbecke (FGT) (1984) ratios were estimated for each of

the major income groups. Here attention was given primarily to the comparison of poverty across various income groups over the study period.

The FGT can be expressed as:

$$P\alpha = \frac{1}{n} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^\alpha \quad (1)$$

Where  $n$  is the total population (households);  $q$  is the number of households with income below the poverty line;  $z$  is the poverty line;  $y_i$  is the income of the poor household;  $y$  is the income of the poorest household; and  $\alpha$  is a poverty aversion parameter to be chosen in line with a society's sensitivity to deprivation and where  $\alpha = 0, 1, \text{ or } 2$ .

The FGT poverty measure satisfies relevant welfare properties that include common poverty measures such as the head count ratio ( $\alpha = 0$ ) and the income gap ( $\alpha = 1$ ) as special cases and is additively decomposable. The latter property means that poverty of the whole society can be expressed as the weighted sum of the FGT poverty measures of its constituent groups, where the population shares of the groups are the weights

$$P_\alpha = \frac{n_1}{n} P_{1,\alpha} + \frac{n_2}{n} P_{2,\alpha} + \dots + \frac{n_k}{n} P_{k,\alpha} = \sum_{i=1}^k \frac{n_i}{n} P_{i,\alpha} \quad (2)$$

Here  $n_i$  is the population of group  $i$  and  $p_i$  is the poverty measure for group  $i$ . This decomposability property is very useful in that it allows one to determine how any change in the poverty level within one group affects the level of poverty for the society as a whole. In this study the relative poverty line was adopted, defined as two-thirds of the mean income.

### ***Marginal contributions of the within and between income group inequalities***

Here we consider the marginal contribution of a given component as the variation in poverty index after adding that component to the complement components. We estimate the impact of the inequalities between the income groups on the total poverty and the impact of its corresponding within the income group inequality on the total poverty. To eliminate the intra-group inequality and to calculate the inter-group inequality,  $I(\mu_1 \dots \mu_g)$ , we will use a vector of income where each household has the average income of its group, denoted by  $\mu_g$ .

To eliminate the inter-group inequality and to calculate the intra-group inequality, we will use a vector of income where each household has its average income multiplied by the ratio  $\mu/\mu_g$ . With this new income vector, the average of the incomes of each group is

equal to  $\mu$ . We express total inequality as:

$$I = E_{inter}^S + E_{intra}^S \quad (3)$$

Although this procedure gives insight into the contribution of each of the two factors to total inequality, this approach overestimates their contributions such that:

$$I < E_{inter}^S + E_{intra}^S \quad (4)$$

To avoid this, we use the Shapley approach to analyse the inter- and intra-group inequality simultaneously. It keeps the same rules for eliminating each of the between and within group factors and yield exact value of total inequality.

This decomposition gives us:

$$\begin{aligned} E_{inter}^S &= 0.5[I(y) - I(y(\mu/\mu_g)) + I(\mu_g) - I(\mu)] \\ E_{intra}^S &= 0.5[I(y) - I(\mu_g) + I(y(\mu/\mu_g)) - I(\mu)] \end{aligned} \quad (5)$$

### ***Using Shapley solution to decompose poverty measures***

One of the most widely known solution concepts in cooperative games is the Shapley value (Shapley, 1953). This value is based on four axioms: Efficiency, dummy player, symmetry and additivity. Here we use the Shapley decomposition procedure to attempt to determine the marginal impact on poverty of the major category of occupation in the rural Nigeria.

To start, let  $I$  be a statistical indicator representing a poverty or inequality measure, and let  $X_k$ ,  $k = 1, 2, \dots, m$  be a set of contributory factors to the value of  $I$ . We can write

$$I = f(X_1, X_2, \dots, X_m), \quad (6)$$

where  $f(\cdot)$  is an appropriate aggregation function. The goal of all decomposition techniques is to attribute contributions,  $C_k$ , to each factor,  $X_k$ , so that ideally, the value of  $I$  will be equal to the sum of the  $m$  contributions. The only function that satisfies Shapley's axioms as given above, is given by the Shapley values of a player  $i$  computationally given by

$$\phi_i = \sum_{S \subset N} \frac{(s-1)!(n-s)!}{n!} (v(S) - v(S \setminus i)) \quad (7)$$

Proportion of the rural poverty accounted for by the major occupational groups was estimated using Distributive Analysis STATA Package (DASP) version 1.4 developed by Abdelkrim and Duclos (2007), Université Laval, Canada.

### **Poverty curves**

We present very useful and informative tools in portraying the whole distribution of poverty gaps on a simple graph. The poverty gap curve plots  $g(p, z)$  as a function of  $p$  where  $p$  is the poverty measure of group  $g$ , and  $z$  is the poverty line. The curve naturally decreases with the rank  $p$  in the population, and reaches zero at the value of  $p$  equal to the headcount. The integral under the curve gives the average poverty gap, and its steepness indicates the degree of inequality in the distribution of poverty gaps (Duclos and Araar, 2006).

Here we are interested in knowing whether poverty in one region is higher than in the other, based on our poverty measures. In other words, we want to assert that poverty in a distribution A, is higher than poverty in a distribution B. Our concern is in ordinal comparisons and we do not attempt to put a precise numerical value on the extent of poverty in each occupational group. We only attempt to rank poverty across the income distributions, indicating whether one is unambiguously higher or lower than the other. We are of the opinion that this method is robust to the choice of measurement assumptions and can be sufficiently informative when considering the choice of good policies to alleviate poverty, or determining the distribution that has the highest poverty level. This method also saves most of the considerable energy and time often spent on estimating poverty lines and on selecting and calculating poverty indexes.

### **The decomposition of income inequality by sources of income**

Following Foster (1985) and others, the chosen measure of decomposition should have five basic properties: (1) Pigou-Dalton transfer sensitivity; (2) symmetry; (3) mean independence; (4) population homogeneity; and (5) decomposability.

Several measures of inequality meet these five properties. These measures include Theil's entropy index  $T$ , Theil's second measure  $L$ , the coefficient of variation and Gini coefficient. The two Theil measures, however, are not decomposable when sources of income are overlapping and not disjointed (Adams, 1993). While the need for non-overlapping groups is not restrictive when inequality is decomposed, this restriction rules out using the two Theil measures here because many of the survey households receive income from several different sources. This study will therefore use the Gini coefficient.

### **Gini coefficient**

Here, an attempt is again made to decompose income inequality by sources of income to assess the contribution of sources of income to total income inequality. The focus is on

the elasticity of overall inequality, that is, the degree to which overall inequality changes with small changes in rural non-agricultural incomes.

The Gini coefficient decomposition is a single-number index of the Lorenz curve equal to 1.5 times the area between the Lorenz curve and the 45-degree line. The Gini is zero when income is equally divided among a population and it approaches one when income becomes increasingly concentrated in the hands of a few individuals or households. The Gini coefficient decomposition is useful for examining the effects of different income sources on overall income inequality.

The best known and most general formula for decomposing inequality into its components is attributed to Shorrocks (1982):

$$S_k = \frac{\text{cov}(Y_k, Y)}{\text{var}(Y_k)} \bar{G}(Y_k), \sum_k S_k = 1 \text{ and } Y = \sum_k Y_k \quad (8)$$

where  $Y_k$  is income from source  $j$ ;  $Y$  is total income; and  $\text{var}(Y_k)$  is variance. This method is independent of the inequality measure one uses. Shorrocks (1982) calls it the “natural decomposition”.

Extending this derivation and following Kakwani (1977), Lerman and Yitzhaki (1985) measure the contribution of a source of total inequality as the product of its share in total income, source Gini and the correlation between source and total income. An important feature that makes the Lerman-Yitzhaki decomposition technique attractive to use in empirical studies is that it enables us to measure the marginal impact of a change in income source on total inequality.

If there are  $y_1, y_2, \dots, y_k$  sources of income that comprise total income, then

$$y = \sum_{k=1}^k y_k \quad (9)$$

Equation 9 can be written as

$$G = \sum_{k=1}^k R_k G_k S_k \quad (10)$$

where  $R_k$  is the Gini correlation between income source  $k$ , and total income. The relative Gini index of source  $k$  is given by the expression  $G_k$  and  $S_k$  represents source  $k$ 's contribution to total income.

## ***The determinants of rural non-farm employment: A multivariate analysis***

Here we consider a multivariate analysis of participation in non-farm activities. We estimate a probit model of involvement in non-farm activities as a primary occupation on a range of individual and household characteristics. Our interest is largely in the marginal effects associated with each explanatory variable. These can be interpreted as indicating the effect of a percentage change in the explanatory variable on the probability of involvement in non-farm business activities, taking all other variables in the specification at their mean (Ferreira and Lanjouw, 2001).

As discussed earlier, the non-farm sector as a source of income could be both high-return employment and a “last resort” option. We therefore estimate two additional models with the same specification of regression, but differentiating between involvement in high-return non-farm activities as opposed to low-return non-farm activities. We designate non-farm subsectors as either high-return or low-return depending on the average monthly earnings accruing to individuals whose primary occupation is in that sector. If the average monthly income accruing to a particular subsector of the non-farm sector is below the poverty line employed earlier, the subsector is designated as low-return. All those engaged in this subsector are then regarded as involved in a low-return, last resort, activity. Conversely, if the average monthly return from a subsector is above the poverty line, the subsector is designated as high-return activities.

### **Basic probit model**

Probit is used for analysis of discrete choice: In the basic probit, the dependent variable takes a value of 0 or 1. For the probability of being involved in non-farm activity for observation  $i$ :  $Y_i=1$  if the respondent is involved in non-farm activity;  $Y_i=0$  if not. We estimate the probability that the event occurs as a function of our explanatory variables  $X_i$ . The probit model uses the normal cumulative density function for  $F$ :  $\text{Prob}(Y_i=1) = \Phi(\beta'X_i)$ . Where  $\Phi$  = standard normal c.d.f. As a c.d.f., it has the desired property of always falling between 0 and 1. Note the c.d.f. makes the probability a non-linear function of the  $X$ . Following the index function and writing it out explicitly:

$$\Phi(\beta'X_i) = \int_{-\infty}^{\beta'X_i} \phi(\varepsilon) d\varepsilon. \quad (11)$$

Therefore we shall use maximum likelihood to estimate the  $\beta$ .

### **Elasticities**

We shall report the marginal effect of an infinitesimal change (or discrete change in the case of dummy variables) in each independent variable on the outcome probability. These

show the percentage change in the probability for a percentage change in the variables:

$$\ell = \frac{\Delta\% \text{Prob}[Y_i = 1]}{\Delta\% X_k} = \frac{\partial \text{Prob}}{\partial X_k} \cdot \frac{X_k}{\text{Prob}} = \frac{\partial \Phi(b'X)}{\partial X_k} \cdot \frac{X_k}{\Phi(b'X)} \quad (12)$$

We can see from the last expression that we can derive elasticity by multiplying the derivative by  $\frac{X_k}{\Phi(b'X)}$ , or the value of  $X_k$  over the predicted probability. STATA's probit command yields the derivative at mean  $X_i$ . We can combine this with the predicted probability and mean for  $X_k$  to calculate the elasticities.



## 4. Results and discussion

Different characteristics of the households in terms of size, age and sex distribution, occupational distribution, educational distribution and socioeconomic status often strongly influence their level of poverty. These characteristics will, therefore, in part provide the context within which poverty status will be discussed. Table 2 presents summary statistics of the variables used in this study.

**Table 2: Variable definitions and summary statistics**

Variable	Measuring unit	Mean	Std. Dev.	Min.	Max.
Wage employment income	Naira	3161.44	18374.93	0	792,000
Agricultural income	Naira	6237.65	14261.75	0	400,000
Non-farm income	Naira	3561.03	16518.40	0	755,800
Remittances	Naira	373.83	3072.39	0	150,000
Other sources of income	Naira	660.52	3949.19	0	255,000
Total income	Naira	13994.47	28647.91	0	792,000
Household size	Number	4.95	2.86	1	22
Age	Years	29.58	11.94	11.5	99
Age squared	Years	1017.61	975.73	25	9,801
Sex	Number	1.49	.2290912	1	2
Educational group	Years	2.59	1.32	1	6

Exchange rate US\$1 = N154

The average age of the respondents is 29.58. We are of the opinion that the majority of the people in rural Nigeria are strong enough to cope with the physical vigour needed for farming activities. Their average age suggests potential for innovation adoption in an enabling environment. It is evident that Nigeria is a country of moderate family size of five in the rural areas. Average level of education in rural Nigeria is primary education as revealed by the information in Table 2.

### Employment patterns in rural Nigeria

Table 3 presents a gender disaggregated breakdown of the entire economically active population by sector of principal activity ("occupation") in the rural area. Here we examine economic activity and occupation of the rural dwellers in order to have an overview of the rural non-farm sector. Several points are worth noting. Starting with agricultural activities which comprise livestock, plant production and fishing, it is evident from Table 3 that in rural Nigeria, agriculture remains the major source of income for the majority of

the people (71.65%), suggesting that the process of transition out of agriculture remains very slow. Most of the households earn income from more than one source. The analysis suggests that roughly 30.35% of the economically active population in rural Nigeria was employed primarily in the off-farm sector. It is observed that trading (7.09%) is an important activity commonly adopted by households to generate earnings in addition to those provided by agricultural production and could perhaps create a potential path out of poverty. Other non-farm activities include services in the form of housekeeping (10.93%), clerical-related activities (0.29%), teaching (1.84%), bricklaying (1.5%), physical labour (0.57%), hairdressing (0.24%), and religious work (0.24%) to mention but a few.

**Table 3: Share of the working population by sector of primary occupation, 2004**

Occupation code	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
<b>Production</b>						
Agricultural	13,549	46.03	6,981	23.72	20,530	69.75
Forestry worker	23	0.08	6	0.02	29	0.10
Fishing	337	1.14	192	0.65	529	1.80
Sub-total		47.25		24.39		71.65
Mining/extraction	12	0.04	0	0.00	12	0.04
Sub-total		0.04		0.00		0.04
<b>Manufacturing</b>						
Wood preparation	30	0.10	0	0.00	30	0.10
Spinners weavers	15	0.05	89	0.30	104	0.35
Food and beverage	27	0.09	105	0.36	132	0.45
Tailor, dressmaker	77	0.26	104	0.35	181	0.61
Cabinet maker	43	0.15	0	0.00	43	0.15
Blacksmith	20	0.07	1	0.00	21	0.07
Machinery & electric fitter	64	0.22	0	0.00	64	0.22
Metal processors	11	0.04	0	0.00	11	0.04
Sculptor/painter	17	0.06	5	0.02	22	0.07
Sub total		1.03		1.03		2.07
<b>Sales</b>						
Proprietor/wholesale	519	1.76	1,300	4.42	1819	6.18
Sales workers	72	0.24	163	0.55	235	0.80
Sales suppliers and buyers	18	0.06	16	0.05	34	0.12
Sub total		2.07			5.02	7.09
<b>Services</b>						
Architect	11	0.04	5	0.02	16	0.05
Engineering	29	0.10	11	0.04	40	0.14
Building caretaker	17	0.06	22	0.07	39	0.13
Medical, dentistry	27	0.09	15	0.05	42	0.14
Professional nurses	5	0.02	40	0.14	45	0.15
Accountants	30	0.10	13	0.04	43	0.15
Economist/Insurance	8	0.03	7	0.02	15	0.05
Lawyer	10	0.03	1	0.00	11	0.04
Technical	53	0.18	6	0.02	59	0.20
Teachers	372	1.26	169	0.57	541	1.84

*continued next page*

**Table 3 Continued**

Occupation code	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
Housekeeping	143	0.49	3,074	10.44	3217	10.93
Hairdressers	17	0.06	55	0.19	72	0.24
Legislative officer	13	0.04	4	0.01	17	0.06
Farm manager	13	0.04	22	0.07	35	0.12
Clerical related	219	0.74	85	0.29	304	1.03
Government executive	43	0.15	17	0.06	60	0.20
Trans. and Com supplies	109	0.37	1	0.00	110	0.37
Mail distributors	12	0.04	2	0.01	14	0.05
Restaurant	13	0.04	23	0.08	36	0.12
Maids and related	7	0.02	46	0.16	53	0.18
Security guards	110	0.37	0	0.00	110	0.37
Service worker	146	0.50	31	0.11	177	0.60
Plumber/welder	37	0.13	1	0.00	38	0.13
Bricklayer	150	0.51	1	0.00	151	0.51
Transport	145	0.49	2	0.01	147	0.50
Labour	111	0.38	57	0.19	168	0.57
Religious worker	64	0.22	6	0.02	70	0.24
Athletes/sport	8	0.03	0	0.00	8	0.03
Sub total		6.53		12.62		19.15
Total	16,756	56.93	12,678	43.07	29,434	100.00

In the rural non-farm sector, we can see that 2.07% of the working population is engaged in manufacturing and related activities and 19.15% in various service sector activities. In total, about 30.35% of the rural working population is engaged in non-agricultural activities as a primary activity. As observed by Ferreira and Lanjouw (2001), the figures obtained above are likely to be conservative estimates of the importance of non-agricultural activities because they do not include non-farm activities that are a secondary occupation.

The fact that a high proportion of the working population engaged primarily in service activities suggests that the dominant activities in rural Nigeria may belong to low-productivity, low-income activities that may not lift people out of poverty. What is striking about this observation is the high proportion of women in the service activities. The information in Table 3 also reveals that the most important activities within manufacturing and related subsectors comprise tailoring/dressmaking, food processing and textiles. Sales at wholesale level account for 6.18% of total non-farm activities in rural Nigeria. Other commercial workers account for 0.8% while those engaged in buying and selling of goods account for 0.12%. Although, it is often said that Africa has a female farming dominance par excellence (Staudt, 1982), the situation in Nigeria shows that the number of males (47.25%) who engaged primarily in agricultural activities was almost twice the number of females (24.39%). However, we are of the opinion that the information might have underestimated the number of females in agricultural activities because of the cultural factors. In broad terms, a woman in Nigeria may not consider herself a farmer when she works on her husband's farm, even when she has a plot. Females work mainly in non-farm activities related to housekeeping, sale of merchandise, dressmaking, food processing and textiles.

## Marginal impacts and elasticities of poverty with respect to within/between inequality in income components

Most economists and policymakers in developing countries agree that the rate of poverty reduction would be influenced by the level of inequality, in the sense that poverty reduction strategies are likely to be more effective when the level of inequality is low. The key policy question then becomes: To what extent does a given level of inequality reduce poverty? Expressed in more technical terms, the question is: What is the “inequality elasticity of poverty?” Or how much will poverty decline in percentage terms with a given percentage rise in inequality? Here we consider both the impact and elasticities of poverty with respect to within and between income groups. Table 4 presents a breakdown of the income share and impact on both inequality and poverty of income sources as well as the response of poverty to their within and between variations.

**Table 4: Marginal impacts and elasticities of poverty**

Source	Income share	Impact on inequality	Impact on poverty	Elasticity
Agricultural income	0.4782	0.0026	-0.0004	-0.1326
Non-farm self employment income	0.2281	0.0017	0.0001	0.0743
Off-farm wage employment income	0.2172	0.0018	0.0003	0.1323
Remittances	0.0230	0.0002	0.0000	-0.0282
Other sources of income	0.0534	0.0003	0.0000	-0.0869
Within		0.00651	-0.000044	-0.00601
Between		-0.00016	-0.000067	0.38304
Poverty and inequality indexes				
Indices	Estimate			
FGT	0.7240			
Gini	0.6509			

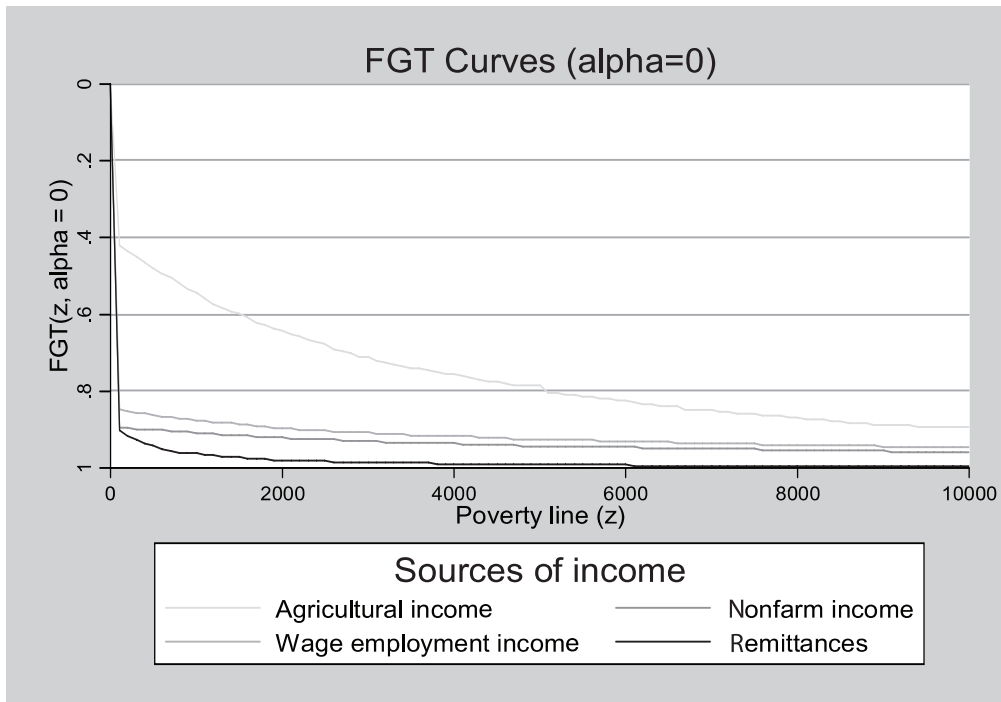
Generally, there is a high level of inequality (0.65) among the income sources. This is expected given the high differential in access to factors of production between those who engaged in high productivity, high-return and low productivity, low-return activities in the rural sector. The results reveal that 72% of the working population is not poor, being above the relative poverty line computed for the income earning groups. The information in Table 4 reveals variation in all the sources of income considered and at the margin they all have a tendency to have a positive impact on the level of inequality when they are increased. However, only agriculture has a negative impact on poverty. This suggests that much needs to be done to enhance productivity and high returns on investment in agriculture before it can contribute positively to poverty reduction like the other sources of income considered. Whichever way we look at it, disparity between income groups has a negative impact on both inequality and poverty, while disparity within income sources has a positive impact on inequality and, as expected, a negative impact on poverty. This underscores the need for strategies that will reduce both between and within inequality among the working groups in society. Mass education may afford equitable job opportunities among the occupational groups. Focusing more on how poverty will respond

to proportional change in income source, it seems only wage employment income and non-farm income has the potential to lift the rural population out of poverty. The income from agriculture, remittances and other sources (like thrift, money borrowed, government and other incomes) have not reached the threshold that could make them have a positive impact on poverty reduction in rural Nigeria.

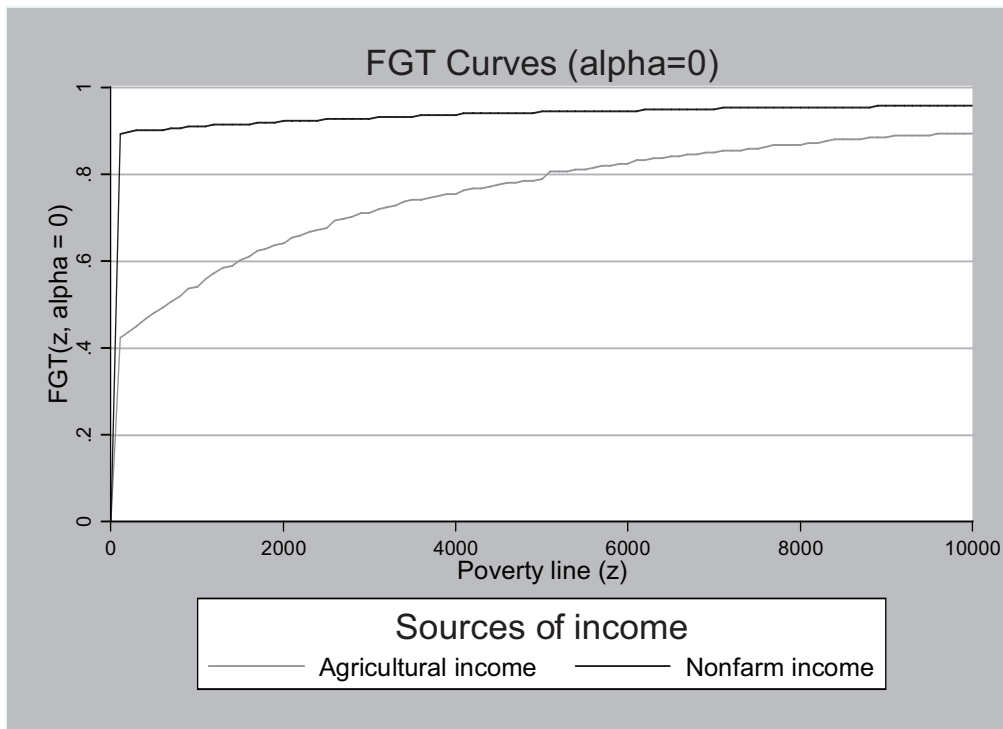
### Poverty curves

Figures 1 and 2 illustrate the levels of poverty among the working population of different occupational groups. Figure 1 comprises agricultural sources of income, wage employment income, rural non-farm income, remittances and other sources. The y-axis is reversed for ease of interpretation of the graph. It is evident that agricultural sources of income have the least potential to lift people out of poverty. At every level, it has the highest proportion of the working population under the poverty line. Remittances have the least percentage of the working population below the poverty line at every choice of the poverty line.

**Figure 1: Poverty gap curves of occupational groups (y-axis reversed)**



**Figure 2: Poverty gap curves for agricultural income and non-farm income**



This is indicative of the importance and the positive role remittances can play in the rural economy of Nigeria. Wage employment and non-farm self-employment sources of income have almost the same impact on the rural working population in Nigeria. However, wage employment income seems to have a greater impact on the alleviation of poverty among the working population. Figure 2, which is a subset of Figure 1, presents a clearer picture of both agricultural and non-farm sources of income. It is evident that non-farm sources of income offer great potential as a route out of poverty if sufficiently developed as a veritable source of investment in Nigeria.

### **Income inequality decomposition by income source: Gini index**

The issue of income inequality is further discussed because the link between income inequality and poverty has been the focus of discussions of poverty (Ravallion and Datt, 1995). This is important because it is widely believed that reducing income inequality could benefit the poor both immediately and in the long run by facilitating economic growth (Lanjouw, 2001).

To this end, an attempt is made to decompose the Gini coefficient to identify which income sources contribute to overall income inequality. First, it can be asked whether an

income source serves to increase or decrease overall income inequality. Second, it is possible to identify how much of the overall inequality is due to any particular income source.

The extent of inequality by income source and the contribution of different sources to total income inequality are presented in Table 5. The Gini indexes by source show that the agricultural income is the most unequally distributed with an index value of .78. The Gini index for total income is the weighted sum of the product of the source's share in the total income (0.79). The contribution of each source to total inequality is calculated as the product of the source's Gini index, its share in the total income and its correlation with total income. The higher the values of these estimates for a source, the higher will be its contribution to total inequality. Column 5 in Table 5 presents the absolute contribution of each source to total income inequality. The proportional contribution of a source to total inequality is the ratio of its absolute contribution to overall Gini index (Column 6).

**Table 5: Income inequality decomposition by income source: Gini index**

Income source	Income share	Gini of source	Correlation with rank of total income	Contribution to total inequality	Proportional contribution to total inequality	Relative income inequality	Relative marginal effect
	$S_k$	$G_k$	$R_k$	$R_k G_k S_k$	$R_k G_k S_k / G$	Col6/Col2	Col6-Col2
1	2	3	4	5	6	7	8
Agriculture	0.48	0.78	0.38	0.14	0.18	0.38	-0.30
Non-farm income	0.23	0.96	0.52	0.11	0.14	0.63	-0.08
Off-farm wage employment	0.22	0.05	0.62	0.01	0.01	0.04	-0.21
Remittances	0.02	0.97	0.17	0.00	0.01	0.20	-0.02
Other sources	0.05	0.98	0.23	0.01	0.02	0.28	-0.04

As expected, the contribution of agriculture to total inequality is the highest (14.25%) because of its maximum contribution to total income and its moderate correlation with the total income (.38). Similarly, household self-employment incomes (non-farm) contribute the second largest share to the total income, have a fairly high degree of correlation (.52) with total income and contribute 11.41% to total income inequality. Off-farm wage employment, which is the third largest source of income, is fairly highly correlated (.62) to total income but accounts for a low percentage (0.63%) of the total inequality, while both remittances and other sources of income account for about 1.5%.

Let us now consider whether a source is inequality-increasing or inequality-decreasing. This is decided by the relative inequality coefficient which is defined as the ratio of proportional contribution of a source to total inequality to its share in total income (Column 7 in Table 5). A value greater than one classifies a source as inequality-increasing and vice versa. The information in Table 5 reveals that all the sources of income considered will reduce income inequality. The extent to which a change in income source would increase or decrease total inequality is given in column 8 in Table 5. The relative marginal effect is calculated as the difference between a source's share of inequality and the share

in total income. The magnitude and direction of this relationship would give us the effect of a change in income source on total inequality on the margin. A positive sign would indicate an increase in total inequality on the margin due to an increase in income from that source. The relative marginal effect associated with all the sources of income is negative, indicating general level of impoverishment among the working population in rural Nigeria. However, agriculture and off-farm wage employment have the largest negative relative marginal effect on total inequality, which is indicative of high proportion of low-income group in the two occupational groups. These results call for initiatives aimed at improving rural income distribution through increased capability of people to have access to high-entry, high-paid employment. Further, the results suggest that there is a need for an improvement in skills and formal education of the lower income groups so as to increase their access to non-farm income generating activities.

## **The determinants of rural non-farm employment: A multivariate analysis**

Here we turn our attention to the household and individual characteristics associated with non-farm employment and poverty in Nigeria. Our concern is a multivariate analysis of participation in non-farm activities. We estimate a probit model of employment in non-farm activities as a primary occupation on a range of individual and household characteristics. It is argued that the choice of a primary occupation in the rural non-farm sector is influenced by the size of household, gender, age, and educational level. We present the marginal effect associated with each explanatory variable, which can be interpreted as indicating the effect of a percentage change in the explanatory variable on the probability of involvement in non-farm business activities taking all other variables in the specification at their means.

As mentioned earlier, we are interested in both high-return and low-return employment. Towards this, we estimate two additional models with the same specification of regressors, but differentiating between involvement in high-return non-farm activities as opposed to low-return non-farm activities. We designate the non-farm subsector as either high-return or low-return based on the average earnings accruing to individuals whose primary occupation is in that sector. If the average income accruing to a particular subsector of the non-farm activity is below the relative poverty line computed, the subsector is designated as low-return. All those engaged in this subsector are then regarded as involved in a low-return, last resort activity. Conversely, if the average income from a subsector is above the poverty line, the subsector is designated as high-return.

Model 1 in Table 6 shows that men are more likely to be engaged in the non-agricultural sector than women, controlling for all other variables. At first, age has a positive impact on the likelihood of being in off-farm activities and later negatively. The effect of age on earning illustrates the non-linear, concave shape well known in the empirical human capital literature (Canagarajah and Thomas, 2001). This indicates that earnings increase early in life as experience increases but later decrease as the individual gets older. The probability of non-farm employment increases with the household size, controlling for other characteristics.



**Table 6: Probit model of non-agricultural employment**

Explanatory variables	Any non-agricultural employment (Model 1)	Low-productivity non-agricultural employment (Model 2)	High-productivity non-agricultural employment (Model 3)
	DF/ds (Prob value)	DF/ds (Prob value)	DF/ds (Prob value)
Male (dummy variable)	0.037(0.014)	-.0013(0.935)	0.0011(0.93)
Age	0.0086 (0.00)	-0.00088(0.79)	0.002311(0.071)
Age squared	-0.0000830.000)	-0.0000038(0.83)	-0.000025(0.110)
Household size	0.020(0.000)	0.0080.00)	0.0064(0.00)
Educational group	0.022(0.00)	-0.014(0.00)	0.061(0.00)
Number of observations	13612	13612	13612
<sup>2</sup>	417.34	84.13	824.38
Prob > <sup>2</sup>	0.00	0.00	0.00
Log likelihood	-5953.79	-7047.49	-5303.79
Observed probability	0.17	0.22	0.15
Predicted probability	0.16	0.21	0.13
Pseudo R <sup>2</sup>	0.034	0.0069	0.072

Large families would probably gravitate towards non-farm employment, particularly high productivity high-return employment to earn more income to make ends meet. In line with most studies, the educational level is positively and significantly associated with the probability of non-farm employment. Holding other variables constant at their sample means, the model reveals that a 10% rise in the level of education would increase the probability of non-farm involvement by 2.2 percentage point.

Let us now consider the situation when we split non-farm employment into two types: Low and high productivity. One striking result is the changes observed: While men were more likely than women to be employed in the non-farm sector in general (Model 1), the reverse is the case when we focus on low-remuneration non-farm activities. Here men have a 1.3 percentage point lower probability of participating in these activities. It seems no one naturally has an incentive for low-productivity, low-income employment. The negative sign on age for both young and old indicates that no age level would want to engage in low-return employment. Household size is still positive and significantly related to employment in non-farm activities, still suggesting that households with many family members may well need to spread their net wider for more income. Unexpectedly, educational level is negatively associated with low-return non-farm employment participation. Perhaps average level of education considered is higher than what would be expected to take on low-return non-farm employment. After all, low-return rural non-farm activities are largely a coping mechanism that enables families to alleviate the hardship associated with poverty, rather than a route out of poverty altogether (Ferreira and Lanjouw, 2001). Controlling for other characteristics, Model 3 follows the results of Model 1 with greater association of educational group with the probability of non-farm participation in high-return activities.

## 5. Conclusion

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In spite of the size and potential wealth of Nigeria, rural poverty remains a crucial part of its economic problems. Given the rapid growth of the rural non-farm sector in Nigeria, it is natural that attention is increasingly focused on the role that off-farm economic activities could play in ameliorating living conditions and reducing poverty.

Using nationally representative data, the study investigates the impact of non-farm rural activities on the level of poverty and income distribution in Nigeria. The results show that the non-farm sector in Nigeria, while not the dominant sector in rural areas, is important in terms of both employment rates as well as incomes. Its share is now about 30.35% of the economically active population in rural Nigeria and likely to be higher over time. Because of its sheer size, if not for anything else, the sector must feature prominently in any development initiatives for the economy as a whole. There are also many inter-sectoral linkages which make the rural non-farm sector an important source of future economic growth.

Measures of poverty sensitive to the depth of deprivation reveal that the majority of the poor are in the agricultural and off-farm wage employment activities which reflect a low level of productivity in these sectors. This makes it imperative for policy actors to design strategies which will improve the labour market and productivity in the rural areas as a means to alleviate poverty among the rural majority. The study finds that if income from non-farm activities could be increased, it would help in reducing the level of inequality in rural Nigeria.

The empirical findings are in line with the theoretical suggestions and the adopted model predicted the observed individual's choices reasonably well. The study finds that education, age, enterprise number and labour are generally significant in the expected ways. Results of the multivariate analysis reveal that education is a particularly important income-enhancing factor, which could help the poor to break the entry barrier to high-pay and productive activities. These occupations nevertheless provide a critical contribution to their livelihoods and prevent further destitution.

In general, the study suggests and shares the notion that, like the Asian example, governments should create an environment with relatively egalitarian distribution of income, well-functioning input markets and a strong emphasis on educational expansion. If this were the case, rural non-farm employment would lead to a spurt of broad-based development and rapid income increases for all rural inhabitants. It is argued that such a strategy would provide great benefits not only to rural dwellers but to the economy as a whole.

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