



**INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE**
sustainable solutions for ending hunger and poverty
Supported by the CGIAR



NSSP Background Paper 9

Quantitative Analysis of Rural Poverty in Nigeria

Bolarin T. Omonona

Department of Agricultural Economics
University of Ibadan, Nigeria

Nigeria Strategy Support Program (NSSP)

Background Paper No. NSSP 009

November 2009

IFPRI-ABUJA

International Food Policy Research Institute
c/o International Center for Soil Fertility and Agriculture
Development
No.6/ Plot 1413 Ogbagi Street
Off Oro-Ago Crescent
Cadastral Zone 11, Garki, Abuja
Nigeria
E-mail: ifpri-nigeria@cgiar.org
www.ifpri.org

IFPRI HEADQUARTERS

International Food Policy Research Institute
2033 K Street NW
Washington, DC 20006-1002 USA
Tel. +1-202-862-5600
Fax +1-202-467-4439
E-mail ifpri@cgiar.org
www.ifpri.org

THE NIGERIA STRATEGY SUPPORT PROGRAM (NSSP)

BACKGROUND PAPERS

ABOUT NSSP

The Nigeria Strategy Support Program (NSSP) of the International Food Policy Research Institute (IFPRI) aims to strengthen evidence-based policymaking in Nigeria in the areas of rural and agricultural development. In collaboration with the Federal Ministry of Agriculture and Water Resources, NSSP supports the implementation of Nigeria's national development plans by strengthening agricultural-sector policies and strategies through:

- Enhanced knowledge, information, data, and tools for the analysis, design, and implementation of pro-poor, gender-sensitive, and environmentally sustainable agricultural and rural development policies and strategies in Nigeria;
- Strengthened capacity for government agencies, research institutions, and other stakeholders to carry out and use applied research that directly informs agricultural and rural policies and strategies; and
- Improved communication linkages and consultations between policymakers, policy analysts, and policy beneficiaries on agricultural and rural development policy issues.

ABOUT THESE BACKGROUND PAPERS

The Nigeria Strategy Support Program (NSSP) Background Papers contain preliminary material and research results from IFPRI and/or its partners in Nigeria. The papers are reviewed by at least one reviewer from within IFPRI network but are not subject to a formal peer review. They are circulated in order to stimulate discussion and critical comment. The opinions are those of the authors and do not necessarily reflect those of their home institutions or supporting organizations.

This paper received support from the Agricultural Policy Support Facility (APSF), funded by the Canadian International Development Agency (CIDA).

Quantitative Analysis of Rural Poverty in Nigeria

Bolarin T. Omonona
Department of Agricultural Economics
University of Ibadan, Nigeria

Copyright © 2009 International Food Policy Research Institute. All rights reserved. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to IFPRI. To reproduce the material contained herein for profit or commercial use requires express written permission. To obtain permission, contact the Communications Division at ifpri-copyright@cgiar.org.

Table of Contents

Introduction	2
Analytical Framework and Literature Review.....	4
Analytical Framework	4
Literature Review	5
Methodology of the Study	7
Data Issues	7
Deriving Poverty Thresholds	8
Analytical Techniques	10
Results and Findings of the Study	13
Poverty Lines.....	13
Summary Statistics.....	13
Poverty Profile for 1996 and 2004.....	19
Determinants of Rural Nigerian Household Welfare in 1996 and 2004.....	20
Gender Dimensions of Determinants of Rural Welfare in Nigeria.....	22
Determinants of Welfare for Male-headed Rural Households in Nigeria.....	23
Determinants of Welfare of Female-headed Rural Households in Nigeria.....	25
Geo-political dimensions of determinants of rural poverty in Nigeria	26
Determinants of welfare of North Central rural households in Nigeria	26
Determinants of welfare of North East rural households in Nigeria.....	27
Determinants of welfare of North West rural households in Nigeria.....	28
Determinants of welfare of South East rural households in Nigeria	29
Determinants of welfare of South South rural households in Nigeria	30
Determinants of Welfare of South West Rural Households	31
Difference in Regression Parameters (between 1996 and 2004)	32
Conclusion and Implications for Policy	33
References.....	34
Appendix 1:	39
Deflating Welfare Aggregates	39
Standard of Living Measure	39
Appendix 2: Weighting Processes and Estimation	39
Appendix 3: Summary of all the Regression Result.....	41

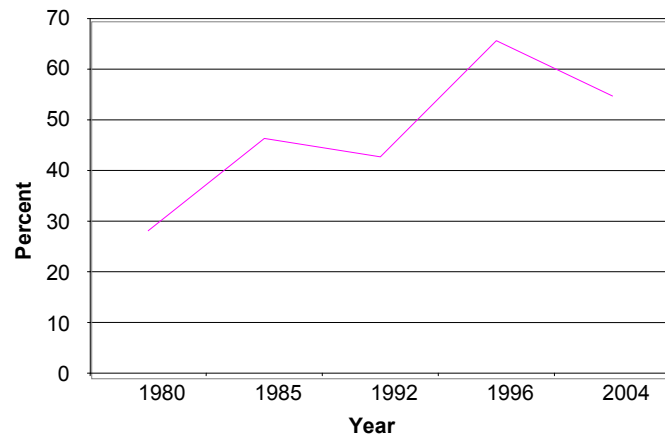
List of Figures

Figure 1:Poverty in Nigeria	2
-----------------------------------	---

Introduction

Poverty in Nigeria is pervasive although the country is rich¹ in human and material resources that should translate into better living standards. According to the most recent survey (2004 National Living Standards Survey) presented by the National Bureau of Statistics (NBS 2007, about 69 million people were living in poverty², which represents 54.4 percent of the Nigerian population. Since the 1980s, the Nigerian poverty situation has been deteriorating as seen in the figure below.

Figure 1:Poverty in Nigeria



The rate of poverty during those years translated to 17.7 million poor people in 1980, 34.7 million in 1985 and, not minding the drop between 1985 and 1992 (due to the implementation of the structural adjustment program), about 39 million people were poor in 1992. In 1996, however, about 67 million people were poor and despite the drop in incidence between 1996 and 2004, about 69 million people were poor in 2004³.

The high poverty rates in Nigeria go beyond low incomes, savings and growth because these are compounded by the high level of inequality resulting from unequal access to income opportunities and basic infrastructure. Unequal capabilities due to education and health status also play a role. According to the NBS (2007), Nigeria has a more unequal distribution of income than Ethiopia, Madagascar, India, Niger, the United States and Sweden. The Gini Coefficient of income inequality for Nigeria was put at 56.9 percent, which is among the highest within the class of comparable countries⁴. Incidentally, the importance of equal access to income opportunities and assets cannot be overemphasised as such access plays an important role in reducing poverty and spurring the economy to long-term

¹ Nigeria is a country that is richly blessed with vast amounts of human, physical, and natural resources. The natural resource endowment of the country includes petroleum, gas, and several solid mineral resources. There is a wide range of climatic, vegetation, and soil conditions that are suitable for rich agricultural production. The diversity of species of plants and animals is indispensable for both domestic consumption and export. The country is also blessed with a vibrant population, a large proportion of who are highly educated, active, and talented.

² According to the NBS (2007), poverty exists when a person within a household does not spend up to ₦23,733.00 per annum.

³ The apparent decline in the poverty headcount in 1992 and 2004 was, partly, due to a relatively faster rate of increase in the population base compared to a relatively slower rate of decline in the number of the poor.

⁴ Comparable countries are those with similar characteristics in terms of gross domestic product and per capita gross national product and income

development. According to the World Bank (1996), poverty in Nigeria would have decreased 13.6 percent between 1985 and 1992 had income distribution remained unchanged. Instead, it only declined 8.9 percent over that time.

The poverty profiles constructed by the National Bureau of Statistics (2007) showed that Nigerian poverty is predominantly a rural phenomenon. In 1980, 28.3 percent of the rural population was poor. This increased to 51.4 percent⁵ in 1985 but declined to 46.0 percent in 1992 before increasing to 69.8 percent in 1996 and again decreasing to 63.8 percent in 2004.

On the other hand, the proportion of the poor in the urban areas rose from 17.2 percent in 1980 to 37.8 percent in 1985. It declined to 37.5 percent in 1992 and rose to 58.2 percent in 1996 before decreasing to 43.1 percent in 2004. This is a reflection of the disparities in access to opportunities and infrastructure among the different households. For instance, infrastructure such as roads, water and sanitation, universities and electricity are not always readily available in the rural areas of the country. Nor are opportunities such as off-season employment, credit availability and access to timely agricultural inputs. Further investigation of the poverty profile in the rural areas reveals that about 44.4 percent of households cannot meet the food expenditure requirements. Another 19.38 percent can meet the food expenditure requirements, but are unable to meet the minimum expenditure to cover other basic needs.

In the case of urban households, only 26.7 percent could not meet the required expenditure on food while 16.4 percent that could meet the food expenditure still could not meet the other non-food basic needs expenditure. This indicates that although poverty alleviation programs should concentrate in the rural sector, the urban sector should not be neglected.

According to Datt et al (2000), a useful starting point for the analysis of poverty determinants is a "poverty profile." This is an important descriptive tool for examining the characteristics of poverty in a given place such as a country. Poverty profile tables provide key information on the correlates of poverty, and hence also provide important clues to its underlying determinants. However, the tabulations in poverty profiles are typically bivariate in nature, in that they show how poverty levels are correlated with one characteristic at a time. This feature tends to limit their usefulness because bivariate comparisons may erroneously simplify complex relationships. For example, when education of the head of the household is compared with poverty status, it is not clear if the observed negative relationship is due to education, or due to some other factor that might be correlated with education, such as the amount of land held by the household. For this reason, the typical bivariate associations found in a poverty profile can be misleading; they leave unanswered the question of how a particular variable affects poverty in relation to other potential determinants of poverty.

There are contexts in which unconditional poverty profiles are relevant to a policy decision, as, for instance, in the case of geographical or indicator targeting. But, more often, "conditional" poverty effects are more relevant for evaluating proposed policy interventions that seek to alter only one or a limited set of conditions at a time. In other words, the effect of a policy intervention is correctly identified when policy makers control for the other potential factors affecting poverty. It is not surprising, therefore, that recent empirical poverty assessments included multivariate analyses of living standards and poverty

Initial quantitative analyses of the determinants of poverty in Nigeria have been done along with a complete poverty profile using the National Consumers' Survey data sets of 1980,

⁵ The sudden increase in the poverty incidence from 1980 to 1985 was as a result of the worsening conditions in the economy. There was a glut in the international oil market in the early 1980s, leading to a sudden drop in government revenue.

1985, 1992, and 1996 (see Oni et al 2007; Olaniyan et al 2005; Anyanwu 2005, Okojie 2001; Aigbokhan 2000; Olaniyan 2000, FOS 1999a; FOS 1999b; Canagarajah et al 1997 and World Bank 1996). As for the National Living Standards Survey of 2004, only a complete poverty profile prepared by NBS (2007) is complete; the quantitative determinants of poverty using the NLSS 2004 are not. However, Oyekale et al (2008) used the NLSS 2004 data set to assess income shocks and expected poverty dynamics in Nigeria, but not to analyze determinants. And although the NBS (2007) provided changes in poverty rates from 1980 to 2004 as shown in the poverty profiles, the bureau has not done this for rural poverty, which is the focus of this study. In addition, the NBS has not analyzed the determinants of rural poverty. This study, therefore, will compare changes across time and regions in both determinants and rates of rural poverty for the years 1996 and 2004.

The main objective of this study is to deepen our understanding of how the determinants of poverty in rural households changed over that time and how they vary by region. This should give policymakers insights into what factors they may most need to pay attention to in the various regions. Specifically, the study

- presents measures of poverty (headcount, depth, severity) over time, in different regions, and by urban-rural areas of Nigeria,
- identifies household and community characteristics and region-specific risks that affect rural poverty in Nigeria, especially women's status,
- quantitatively assesses the household- and community-level determinants of poverty for rural households, taking region-specific risk into account; and
- makes policy recommendations based on the findings of the study.

The remainder of the paper is organized as follows: The next section reviews available poverty studies of Nigeria and presents the analytical framework for the study. The section after that explains the methodology and discusses the estimation results. The final section discusses implications for policymaking.

Analytical Framework and Literature Review

Analytical Framework

According to Ravallion (1996), an increasingly common practice in poverty analysis is to construct the poverty profile in the form of a regression of poverty measured against a variety of household characteristics. One postulates that y_i/z_i (or its log) is a function of a vector of observed characteristics (household and community) x_i , namely

$$y_i/z_i = \beta_0 + \beta_i x_i + \varepsilon_i$$

where y_i is the per capita expenditure, z_i is the poverty line, y_i/z_i is the welfare ratio, β_i is a vector of a parameters and ε_i is an error term. and this was termed "levels regression" by Ravallion. One then defines the binary variable $h_i = 1$ if $y_i/z_i < 1$ and $h_i = 0$ otherwise. The method then pretends not to observe the y_i 's, acting as if only h_i and the vector of characteristics is observed. And hence, the method usually estimates a probit or logit regression, depending on the assumption made about the distribution of the error term ε . Better still, a generalization of this procedure can be made to other poverty measures (of higher order) in order to use censored regression.

Ravallion put to rest the debate on the merits of welfare regressions versus binary poverty models. Ravallion (1996) argues that the binary response model is redundant, since the parameters measuring the effect of household characteristics on the probability to be poor can be derived from the levels regression, which is consistently estimable under weaker

assumptions about the distribution of the error. That is, whenever a conditional poverty profile is needed, the probit, logit, and Tobit models may be redundant because the usefulness of conditional poverty profiles has not always been positively related to the degree of their sophistication. Hence, unlike the usual binary response model, the continuous 'latent' variable is not latent at all, but observed. So there is no need for a binary response estimator if one wants to test the effects of household characteristics on money-metric poverty.

Literature Review

The analysis of the determinants of poverty is multivariate. It extends the analysis of the poverty profile by attempting to infer the causality of specific household characteristics on household welfare. It attempts to answer the question of how a particular variable affects poverty conditional on the level of other potential poverty determinants. It goes beyond the poverty profile⁶ of assessing mere correlation of the characteristics of a household with its poverty status to consider the causes of poverty at the household level. The results of these determinants of poverty analysis exercises should be of particular interest to policymakers since they provide a means to assess the likely impact of a range of specific government policies aimed at improving the welfare of Nigerians.

A large number of poverty studies on Nigeria have been completed (Anthonio 1975; Oshuntogun 1975; Adeyokunnu 1975; Ogwumike 1991; World Bank 1990, 1995 and 1996; Onah 1996; Echeberi 1997; Obadan 1997; Dike 1997; Ogwumike and Ekpeyong 1996; Anyanwu 1997; Englama and Bamidele 1997; Odusola 1997, Olaniyan 2000, Omonona 2001, Alayande et al 2004, Olaniyan et al 2005, Okunmadewa et al 2005, Oni et al 2007, and Oyekale et al 2008 among others). In the earlier years, especially in the 1970s, poverty analyses were basically descriptive as seen in the works of Anthonio (1975), Oshuntogun, (1975) and Adeyokunnu (1975). But with the popularization of the Foster, Greer and Thorbecke (FGT) (1984) weighted poverty measures, the use of poverty profiles became common. (See for example World Bank 1996 and FOS 1999). But in recent times, there have been a lot of studies that concentrate on the quantitative determinants of poverty in Nigeria. This section therefore reviews studies that are related to the quantitative determinants of rural poverty in Nigeria at the national level.

Olaniyan et al (2005) used the merged data from the 1996 General Household Survey (GHS) and the National Consumer Survey (NCS) to study the effect of human capital and capabilities on rural poverty in Nigeria. Both surveys had a national coverage and used the same sampling design in addition to covering all the federation's 30 states at the time and the Federal Capital Territory. The sample design for the study was a two-stage stratified sample design. Using the probit model to determine the probability of being poor as a result of a unit change in a variable, all the predictors of human capital variables represented by the educational level of the household head were statistically different. The results indicate that education reduces the probability of being poor in a household. Judging from the marginal effects, the largest impact is for those who have up to a post-secondary education, which is followed by those with a primary education. Human capital has a decreasing effect on the probability of being poor among all rural households, whether they are engaged in farm activities or non-farm activities. The marginal effects indicate that the coefficients are significant both in magnitude and sign (positive or negative). For example, completing a primary education reduces the probability of being poor by the rural households by as much as 19.0 percent while completing a secondary education decreases the probability of being poor by 18.6 percent

⁶ The detailed poverty profile for Nigeria can be found in Omonona, forthcoming.

Olaniyan (2000) studied how household endowments determine poverty in Nigeria by using the National Consumer Survey data sets of 1985, 1992, and 1996 of the Federal Office of Statistics (now National Bureau of Statistics). The surveys are representative samples of the Nigerian households, with both 1985 and 1992 surveys having a sample of about 10,000 households each and the 1996 survey having an increased sample of 14,600 households from all the Nigerian states. He estimated two alternative probit specifications for each of the three years considered. The first type includes explicitly both human and physical household endowments together with other poverty determinants. In the second type, he explored the effect of income composition on the probability of being poor as an alternative way of measuring the productivity of asset composition among rural households. Olaniyan's analysis revealed that human capital endowments were significant determinants of the probability of a rural household being poor. Specifically, the education level of the head of the household was a significant influence on the probability of that household being poor. The life cycle effect of the head of the household was also important. An increase in the age of the household head raised the probability of being poor in 1985 and 1996. Incidentally, the negative sign of the squared age showed that an increase in the age of household head beyond the peak age reduced the probability of being poor. An increase in the size of the household led to an increase in the probability of being poor. Household physical assets were also significant determinants of the probability of being poor. Also, the ownership of other business enterprises reduced the probability (However an examination of the coefficients in the three years found that this influence, though significant, was waning). As for house ownership, the effect was not statistically significant in 1985. But in subsequent years owning a house helped to reduce the probability of being poor for rural households.

The alternative specification showed that wage income was the most important contributor to the probability of being non-poor in 1985. The situation was the same in 1992. However, the effect of wage income was not statistically significant in 1996 and reliance on other income became the main contributor to being poor. The striking point here is that when this happened there was an increased probability of rural households being poor, because much of rural peoples' income is not from wages but rather from non-wage incomes such as farming, petty trading, and artisanship that are neither adequate nor regular.

There is also a gender dimension to the issue. Among rural households, being a female was associated with rural poverty in 1985, but from 1992 to 1996 the situation had changed.

The impact of regional variables on rural poverty indicates that there were also significant geographic differences in the probability of falling into poverty. Nigeria is a large country with varied geography and a range of cultures. All these factors lead to differences in the probability of being poor. In addition, being a farmer is positively related to the probability of being poor.

Oni and Yusuf (2007) examined the determinants of expected poverty among rural households in Nigeria. The data for their study were obtained from the merged General Household Survey (GHS) and the National Consumer Survey (NCS) of 1996. The cross-sectional data were augmented with certain covariate factors. The data were analyzed using three stage Feasible Generalized Least Squares (FGLS). Both idiosyncratic and covariate factors affected the expected log per-capita consumption of rural Nigerians. The overall expected poverty for the country was 0.535 and this was 1.02 times the observed poverty in 1996. Higher expected poverty was synonymous with living in the Northeast, having no formal education, farming, being an older or a male head of household, and having a large household. The Northeast region has both lower mean per-capita consumption and higher consumption variance compared with other regions of the country. Further, consumption variance is highest for households whose heads have a secondary education while households whose heads have no formal education have the lowest mean expected consumption. The researchers found further that farming households have lower mean per

capita consumption compared with their non-farming households. Male-headed households, Oni and Yusuf found, have both lower mean consumption and higher consumption variance relative to their female counterparts. Households headed by people who are younger than 20 had the lowest mean consumption and the highest consumption variance. Households with more than 10 members had very low mean consumption and very high consumption variance. Depending on whether there is low mean consumption or high consumption variance or both, suitable policy strategies will include those that aim for increased mean per capita consumption and those that smooth consumption or both.

In summary, all these studies revealed that poverty levels were inversely related to the level of formal education and the ownership of assets such as houses, buildings and businesses. In addition, the higher the household size, the worse the poverty, while households in the northern part of the country are poorer than those in the south. It appears that efforts to estimate the determinants of poverty focused on demographic/household variables only while excluding community variables. Hence, we will try to see the impact the community variables have on poverty among rural households, which had been left out of most previous studies. In addition, this study will contribute to an understanding of how the poverty of rural households and its determinants changed between 1996 and 2004. On the analytical front, we shall apply the simple Ordinary Least Squares (OLS) Ravallion used (1996) as against the limited dependent variable models (probit, logit and Tobit) that are popular in the literature. Ravallion (1996) asserted that the usefulness of a model is not in the degree of its sophistication but in its ability to capture and determine what it ought to. This OLS is different from those approaches used to measure welfare (as per capita expenditure or its log) in that it incorporates both the per capita expenditure of the household and the poverty line into a single variable known as welfare ratio and defined as per capita expenditure divided by the poverty line (that is, y_i/z).

Methodology of the Study

Data Issues

This study relies on datasets collected at two different points in time (1996 and 2004) on rural households in Nigeria, in order to be able to see the changes in poverty that took place in the interim. It is important to stress that the data sets are not panel but they were collected using the same sampling procedure at the household level. And hence, a comparison of changes in poverty status of rural Nigerian households between the two periods was undertaken because each was randomly sampled.

The 1996 dataset is made up of merged data from the National Consumer Expenditure Survey of Households and the General Household Survey (GHS) both conducted by the Federal Office of Statistics (FOS) during 1996–97 under the National Integrated Survey of Households (NISH). The consumer expenditure survey provides data that can be used to fill in details about household and individual welfare. The details are provided by FOS (1999). Essentially, the National Consumer Surveys (NCS) supplement the National Integrated Survey of Households (NISH), which has been on FOS's schedule of duties since 1953. Both the NCS and the GHS cover all states of the federation and the Federal Capital Territory (FCT).

FOS used a two-stage stratified sampling design to collect the 1996 NCS data. The first stage sampled clusters of housing units called Enumeration Areas (EAs), while the second stage sampled the housing units. FOS selected 120 EAs and covered them annually in each state. However, 10 EAs were randomly allocated to each month of the survey. In each selected EA, a sample of 10 households was covered each month for the GHS while five of these households were sub-sampled for the NCS. In the final analysis, the merged GHS and NCS data consists of 9,436 households spread across all the states of the federation. The

data set is rich and provides all the general information required for examining the determinants of household poverty in rural Nigeria. And, apart from the fact that it provides information on household structure and composition, it also provides information on the quality of housing facilities available to these households. Thus, it is possible to adequately capture the data necessary for the determinants of poverty in rural Nigeria. Of the 9,436 households, 7,425 were rural households. However, due to an incomplete data set (missing key variables for vulnerability analysis) only 7,210 rural households were used for the analysis representing 97.1 percent of all rural households covered in the survey.

The National Living Standard Survey of 2004 (NLSS) is the second source of data for this study. The National Bureau of Statistics (NBS) carried out this survey between September 2003 and August 2004. This survey constitutes the latest national data collected by the NBS on household welfare. The sample design was two-stage stratified sampling. At the first stage, from each state and the Federal Capital Territory (FCT, Abuja), NBS randomly selected clusters of 120 housing units called Enumeration Areas (EAs). The second stage involved random selection of five housing units from the selected EAs. A total of 600 households were randomly chosen in each of the states and 300 from the FCT, summing up to 21,900 households in all. However, some households did not fully complete the questionnaires. Therefore, data were available only on 19,158 households made up of 14,512 rural and 4,646 urban households. The survey appropriately weighted the households in order to avoid biased estimates of the parameters (see the appendix for the weighting procedure).

Deriving Poverty Thresholds

The analysis of poverty in Nigeria starts with the derivation of a poverty line. A poverty line is often defined as a predetermined or well-defined standard of income or value of consumption, which is deemed to represent the minimum required for a productive and active life or even survival (Okunmadewa 1999). Though several methods can be used to obtain the poverty threshold, in this paper, I followed the standard practice and chose per capita expenditure as a measure of welfare instead of per capita income. I preferred to use household expenditure because literature has shown that income, as a measure of welfare is prone to many flaws, especially in Sub-Saharan African countries (Datt and Jolliffe 1999). First, income varies from year to year and from season to season depending on farm production and prices. Secondly, most individuals are often reluctant to declare their true income and lastly, it is not the amount of income per se that matters but the amount spent on consumption. So, an analysis of poverty limited to income of the household may underestimate (if the household borrows to augment consumption) or overestimate (if the household saves much of the income earned without spending on consumption items that would translate to improved welfare). The approach using per capita expenditure has been used in many studies on poverty in Nigeria (see World Bank 1996, FOS 1999a, FOS 1999b, Olaniyan 2000, Omonona 2001, Olaniyan 2005, Okunmadewa et al 2005, and Oni et al 2007).

In the literature, economists use two major approaches to determine a poverty line. These are the absolute approach and the relative poverty approach. Under the absolute approach, a household is considered poor if its consumption level is insufficient to acquire a given level of goods and services regarded as an essential minimum standard of living. The poverty line from this approach usually has a fixed value. The popular methods for estimating these poverty lines include the food- energy intake approach and the cost—of—basic needs method. The relative poverty approach, on the other hand, defines the poor relative to others in the same society or economy. A relative poverty line varies as the average of total population's consumption varies. For example, the fixing of poverty line as the two-thirds of the mean per capita household expenditure is a relative poverty approach. The relative poverty line is both subjective and arbitrary (Olaniyan 2000) and hence the need to

standardize it against some costs of basic needs in the economy (such as the cost of the recommended dietary intake or some internationally acceptable measures like US\$1 per day).

Not minding the controversies, the main issue in poverty line, however, is to be able to get a poverty line that offers a consistent poverty profile so that we will be able to compare poverty among households with precision. In this paper, I adopted the relative poverty line for the analysis despite its shortcomings. Its choice was dictated by the unavailability of data needed to calculate the absolute poverty line. Despite the fact that the NLSS 2004 had information on intangibles and physical quantities of consumed food; the NCS data for 1996 do not. The poverty line for the NCS 1996 data set was obtained by multiplying the poverty line (N359.4) obtained in the 1985 NCS by a raising factor (28.56) obtained from the ratio of the Composite Price Index (CPI) of 1996 to that of 1985 (the base year)⁷. This gave a poverty line of N11292.62 in 1996.

This study relied on relative poverty line because the earlier datasets before the NLSS of 2004 did not permit the computation of the absolute poverty line because according to FOS (1999), the data (NCS 1980, 1985, 1992 and 1996) were collected primarily to:

- revise the weights needed to construct or revise the Consumer Price Index (CPI),
- provide household income and expenditure data needed for preparing some aspects of national income,
- provide data on spending patterns and other socioeconomic features of the average household, and
- provide data for market and private research groups.

The data (NCS 1980, 1985, 1992 and 1996) were, however, used for poverty analysis because it contained information on income, expenditure and demographic and socioeconomic variables.

Despite that the NLSS 2004 generated an absolute poverty line, the FOS's use of the relative poverty line for the NCS 1996 dataset made it compulsory for us to use the same approach to allow for easy comparison of the data. According to the NBS (2007), the NLSS researchers computed their relative poverty line in the 2004 NLSS using the following procedures:

- Aggregating and annualizing food expenditures (food purchased and consumption of own produce)
- Aggregating non-food expenditure. This included imputation of rental values for all categories of non-rented homes including owner-occupied houses, rent-free houses, subsidized housing, etc. A component of use value for assets is also included.
- Obtaining total household expenditure (food and non-food). Since this measure includes imputed own produce and other items, the aggregate tends to measure welfare. (However, the term "expenditure" is frequently used and understood to mean "welfare.")
- Deflating to national prices using the CPI to the base year on January 2004. (See Appendix on computing the price deflators.)
- Computing per capita household expenditure: total household expenditure divided by the household size.

⁷ The 1985 poverty line from the NCS data was obtained from calculating two-thirds of the mean per capita expenditure. The poverty line was N359.4. This amount, according to FOS (1999b), was higher than the minimum wage of unskilled labor in 1985 and provided a basket of goods that met the FAO recommended intake of 2100 calories per day.

- Summing up all the per capita household expenditure across all the households and dividing by the total number of households. (Sample weights at the EA level are used to compute the figure. See Appendix D for further discussion too.) This gives the weighted mean per capita household expenditure.

The average per capita household expenditure was N35,600. With the poverty line being based on two-thirds of the average per capita expenditure (N23,7338), all people with per capita expenditure less than this amount are considered poor. Those equal to or above are non-poor.

I then used the poverty lines I'd estimated to profile rural poverty and changes therein, as well as to gauge the determinants of rural poverty in Nigeria.

Analytical Techniques

This study employed a number of analytical techniques. These include descriptive statistics, the weighted poverty measures and the multivariate regression models. The descriptive statistics used include mean, standard deviation, percentages and tables.

Poverty Indices/Measures

Usually, there are three steps involved in the measurement of poverty. These are choosing a quantitative welfare indicator, choosing a means of discriminating between the poor and non-poor (through the use of a poverty line), and aggregating this information into a poverty measure for a particular population.

Though there are a lot of methods for aggregating the poverty of a group, this study used the Foster-Greer-Thorbecke's (FGT) weighted poverty index due, among other things, to its additive decomposability into sub-groups. This FGT weighted poverty measure, otherwise called the P_α measure, is used to obtain the incidence, depth and severity of poverty by location (rural-urban and geopolitical zones) and sex of the household head. The FGT measure for the i^{th} subgroup ($P_{\alpha i}$) is given below:

$$P_{\alpha i} = \frac{1}{n} \sum_{i=1}^q \left[\frac{(z-y)}{Z} \right]^\alpha$$

when $\alpha = 0$, $P_0 = \frac{1}{n} \sum_{i=1}^q \left[\frac{(z-y)}{Z} \right]^0 = \frac{q}{n} \rightarrow \text{Poverty incidence or head count}$

$\alpha = 1$, $P_1 = \frac{1}{n} \sum_{i=1}^q \left[\frac{(z-y)}{Z} \right]^1 \rightarrow \text{Poverty gap or depth}$

$\alpha = 2$, $P_2 = \frac{1}{n} \sum_{i=1}^q \left[\frac{(z-y)}{Z} \right]^2 \rightarrow \text{Poverty severity}$

where

n	=	number of households in a group
q	=	the number of poor households
z	=	poverty line
y	=	the per capita expenditure (PCE) of the i^{th} household; and,

⁸ The 2/3 mean per capita expenditure was referred to as the moderate poverty line while its 1/3 is referred to as the core poverty line. I have limited myself to the moderate poverty line because it closely approximates the \$1/day international poverty line in the 2004 NLSS and also in the 1996 NCS as reported by the NBS (2007).

α = degree of poverty aversion

The study computed the poverty measures using the DAD 4.5 software used for distributive analysis

Determinants of Welfare

The analysis in this report is based on the money-metric measure of utility and welfare in line with most recent works on poverty. The report used the ratio of per capita household expenditure to the poverty line as a measure of household welfare, as outlined in the analytical framework earlier. Expenditure is better to use than income because it is usually better reported in household budget surveys and also, it better reflects permanent income. This argument is particularly relevant in Sub-Saharan Africa, where the volatility of current income is still quite high due to the high rates of unemployment.

In order to establish the relative importance of each determinant, the study used a multivariate model. According to Ravallion (1996), a basic model uses household expenditure per capita/poverty line ratio as a dependent variable in a regression with exogenous household characteristics (X_i), as well as community characteristics (C_i) as explanatory variables shown below.

$$y_i/z_i = \beta_0 + \sum \beta_{1i}X_i + \sum \beta_{2i}C_i + \varepsilon_i$$

Where y_i/z_i = welfare ratio, y_i = per capita expenditure of household i , z_i = poverty line, β 's are model parameters while ε_i = error term.

The study ran two variants of the welfare model above for each category; One is the full ordinary least squares (OLS) regression and the other is fixed effects regression. One practical advantage of modeling welfare rather than poverty *per se* is that the dependent variable is continuous and can be estimated by OLS. This makes it feasible to estimate a fixed effects model to control for unobservables common to the local community especially diversity in prices, local infrastructure, environment and culture across the many enumeration areas the survey sampled in both 1996 and 2004. According to Appleton (1995), whether fixed effects models are preferable is unclear *a priori* because, although they reduce omitted variables bias, they will tend to magnify the effect of any measurement errors. In practice, however, they are frequently regarded as providing better estimates (Behrman and Deolalikar 1993). Consequently, the discussions of the determinants of poverty and welfare refer to the fixed effects in all the models unless otherwise stated. In fact, the results appear fairly robust to control for fixed effects because the absolute size of most of the coefficients and t-ratios tend to rise. The table below shows the definition of the variables used in the OLS regression of the determinants of welfare in Nigeria.

Table 1: Variable Definitions

Variable	Definition
welfare	Welfare ratio defined as the per capita expenditure divided by the poverty line
gender	Male headship of a household
age	Age in years of the household head
hh size	Household size
prim_edu	Household heads completing primary education
sec_educ	Household head completing secondary education
ter_educ	Household head completing any tertiary education
monogamo	Household head is monogamous
polygamo	Household head is polygamous
divos/epa	Household head is divorced, separated or widowed

farming	Household head is into farming as primary occupation
single_room	Household members live in a single room
flat/dupl	Household members live in flats, duplexes or whole building
safe_water	Household members have access to safe water (piped water, borehole and protected well)
safe_toilet	Household members have access to safe toilet (water closet, flush to sewer, and VIP latrine)
North_East	Household resides in the North East
North_West	Household resides in the North West
South_East	Household resides in the South East
South_South	Household resides in the SouthSouth
South_West	Household resides in the South West

Source: Author's compilation

In regression analysis, one must ensure that the regressors are truly exogenous to the system because of the inherent problem of biased estimates if an endogenously determined variable is treated as exogenous. As Grootaert and Braithwaite (1998) argue, variables to be considered exogenous depend on the time horizon considered relevant. And it has become fashionable in econometrics to take a rather narrow view on this (i.e., to consider a long time horizon) and to estimate welfare models with very parsimonious right-hand side variables (see e.g. Glewwe and Hall, 1995). And as Appleton (1995) has argued, reasons can be found why almost every conceivable determinant of poverty is simultaneously determined with welfare, and he cites a number of examples of such discussions in the literature. In the end, little more than gender, age and a few parental characteristics⁹ end up as truly exogenous. Hence, such econometric purity, according to him, is problematic if the analysis is meant to guide policy. Most policy and targeting variables at the household level become endogenous if the time period is made long enough. All assets (education, physical capital, land) as well as household size are to some degree a function of the household's welfare level and its evolution over the life cycle. Location can change due to migration. Likewise, the household head can change as a result of migration, or the splitting of one household into several households (or the reverse process).

And following from the submission of Grootaert and Braithwaite (1998), we recognized the strict validity of these arguments. But this study takes a pragmatic view and used a fairly generous set of right-hand side variables. The objective was to identify determinants of welfare and poverty which, in the short run, are valid policy and targeting variables. For a relevant time frame, we considered the reference period for the data collection, that is a year or less. We therefore included, as the right-hand side variables, those which a typical household in the country cannot change in a one-year period or only with great difficulty or cost. In line with this, we did not include ownership of durable goods, especially physical assets such as land and livestock.

Generally speaking, asset variables have to be seen as endogenous with respect to household welfare, because in an intertemporal context, the household's welfare level will determine the extent of education children receive and will determine capital accumulation. For a one-period model estimation, based on cross-sectional household data, the case for exogeneity is stronger, but not absolute. In principle, it would be desirable to replace these variables with instruments such as parents' education, inherited wealth, and so on. Unfortunately, such variables are not available in the data sets. Using a one-year time frame, we consider as exogenous the following sets of variables:

⁹In an inter-generational context, even parental characteristics can be endogenous.

- Household assets: education
- Demographic household characteristics: household size, composition, and characteristics of the head of household
- Labor market issues: employment of the head of household in farming or other occupations
- economic environment: location

The types of housing units and their access to safe water and toilets were included as regressors because precarious and less sanitary household environments contribute to poorer health and lower productivity of household members, thereby aggravating their poverty status.

On the whole, this study used three different types of regression models. The first was for the rural population while the second was the gender dimension of rural welfare. The third was for the various regions. For the second and third cases, the study relied on the Chow Test to see if the various grouping's regressions have equivalent parameters or not. In addition, the study sought to find out whether the determinants of various kinds of poverty have equivalent parameters for 1996 and 2004 respectively. The study sought to find this out for rural poverty, male-headed household poverty, female-headed household poverty and the various regions' poverty. It looked at the various geopolitical zones North Central, North East, North West, South East, South South, and South West. The Chow Test statistics is shown below:

$$F = \frac{RSS_c - (RSS_1 + RSS_2) / k}{RSS_1 + RSS_2 / n - 2k}$$

Where F is the F-ratio with F(k,n-2k) degrees of freedom with k being the number of parameters and n being the number of observations in the sample. The RSS_c is the residual sum of squares for the pooled data while RSS_1 and RSS_2 are the residual sum of squares for the first and second groups respectively.

Results and Findings of the Study

Poverty Lines

This study used poverty lines obtained from the National Bureau of Statistics (NBS). These poverty lines are N11,292.62 and N23,733.00 for the 1996 NCS and the 2004 NLSS respectively.

Summary Statistics

The summary statistics of the variables used in this study are presented in Table 2.

Table 2: Descriptive statistics of variables

Variable	1996		2004		Definition
	Mean	Standard deviation	Mean	Standard deviation	
welfare_	1.2104	1.80012	1.1984	1.36768	Welfare ratio defined as the per capita expenditure divided by the poverty line
gender	.8738	.33211	.8649	.34180	Gender of household head
age	44.7555	13.16449	47.3381	14.52831	Age in years of the household head
hh size	4.5214	2.66841	4.8838	2.86530	Household size
no_formal	.6721	.46947	.6140	.48684	Household head has no formal education
prim_edu	.2079	.40584	.0538	.22567	Household heads completed primary education
sec_educ	.0917	.28859	.2987	.45771	Household head completed secondary education
ter_educ	.0283	.16582	.0334	.17974	Household head completed tertiary education
monogamo	.5287	.49921	.6309	.48259	Household head is monogamous
polygamo	.2804	.44925	.1573	.36411	Household head is polygamous
divo/sepa	.1329	.33946	.1577	.36450	Household head is divorced, separated or widowed
never_married	.0580	.23371	.0541	.22621	Household head is never married
farming_	.8092	.39300	.7670	.42274	Household head is into farming as primary occupation
single_room	.7212	.44843	.7459	.43539	Household members live in a single room
flat/dupl	.2739	.44600	.1774	.38205	Household members live in flats, duplexes or whole building
other_bu	.0049	.06951	.0767	.26612	Household members live in other forms of housing types such as huts, makeshift houses etc
safe water	.3714	.48322	.4085	.49157	Household members have access to safe water (piped water, borehole and protected well)
safe_toilet	.0337	.18048	.0385	.19229	Household members have access to safe toilet (water closet, flush to sewer, and VIP latrine)
North_Central	.1741	.3786	.1896	.39197	Household resides in the North Central
North_East	.3406	.47396	.1883	.39093	Household resides in the North East
North_West	.2198	.41416	.2151	.41093	Household resides in the North West
South_East	.1828	.38653	.1620	.36847	Household resides in the South East
South_South	.1549	.36186	.1628	.36922	Household resides in the South South
South_West	.1018	.30241	.0822	.27469	Household resides in the Southwest

Source: Author's computation

The welfare ratio averaged 1.2104 and 1.1984 in 1996 and 2004, respectively. The averages of the welfare ratios have standard deviation values that were greater than their respective mean, indicating a wide variability in the welfare ratio of the rural populace. One needs to point out that despite that the average welfare ratios were greater than 1.0, which was the cutoff for poverty, about 70 percent and 64 percent of the rural people were poor in 1996 and 2004, respectively (see table 3). This is an indication of the existence of a wide gap between the poor and non-poor in the welfare ordering.

About 87 percent and 86 percent of the rural households were headed by males in 1996 and 2004 respectively. This shows that rural households are mainly headed by males in Nigeria. The average age of rural household heads were 45 and 47 years respectively in 1996 and 2004. This means that the rural household heads are, on the average, in their economically active age. In addition, this age structure must have affected the future size of the rural

households since the men are in their active reproductive age. In 1996, the minimum age of these household heads was 16 years and the maximum age was 99 years while in 2004 there was a reduction in the minimum age of the heads of rural households to 13 years while the maximum age still remained 99 years¹⁰.

The average size of a rural household in Nigeria in both periods was about five members with standard deviation of about three. Despite this, there is a wide dispersion between the least household size of one in both years and a maximum of 24 people in 1996 and 22 in 2004. In fact, 2004, with a smaller maximum size than 1996, had a higher average household size. Larger household size has been a precursor to higher poverty level as it greatly depresses the per capita expenditure available to a household, *ceteris paribus*. The analysis of the educational status of the heads of rural households revealed that the majority of them did not have formal education. The situation was worse in 1996 (67 percent) than in 2004 (53 percent). In 1996, among rural household heads, the highest percentage had no formal education, followed by secondary, primary and tertiary education, respectively. In 2004, the pattern was similar except that there was a higher percentage of household heads with secondary education than those with primary education. There is a low level of education among the rural households and this has implications for their income-earning capacity as the members may lack the requisite skill to secure a well-paid job. Those in self-employment such as artisanship and farming may find it difficult to adopt modern improved techniques of production or operation because of their lack of education. This also affects the poverty level of the households.

The heads of households were categorized by gender then by marital status into such as married monogamous; married polygamous; separated, divorced and widowed; and have never been married. In both 1996 and 2004, larger proportions (53 and 63 percent respectively) of households were headed by monogamously married people. This was followed by those who were polygamously married, then the divorced, separated and widowed group, and finally, those who were never married. It is important to point out that the proportions of those married monogamously and those divorced increased from 1996 to 2004 while they decreased for polygamous marriage and those never married.

With respect to the occupation of the household head, most rural households were primarily farming in both periods. But there is a gradual decrease in the percentage of the rural population involved in farming from 81 percent in 1996 to 77 percent in 2004. Since the majority of the rural populace are still primarily engaged in rain-fed agriculture, any unfavorable weather can lead to poor harvests and further deepen the poverty of the people, especially in the face of the lack of social benefits- and security.

The analysis revealed that the majority of rural households, about 72 percent and 75 percent, lived in single rooms in 1996 and 2004 respectively. In addition, about 27 percent and 18 percent lived in flats, whole buildings and duplexes while a tiny fraction lived in other forms of housing such as huts. Further analysis reveals that while there was an increase in the proportion of those living in single rooms and those in huts, there was a reduction in the proportion of those living in more decent¹¹ apartments such as flats, whole buildings and duplexes. Type of dwelling is a good indicator of a household's welfare and affects the health of its members, depending on the number of rooms and the size of the household.

¹⁰ In the questionnaires used for the NCS and NLSS, all people aged 99 years and above were recorded as 99 years. So it will be impossible to see any household head with age above 99 years.

¹¹ Note that according to the National Population Commission, an area is delineated as rural if it has a population less than 20,000 people inhabiting it. These areas are also poorly served with social infrastructure such as electricity, potable water and post office. In southern Nigeria, people who work in cities, but are from the rural areas, will first of all build their very house in the village. This must have been responsible for the availability of duplexes, and flats in some of the rural areas studied.

A lot of water sources are used by the rural households, ranging from treated piped water to streams. Safe water, as typified by pipe borne water, borehole, and protected wells, was available to less than half the rural households in Nigeria. This means that the vast majority of the people depend on lower quality water for their domestic chores. One obvious fact, however, is that the proportion of households with access to safe water rose from 37 percent in 1996 to 41 percent in 2004. This has a lot of health implications for the people because it means they are less liable to contract all the forms of water-borne diseases associated with using stream water for drinking and cooking. Toilets facilities available to the rural households ranged from the safe water closet type to the inappropriate bush or dunghill type. It is appalling to note that only about 3 and 4 percent of the rural population had access to a safe toilet.

The study then disaggregated the household characteristics by zones for further analysis, as shown on tables 2a and 2b below. The northern part of Nigeria had a lower welfare ratio than the southern part in both 1996 and 2004, meaning that the north exerts a depressing effect on the national welfare ratio. More than three-quarters of the households were headed by males in 1996. While there was a reduction in the percentage of men heading households in the south in 2004 to between 70 and 77 percent, there was an increase for that of northern Nigeria to more than 90 percent in 2004. On education, close to three-quarters of the heads of rural northern households had no formal education in 1996 and 2004 while it was less for the south (a little above half in 2004). In addition, the north had a higher proportion of population primarily engaged in farming than the south. This is connected to the larger expanse of land available to the rural households in northern Nigeria. In 1996, there seemed to be little difference in the size of rural households but by 2004, the north seemed to have a higher size (5-6) than the south (3-5). Finally, all the zones had unsafe toilets but with the north again having a higher proportion of households without access to safe toilets.

Table 2a: Descriptive statistics of variables by zones 1996

Variable	North Central		North East		North West		South East		South South		South West	
	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev
welfare	1.3613	2.09632	1.0680	1.98980	.9606	1.34863	1.2044	1.52927	1.4221	2.18169	1.1804	1.38330
gender	.8502	.35702	.8968	.30432	.9700	.17063	.8959	.30549	.7887	.40840	.8719	.33428
age	46.4805	13.49314	44.4317	13.22291	40.9169	11.86152	42.3972	12.59827	46.3814	13.82441	46.0776	12.73277
hh size	4.4900	2.60224	4.6677	2.65312	4.4496	2.52454	4.3447	2.74823	3.9006	2.55091	5.0290	2.71345
no_formal eddo	.7012	.45792	.6677	.47122	.7384	.43979	.6769	.46784	.6079	.48844	.6637	.47258
prim_edu	.2024	.40194	.1502	.35743	.2234	.41683	.2073	.40556	.2677	.44295	.2114	.40840
sec_educ	.0837	.27700	.1366	.34352	.0286	.16682	.0624	.24207	.1047	.30636	.1028	.30384
ter_educ	.0127	.11223	.0455	.20853	.0095	.09726	.0533	.22470	.0197	.13901	.0221	.14700
monogamo	.4080	.49165	.6244	.48445	.3937	.48891	.4596	.49857	.6231	.48483	.5931	.49142
polygamo	.3060	.46100	.2511	.43383	.3951	.48920	.2581	.43778	.1799	.38431	.3192	.46633
divo/sepa	.2088	.40659	.0941	.29205	.1376	.34472	.1799	.38422	.1343	.34111	.0662	.24879
never married	.0773	.26716	.0303	.17161	.0736	.26125	.1024	.30332	.0627	.24247	.0215	.14493
farming_	.7896	.40773	.8058	.39576	.9482	.22172	.8276	.37785	.6410	.47992	.8675	.33913
single room	.5809	.49361	.8225	.38227	.8433	.36374	.7610	.42663	.7243	.44709	.6593	.47409
flat/dupl	.4175	.49335	.1768	.38163	.1526	.35984	.2281	.41981	.2677	.44295	.3363	.47258
other_bu	.0016	.03990	.0008	.02754	.0041	.06384	.0108	.10352	.0081	.08944	.0044	.06633
safe water	.3171	.46554	.3945	.48894	.2820	.45029	.2756	.44700	.4244	.49447	.4719	.49937
safe_toilet	.0303	.17142	.0744	.26245	.0095	.09726	.0258	.15864	.0278	.16434	.0240	.15302

Source: Result of data analysis

Table 2b: Descriptive statistics of variables by zones 2004

Variable	North Central		North East		North west		South East		South South		South west	
	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev
welfare_	1.0813	1.49458	.9334	.73466	.8207	.61657	1.7145	2.13554	1.3944	1.19750	1.6585	1.47451
gender	.8960	.30527	.9553	.20659	.9894	.10228	.7031	.45699	.7715	.41997	.7645	.42451
age	45.2784	14.17322	43.5377	13.65609	44.9667	13.00295	54.5729	14.00497	47.4075	14.14810	52.6010	16.25427
hh size	4.9251	2.82345	5.2485	3.08753	5.8440	2.97501	4.5240	2.52683	4.3174	2.58619	3.2707	2.11648
no_formal_educ	.5972	.49054	.7749	.41773	.8587	.34834	.4402	.49652	.3339	.47170	.5415	.49848
prim_educ	.0407	.19766	.0278	.16448	.0221	.14704	.1153	.31942	.0884	.28400	.0369	.18855
sec_educ	.3064	.46110	.1739	.37906	.1099	.31277	.4147	.49278	.5328	.49903	.3688	.48269
ter_educ	.0556	.22922	.0234	.15128	.0093	.09595	.0298	.17000	.0449	.20704	.0528	.22374
monogamo	.6045	.48905	.6742	.46875	.5839	.49299	.6427	.47930	.6420	.47952	.6697	.47050
polygam	.1029	.30385	.1581	.36493	.1829	.38664	.1923	.39416	.1380	.34493	.1836	.38730
divo/sepa	.2130	.40951	.1120	.31543	.1775	.38211	.1246	.33037	.1773	.38202	.1098	.31278
never married	.0796	.27073	.0556	.22926	.0557	.22944	.0404	.19696	.0427	.20232	.0369	.18855
farming_	.7107	.45354	.8730	.33305	.9225	.26745	.7091	.45429	.6212	.48518	.6505	.47702
single room	.7419	.43766	.8763	.32932	.8110	.39156	.5053	.50008	.6961	.46002	.8583	.34885
flat/dupl	.1490	.35619	.0659	.24813	.1198	.32477	.4113	.49218	.2243	.41720	.0956	.29411
other_bu	.1091	.31176	.0578	.23347	.0692	.25381	.0834	.27650	.0796	.27067	.0461	.20979
safe water	.4242	.49431	.3298	.47022	.5692	.49527	.3752	.48427	.3115	.46319	.3898	.48790
safe_toilet	.0600	.23749	.0183	.13406	.0083	.09089	.0766	.26595	.0339	.18089	.0478	.21339
landown	.6412	.47973	.7291	.44449	.5625	.49616	.7308	.44366	.7359	.44093	.8064	.39531
livestock	.4515	.49773	.4363	.49602	.3959	.48912	.5593	.49657	.4642	.49883	.5842	.49306

Source: Result of data analysis

Poverty Profile for 1996 and 2004

This study presents the poverty profile for three key variables. These are rural-urban location of the household, the geo-political zone, and the gender of the head of the household. In 1996, the national poverty incidence, depth and severity were 0.656, 0.358 and 0.207. But these had decreased, respectively, to 0.544, 0.225 and 0.122 in 2004, representing a reduction of 0.112 in incidence, 0.133 in depth and 0.085 in severity as seen in any of tables 3, 4 or 5.

In 1996, generally, a larger percentage of the rural households were poor than were their urban counterparts. About 70 percent of the rural households were poor as compared with 58 percent of the urban households. In 2004, 64 percent of the rural households were poor as compared with 43 percent of their urban counterparts. From Table 3, the same pattern holds true for the other poverty indices (depth and severity). In addition, there was a general reduction in the incidence, depth and severity from 1996 to 2004 for both rural and urban households. But the reductions in incidence, depth, and severity from 1996 to 2004 were more (even doubling in some cases) for the urban households than their rural counterparts. This shows that rural poverty is persisting more than urban poverty.

Furthermore, the poverty incidence, depth and severity among rural households are higher than the national poverty figures while those of the urban households were smaller as seen in Table 3.

Table 3: Poverty by location.

Location	1996			2004			Change between 1996 and 2004		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
Rural	0.698	0.359	0.207	0.638	0.268	0.146	-0.06	-0.091	-0.061
Urban	0.582	0.356	0.206	0.431	0.170	0.092	-0.151	-0.186	-0.114
National	0.656	0.358	0.207	0.544	0.225	0.122	-0.112	-0.133	-0.085

Source: Result of data analysis

As for the level of poverty and the geo-political zone of the rural households, poverty measures showed that the north was poorer than the south in both years. The North West was poorest, followed by the North East, North Central, South South, South East and South West. The South South zone is the poorest of the southern zones because of vegetation loss and the exploration of crude oil with its attendant spillage and flaring of gases. These conditions deny residents of their basic livelihood of farming and fishing. This is compounded by their unemployable status, as a result of inadequate education, in the oil industry and its servicing and allied companies.

Furthermore, all the zones witnessed reductions in all their measures of poverty (incidence, depth and severity) from 1996 to 2004 except the North West where poverty incidence increased from 0.727 in 1996 to 0.764 in 2004, representing an increment of 0.037. In addition, the reductions in the poverty incidence, depth and severity by the rural households in the southern zones are far more than those achieved by their northern counterparts (see table 4). Hence, poverty is more persistent in the northern zones than in the southern zones. In addition, the reductions in poverty in the north were lower than the national reduction in poverty while for the south the reductions were more than the national average reduction figures.

Table 4 : Poverty by geo-political zone

Geopolitical zone	1996			2004			Change between 1996 and 2004		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
North Central	0.643	0.305	0.181	0.628	0.289	0.172	-0.015	-0.016	-0.009
North East	0.685	0.348	0.213	0.673	0.284	0.151	-0.012	-0.064	-0.062
North West	0.727	0.422	0.284	0.764	0.327	0.177	0.037	-0.095	-0.107
South East	0.598	0.283	0.173	0.345	0.111	0.051	-0.253	-0.172	-0.122
South South	0.623	0.270	0.151	0.471	0.181	0.092	-0.152	-0.089	-0.059
South West	0.616	0.294	0.179	0.335	0.107	0.050	-0.281	-0.187	-0.059
National	0.656	0.358	0.207	0.544	0.225	0.122	-0.112	-0.133	-0.085

Source: Result of data analysis

Table 5 shows the relationship between the gender of rural household heads and poverty in Nigeria. Generally, a larger percentage of the rural households headed by males were poor than were their female-led counterparts with respect to incidence, depth and severity in both 1996 and 2004. According to Omonona (2009), this may be because in most parts of rural Nigeria, female-headed households are always involved in many other occupations besides farming, including trading. They also have a higher mean per capita expenditure than their male counterparts because they always have a smaller household size. They are always monogamous as compared with so many male-headed households that are polygamous, which is synonymous with large family size. Even when these female-headed households are divorced or widowed from a polygamous household, such new female heads have the responsibility of taking care of their own immediate family, which are normally small. Furthermore, there was a general reduction in poverty incidence, depth and severity from 1996 to 2004 for both male and female rural households. But the reductions in poverty incidence, depth, and severity between the two periods were far more (even quadrupling in some cases) for the female-headed households than their male-headed counterparts. In addition, incidence, depth and severity among rural households headed by males were higher than the national poverty figures while those of the female-headed households were smaller (see table 5).

Table 5: Poverty by sex of household head

Gender	1996			2004			Change between 1996 and 2004		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
Male	0.651	0.315	0.191	0.599	0.248	0.134	-0.052	-0.067	-0.057
Female	0.589	0.288	0.176	0.385	0.148	0.080	-0.204	-0.14	-0.096
National	0.656	0.358	0.207	0.544	0.225	0.122	-0.112	-0.133	-0.085

Source: Result of data analysis

Determinants of Rural Nigerian Household Welfare in 1996 and 2004

This study used the OLS regression model to estimate the determinants of welfare among rural Nigerian households. And because all the expected community variables could not be included in the model, I also a fixed effects regressions to capture these. In doing this, I first estimated the determinants of rural welfare among all the households. Thereafter, the rural households were divided along gender and geo-political zones. As a consequence, I was able to estimate the determinants of poverty among male-headed and female headed households on one hand and among rural households in the North Central, North Eastern, North Western, South Eastern, South South, and South Western zones in order to see the various gender and geo-political specific factors affecting the poverty of these rural households.

The study relied on fixed-effect regression models because they provided more robust and significant results than the OLS regression models. The fixed-effect models, made it possible to estimate regression models in which I was able to control for unobservables common to the local community. This was especially true for diversity in local infrastructure and environment in the enumeration areas across the geo-political zones in the country.

According to Behrman and Deolalikar (1993), fixed-effects models are preferable because they are thought to provide better estimates. Consequently, the discussions of poverty and welfare determinants refer to the fixed effects in the model for determinants of rural poverty, male-led household poverty and female-led poverty. For instance, in Table 6, showing the determinants of rural poverty, while the adjusted R^2 was 0.017 in 2004 for the OLS, it was 0.319 for the fixed effect. Similarly in 1996, the R^2 for the OLS was 0.136 while it was 0.491 for the fixed effect. These figures show that the contributions of the omitted community variables were great in both years. However, the study used the OLS model for the regression coefficients for the determinants of rural poverty across the geopolitical zones (see tables 9-14).

The F-statistics were greater than the tabulated F-values, meaning that the fixed effects models in 1996 and 2004 were significant ($p < 0.001$) and fit the data well. In addition, the coefficient of multiple determination (R^2) was 0.319 in 1996 as against 0.491 in 2004. Generally the diagnostics for the fixed effects models are superior to those of the OLS.

Table 6: Determinants of rural poverty in Nigeria

Variable	1996 OLS		1996 fixed effects		2004 OLS		2004 fixed effects	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
constant	1.568***	4.754	-	-	1.524***	18.470	-	-
gender	.095	1.389	.125*	1.849	.003	.089	.088***	2.767
age	.002	1.263	.004***	2.686	.003***	4.020	.015***	22.551
house hold size	-.055***	-6.490	-.057***	-6.691	-.124***	-31.124	-.129***	-32.700
prim_edu	.030	.564	.046	.858	.179***	3.668	.395***	8.148
sec_educ	.094	1.246	.110	1.458	.172***	6.190	.436***	17.517
ter_educ	-.128	-9.97	-.112	-.865	.652***	10.241	.903***	14.164
monogamous	-.160*	-1.721	-.059	-.661	.047	.993	.552***	13.395
polygamous	-.213**	-2.203	-.127	-1.362	.082	1.551	.593***	12.449
divo/sepa	-.070	-.670	.041	.401	-.012	-.221	.483***	10.259
farming_	-.182***	-3.179	-.187***	-3.335	-.164***	-5.906	-.043	-1.596
single room	.013	.042	1.301***	10.303	-.021	-.519	.317***	8.692
flat-dupl	.182	.596	1.494***	11.453	.025	.549	.453***	10.504
safe water	-.004	-.082	.015	.325	-.005	-.231	.031	1.402
safe_toilet	-.108	-.905	-.133	-1.118	.241***	4.272	.322***	5.636
North East	-.161**	-2.561	-	-	-.024	-.679	-	-
North_West	-.257***	-3.352	-	-	-.035	-.985	-	-
South_East	#	#	-	-	.512***	13.177	-	-
South_South	.090	1.364	-	-	.174***	4.661	-	-
South_West	-.045	-.751	-	-	.326***	7.138	-	-
Diagnostics	$R^2 = 0.017$ Adj. $R^2 = 0.014$ F = 6.865***		$R^2 = 0.319$ Adj. $R^2 = 0.317$ F = 240.445***		$R^2 = 0.136$ Adj. $R^2 = 0.135$ F = 119.880***		$R^2 = 0.491$ Adj. $R^2 = 0.490$ F = 997.354***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

denotes omitted variable due to multicollinearity with some other variable.

The gender and age of the household heads and household size were significant in both 1996 and 2004. A household headed by a male appeared to have 12.5 percent higher welfare than its female counterpart in 1996 while in 2004; a household headed by a male had 8.8 percent higher welfare than its counterpart. This result, though contrary to a priori expectation, depicts the feminization of poverty, in which women, due to limited access to

opportunities and resources, have a lower level of welfare than their male counterparts. As for the age of household heads, welfare increased by 0.4 and 1.5 percent for every unit increase in the age of household heads in 1996 and 2004 respectively. This may be connected to the fact that at the early stage of life, earnings rise before gradually declining in later years.

The size of the household had significant coefficients. For instance, a unit increase in household size brought about a 5.7 and a 12.4 percent reduction in the household welfare in 1996 and 2004 respectively. The finding aligns with theory because as the size of the household rises, it normally depresses the per capita expenditure which is a critical factor in the determination of welfare. As for the educational achievement of the heads of households, none of the coefficients were significant for the fixed effect model in 1996. But in 2004, households having heads with primary, secondary and tertiary education had 39.5, 43.6 and 90.3 percent higher welfare than those households headed by someone without formal education. The reason for this pattern is not farfetched. Education helps people make informed choices, and obtain good jobs, which leads to higher income. This, in turn, raises the level of per capita expenditure and consequently, welfare.

In 1996, the marital status variables were not significant. But in 2004, belonging to a household headed by someone who was monogamous, polygamous or in the divorced/separated/widowed category gave one 55.2, 59.3, and 48.3 percent higher welfare, respectively, than members of households headed by never-married people.

This finding runs contrary to theory because, usually, households headed by married people are likely larger than those headed by singles. And as mentioned earlier, large households depress per capita expenditure.

As expected for the occupational variable, the primary employment of the head of a rural Nigerian household in farming was associated with lower levels of welfare relative to those households whose heads had non-farming work as their primary employment. As seen in the table, households headed by farmers appeared to have 18.7 percent lower welfare than those headed by non-farmers in 1996. The variable was not significant in 2004.

As for the dwelling type, households living in single rooms or coming under the flats/whole building/duplex category had 130.1 and 149.4 percent higher welfare in 1996, respectively, than those in other forms of dwelling such as huts. These single room and flat/whole building/duplex households, however, fell to 31.7 and 45.3 percent respectively in 2004. In addition, households with safe toilets had 32.2 percent higher welfare than those without safe toilets in 2004 only.

In the fixed effect model, I lumped all the geographic and community variables together and the effect of these are shown by the higher level of the R^2 obtained than those in the OLS. This shows that residence in different geo-political zones had an impact on welfare. I attribute this to the difference in agro-ecological conditions as one moves from Nigeria's south to its north. In addition, households' access to rural infrastructure (paved roads, markets, electricity, hospitals, health centers and so on) also contributed to the level of rural households' welfare. The Chow Test of differences in the parameters of the coefficients obtained from the rural poverty determinants between 1996 and 2004 shows that there are significant differences (see table 2 in Appendix C). So, analyzing the datasets separately for 1996 and 2004 is plausible.

Gender Dimensions of Determinants of Rural Welfare in Nigeria

Having established that the gender of a rural household head was a significant factor in determining household welfare levels, I tried to see the effect on these households of the other independent variables in the model by sex of household head.

Determinants of Welfare for Male-headed Rural Households in Nigeria

As seen in Table 7, a unit increase in the age of the household head increased welfare by 0.5 percent in 1996 and by 1.3 percent in 2004. As explained earlier, the age of the household head is directly related to the level of income until the age peaks and from there, income levels fall. This is usually the case for men who are into energy-sapping occupations like farming. The ability to work large farms with crude implements declines with age. So as age increases, income shrinks, which automatically reduces per capita expenditure.

Household size is an important factor affecting household welfare. All its coefficients were significant in both years. For a unit increase in the size of the household, welfare was respectively reduced by 5.5 percent and 11.1 percent in 1996 and 2004. The education variables conform to the a priori expectations too. Households headed by people with primary education in 1996 seemed to have 1.5 percent higher welfare than those headed by people without formal education. On the other hand, in 2004, households whose heads had primary, secondary and tertiary education appeared to have 42.2, 46.2 and 87.3 percent higher welfare than those households whose heads did not have any formal education. Rural households' level of welfare seemed to rise with the level of formal education attained. The impact on welfare was biggest among those households whose heads had tertiary education and least among those with primary education.

The marital status of the heads of the households also mattered for the welfare of male-headed households. Households whose male heads were polygamous appeared to have 21.0 percent lower welfare in 1996 than those whose heads never married. The reverse was the case in 2004 when households headed by someone who was monogamous or polygamous seemed to have 60.4 and 61.6 percent higher welfare respectively than those headed by the never-married. Also, those households with heads in the divorced/ separated/ widowed category had 54.3 percent higher welfare than their counterparts with unmarried heads. The farming occupation variable of the head of the household was significant in both years. For instance, households whose heads were farmers had 21.9 percent lower welfare than their counterparts with heads who had other occupations. In 2004, people in households whose heads were farmers had 7.8 percent lower welfare than those whose heads had other occupations. This finding provides the insight that even among farmers the erroneous belief that more family members will provide more labor may no longer be tenable. These days, household members who would have contributed labor to a farming family are either in school or training as apprentices.

Table 7: Determinants of rural poverty among Male headed households in Nigeria

Variable	1996 OLS		1996 fixed effects		2004 OLS		2004 fixed effects	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
constant	1.884***	5.161	-	-	1.678***	23.279	-	-
age	.002	1.218	.005**	2.610	.002**	2.279	.013***	20.215
hh size	-.055***	-6.113	-.055***	-6.160	-.113***	-31.669	-.111***	-31.528
prim_edu	-.002	-.035	.015***	.270	.209***	4.518	.422***	9.153
sec_educ	.093	1.146	.115	1.421	.176***	6.921	.462***	20.572
ter_educ	-.145	-1.038	-.141	-1.011	.570***	9.805	.873***	14.967
monogamo	-.216**	-2.159	-.107	-1.116	.038	.876	.604***	16.262
polygamo	-.312***	-2.997	-.210**	-2.093	.057	1.165	.616***	14.195
divo/sepa	-.141	-1.246	-.013	-.119	-.023	-.484	.543***	12.757
farming	-.219***	-3.381	-.219***	-3.475	-.238***	-8.990	-.078***	-3.102
single room	-.018	-.053	1.485***	11.722	-.049	-1.334	.353***	10.683
flat/dupl	.149	.442	1.680***	12.546	-.007	-.169	.449***	11.212
safe water	-.006	-.113	.016	.327	.001	.056	.053***	2.600
safe_toilet	-.072	-.557	-.091	-.704	.204***	3.825	.281***	5.166
North_East	-.225***	-2.875	-	-	-.059*	-1.880	-	-
North_West	-.341***	-3.835	-	-	-.076**	-2.469	-	-
South_East	-.185**	-2.356	-	-	.410***	11.005	-	-
South_South	-.009	-.105	-	-	.134***	3.803	-	-
South_West	-.163**	-2.168	-	-	.306***	7.043	-	-
Diagnostics	R ² = 0.019 Adj.R ² = 0.016 F = 6.733***		R ² = 0.311 Adj.R ² = 0.310 F = 218.692***		R ² = 0.156 Adj.R ² = 0.155 F = 128.910***		R ² = 0.535 Adj.R ² = 0.535 F = 1110.244***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

The dwelling types were significant in both 1996 and 2004. In 1996, living in a single room and a flat/duplex/whole building, respectively, had 148.5 and 168.0 percent higher welfare than those living in other forms of housing such as huts. In 2004 however, these had fallen to 34.6 and 44.3 percent respectively. In other words, those households living in single rooms and flat/duplex/whole buildings respectively had 34.6 and 44.3 percent higher welfare than those occupying other types of houses. As regards access to safe water, those households with access had 5.3 percent higher welfare in 2004 than those that did not. In addition, households with safe toilets had 28.1 percent higher welfare in 2004 than those that did not.

As was the case with the determinants of poverty among the rural population, residence in different geopolitical zones and access to rural infrastructure and other community variables contributed to the determinants of welfare of male-headed rural households. Also, from Table 2 in Appendix C, the Chow Test of differences in the parameters of the coefficients obtained from the rural poverty determinants among male-headed households between 1996 and 2004 shows significant differences. So, analyzing the datasets separately, for 1996 and 2004, is plausible and they should not be pooled for good results.

Determinants of Welfare of Female-headed Rural Households in Nigeria

Among the female-headed households, a unit increase in age of the household head in 2004 brought about a 2.2 percent rise in welfare. In addition, the size of household is an important determinant of welfare. In 1996, a unit increase in household size led to a 6.0 percent decrease in welfare while in 2004, a unit rise in household size led to a 22.5 percent decline in welfare. In fact, these effects were higher than for male-headed households. Large households depress per capita expenditure and hence lower the members' welfare, especially when a large majority is not contributing to the family upkeep.

Education variables were not significant at all in 1996, but in 2004, households whose heads had completed primary school had 39.3 percent higher welfare than those in the default group. In addition, those households whose heads had secondary and tertiary education had 49.4 and 138.1 percent higher welfare, respectively, than those whose heads had no formal education. In 1996, households whose heads' marriages were polygamous had 52.2 percent higher welfare than those in the default. Those households whose heads fell into the divorced/separated/widowed category had 46.9 percent higher welfare than those in the default. In 2004 however, household heads whose marriages were monogamous had 43.0 percent higher welfare than those who were never married. Those whose marriages were polygamous had 60.9 percent higher welfare. This runs counter to the a priori expectation that married households were expected to have more members (though this may not always be the case) than unmarried ones, *ceteris paribus*.

Table 8: Determinants of rural poverty among female-headed households in Nigeria

Variable	1996 OLS		1996 fixed effects		2004 OLS		2004 fixed effects	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
constant	1.249	1.593	-	-	.621*	1.667	-	-
age	.0001	.105	.002	.383	.013***	3.289	.022***	7.392
hh size	-.065**	-2.075	-.060*	-1.933	-.235***	-9.842	-.225***	-9.700
prim_edu	.246	1.594	.234	1.525	.197	1.033	.393**	2.091
sec_educ	.096	.457	.165	.781	.283**	2.113	.494***	3.986
ter_educ	.070	.194	.088	.243	1.198***	3.927	1.381***	4.598
monogamo	.150	.591	.320	1.339	.093	.431	.430**	2.283
polygamo	.333	1.242	.522**	2.042	.201	.840	.609***	2.835
divo/sepa	.370	1.300	.469*	1.710	.045	.187	.301	1.405
farming_	-.081	-.587	.016	.124	.104	.946	.308***	3.017
single room	-.095	-.133	.964***	3.033	.199	1.092	.296*	1.821
flat/dupl	.001	.001	1.057***	3.185	.287	1.461	.542***	2.985
safe water	-.037	-.285	-.019	-.145	-.031	-.312	-.049	-.485
safe toilet	-.285	-.961	-.352	-1.187	.376*	1.744	.460**	2.125
North_East	.250	1.184	-	-	.183	.795	-	-
North_West	.240	1.319	-	-	.434	1.130	-	-
South_East	-.283	-1.304	-	-	.905***	5.624	-	-
South_South	.228	1.234	-	-	.452***	2.830	-	-
South_West	-.245	-.619	-	-	.536***	2.986	-	-
Diagnostics	R ² = 0.026 Adj.R ² = 0.006 F = 1.319		R ² = 0.378 Adj.R ² = 0.369 F = 41.879***		R ² = .091 Adj.R ² = 0.083 F = 10.825***		R ² = 0.401 Adj.R ² = 0.397 F = 100.215***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

Contrary to expectations, individuals belonging to female headed households whose heads were primarily engaged in farming in 2004 had 30.8 percent higher welfare than their non-farming counterparts. In addition, those households that lived in single rooms and duplex/whole building/flats had 96.4 and 105.7 percent higher welfare than those that lived in other forms of housing units in 1996. There was however, a reduction in 2004 to 29.6 and 54.2 percent respectively. Those households having access to safe toilets in 2004 had 46.0 percent increase in welfare than those that do not have access.

Residence in different geo-political zones by female-headed rural households and access to rural infrastructure and other community variables impacted the determinants of welfare. Also, from table 2 in appendix C, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among female-headed households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004 for female headed rural households is plausible and should not be pooled for good results.

Geo-political dimensions of determinants of rural poverty in Nigeria

In table 6, it was inferred that the geo-political residence of the rural households was an important factor in welfare determinants and hence, we tried to show the determinants of rural households' welfare in all the geo-political zones.

Determinants of welfare of North Central rural households in Nigeria

In the North Central zone of the country, rural households' welfare was influenced by most demographic factors. Households whose heads were males in 1996 and 2004 had 40.1 and 27.8 percent higher welfare than their female counterparts. Also, a unit rise in the size of the rural households in the North Central in 1996 and 2004 led to 4.1 and 11.4 percent fall in welfare respectively. Higher size of households depresses per capita expenditure and hence welfare. As for education of the heads of households, none of the variables were significant in 1996 but in 2004, belonging to a household headed by people with primary, secondary and tertiary education had 61.2, 15.8 and 51.1 percent respectively. As seen earlier, on a national scale, tertiary education seem to be most important followed by secondary and then primary education. But evidence from the North Central region seems to portray the fact that primary education of the head of households contributes most to welfare enhancing.

The marital status of household heads' variables were significant only in 1996 and not in 2004. Those households whose heads' marriages were monogamous and polygamous had 51.5 and 77.9 percent lower welfare than those never married. This was probably so as those households headed by married person were likely to have larger members than those households headed by someone who had never been married. Also, those households whose heads were into farming in 1996 only had 46.1 percent lower welfare than their non-farming counterparts. In the North Central, it was surprising to found out that in 2004, households living in single rooms and flats/whole building/duplex respectively had 17.4 and 20.2 percent lower welfare than those in other forms of housing units such as huts and makeshift houses. In addition, households having access to safe water in 1996 had 27.6 percent higher welfare than those accessing unsafe water. Again, it is surprising to see that households with safe toilets in 1996 had 72.2 percent lower welfare than those with unsafe toilets.

From table 2 in appendix c, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among North Central households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004, for North Central rural households is plausible and should not be pooled for good results.

Table 9: Determinants of rural welfare among North Central households in Nigeria

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	1.532	1.030	1.488***	7.583
gender	.401**	2.317	.278***	2.807
age	.001	.308	-.002	-1.103
hh size	-.041*	-1.734	-.114***	-10.867
prim_educ	-.141	-.945	.612***	4.292
sec_educ	.330	1.542	.158**	2.340
ter_educ	.043	.081	.511***	3.863
monogamo	-.515**	-2.246	.120	1.150
polygamo	-.779***	-3.307	.205	1.561
divo/sepa	-.204	-.825	-.030	-.262
farming_	-.461***	-3.117	-.032	-.466
single room	.216	.148	-.168*	-1.866
flat/dupl	.652	.446	-.198*	-1.792
safe water	.276**	2.116	-.014	-.239
safe toilet	-.722**	-2.050	.131	1.107
Diagnostics	R ² = 0.047 Adj.R ² = 0.036 F = 4.371***		R ² = 0.065 Adj.R ² = 0.060 F = 13.551***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

'a' signifies those variables that were perfectly correlated with the dependent variable in 1996

Determinants of welfare of North East rural households in Nigeria

In the North East, variations in welfare were explained for by all the various group of factors. Table 10 revealed that an increase in the size of the household by one person decreased welfare in 1996 and 2004 by 7.5 and 9.1 percent respectively. Also, households whose heads were headed by people having primary education had 24.2 and 18.3 percent higher welfare than those without formal education in 1996 and 2004 respectively. In addition, households whose heads had secondary and tertiary education in 2004 had 22.3 and 47.6 percent higher welfare than those without formal education. Farmers' headed households in 2004 had 34.6 percent lower welfare than those whose heads are not farmers. Households living in single rooms and those living in flat/duplex/whole building in 2004 had 23.4 and 25.6 percent higher welfare than those living in huts and make shift accommodation.

From table 2 in appendix c, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among North East households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004, for North East rural households is plausible and should not be pooled for good results

Table 10: Determinants of rural poverty among North Eastern households in Nigeria

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	1.429***	2.794	1.789***	16.180
gender	-.148	-.997	.010	.164
age	.003	.898	.001	.901
hh size	-.075***	-4.246	-.091***	-21.232
prim_edu	.242**	2.159	.183**	2.373
sec_educ	.098	.527	.223***	6.344
ter_educ	-.329	-1.632	.476***	5.254
monogamo	.193	1.270	.059	1.068
polygamo	.102	.621	.053	.861
divo/sepa	.161	.940	.007	.102
farming_	-.131	-1.071	-.346***	-8.376
single room	.059	.138	-.234***	-4.562
flat/dupl	.105	.243	-.256***	-3.569
safe water	-.153	-1.450	-.024	-.877
safe toilet	-.379	-1.353	-.021	-.224
Diagnostics	R ² = 0.031 Adj.R ² = 0.019 F = 2.689***		R ² = 0.212 Adj.R ² = 0.208 F = 52.213***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

Determinants of welfare of North West rural households in Nigeria

In the North West, individuals belonging to a male headed households in 2004 had 28.7 percent lower welfare than those belonging to female headed households. In 1996, as the age of the head of the household increases, the welfare of the households increases by 0.5 percent. The household size came out strong in 1996 and 2004 because a unit increase in the size of the household respectively led to 5.4 and 5.6 percent reduction in welfare. The coefficients of the education variables of the head of the household showed that those individuals whose heads possessed primary education, secondary and tertiary education in 2004 had 22.5, 30.5 and 79.1 percent increase in welfare respectively. This is in consonance with the national finding that as the educational attainment increases, welfare of households increases. And also, the impact on welfare increases as the formal educational attainment of the household heads increases.

Households whose heads were primarily engaged in farming in 1996 and 2004 had 20.2 and 21.1 percent lower welfare than those whose heads are not into farming. Farming is a difficult work in Nigeria as most tools are rudimentary, requiring a lot of human efforts, making only little area to be farmed. Safe water and toilets are good attributes that can promote well being. Households having access to safe water in 2004 had 7.3 percent higher welfare than those without access. In addition, households that had safe toilets in 2004 had 54.4 percent higher welfare than those that do not have access.

From table 2 in appendix c, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among North West households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004, for North West rural households is plausible and should not be pooled for good results.

Table 11: Determinants of rural poverty among North Western households in Nigeria

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	1.529**	2.535	1.513***	11.938
gender	-.114	-1.038	-.334***	-3.276
age	.005*	1.887	.001	1.066
hh size	-.054***	-3.955	-.056***	-15.460
prim_edu	.054	.623	.225***	3.221
sec_educ	.101	.866	.305***	8.984
ter_educ	-.156	-.649	.791***	7.063
monogamo	-.186	-.774	.009	.199
polygamo	-.159	-.651	-.020	-.405
divo/sepa	-.142	-.522	-.007	-.144
farming_	-.202**	-1.918	-.211***	-5.169
single room	.112	.215	.035	.866
flat/dupl	.216	.413	.007	.133
safe water	-.112	-1.525	.075***	3.585
safe toilet	.359	1.569	.517***	4.574
Diagnostics	R ² = 0.026 Adj.R ² = 0.018 F = 3.048***		R ² = 0.145 Adj.R ² = 0.141 F = 37.513***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

Determinants of welfare of South East rural households in Nigeria

Among the South Eastern rural households, a unit increase in the age of the head of household led to 1.9 percent increase in welfare. Also, an addition of one person to these households in 1996 and 2004 led to 6.3 and 20.4 percent decrease in welfare. As for the education of the head of the households, having a secondary certificate had 20.7 percent higher welfare than those households whose heads do not have any formal education. As found out before, those households whose primary occupation was farming in 2004 had 36.6 percent lower welfare than those whose head was primarily engaged in non-farming occupations. In addition, access to safe water in 1996 had 33.8 percent higher welfare than those households without access. Finally, those households that have safe toilets in 2004 had 33.7 percent higher welfare than those that do not have access to safe toilets.

From table 2 in appendix c, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among South East households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004, for South East rural households is plausible and should not be pooled for good results

Table 12: Determinants of rural poverty among South Eastern households in Nigeria

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	1.758	.868	1.533***	4.472
gender	.261	1.187	-.097	-.941
age	.002	.379	.019***	5.759
hh size	-.063***	-2.824	-.204***	-11.453
prim_edu	-.178	-1.072	.113	.794
sec_educ	.077	.450	.207*	1.944
ter_educ	.040	.148	.434	1.610
monogamo	.194	.601	.090	.416
polygamo	.061	.183	.279	1.203
divo/sepa	.195	.537	-.034	-.140
farming_	.052	.310	-.365***	-3.667
single room	-1.016	-5.08	.171	1.078
flat/dupl	-1.104	-5.51	.132	.814
safe water	.338***	2.875	.019	.221
safe toilet	.164	.720	.337**	2.069
Diagnostics	R ² = 0.016 Adj.R ² = 0.006 F = 1.541*		R ² = 0.087 Adj.R ² = 0.081 F = 15.880***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

'a' signifies those variables that were perfectly correlated with the dependent variable in 1996

Determinants of welfare of South South rural households in Nigeria

In South South Nigeria, households headed by males in 2004 had 13.3 percent higher welfare than their female counterparts. In addition, and contrary to expectation, a unit increase in the age of the household head in 2004 led to 0.4 percent reduction in welfare. What's more, an addition of one person to the South South rural households in 2004 led to a 17.8 percent reduction in welfare. Also, households having tertiary education in 2004 had 57.8 percent higher welfare than those that did not have formal education.

Furthermore, those households whose heads were monogamous had 47.4 percent lower welfare in 1996 than households headed by never-married people. Those households whose heads fell into the divorced/separated or widowed category had 68.9 percent lower welfare.

As for occupation, households headed by people primarily engaged in farming had 16.0 percent lower welfare than those households whose heads were otherwise engaged. Setting aside how access to safe water lessens poverty by reducing infection and promoting good health, the finding here was contrary to expectation because those households with access to safe water in 1996 had 25.6 percent lower welfare than those without such access. On the other hand, households with safe toilets in 2004 had 28.4 percent higher welfare than those without.

From Table 2 in Appendix C, the Chow Test of differences in the parameters of the coefficients obtained from the determinants of rural poverty among South South households between 1996 and 2004 shows that there are significant differences. So, analyzing the

datasets separately, for 1996 and 2004, for South South rural households is plausible and the datasets should not be pooled.

Table 13: Determinants of rural poverty among South South households in Nigeria

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	2.115***	2.654	2.492***	14.184
gender	.007	.042	.133**	2.306
age	.003	.566	-.004**	-2.305
hh size	-.020	-.746	-.178***	-19.246
prim_edu	.052	.335	-.058	-.678
sec_educ	-.209	-.941	.027	.465
ter_educ	-.387	-.790	.578***	4.789
monogamo	-.474*	-1.726	-.097	-.863
polygamo	-.248	-.814	-.214*	-1.712
Divo/sepa	-.689**	-2.174	-.011	-.090
farming_	-.134	-.876	-.160***	-3.250
single room	-.095	-.128	-.138	-1.634
flat/dupl	-.122	-.163	.080	.860
safe water	-.256*	-1.846	-.033	-.651
safe toilet	-.132	-.324	.273**	2.140
Diagnostics	R ² = 0.011 Adj.R ² = 0.001 F = 0.892		R ² = 0.172 Adj.R ² = 0.168 F = 34.959***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

Determinants of Welfare of South West Rural Households

The rural households' welfare situation in both 1996 and 2004 revealed that a unit increase in the number of people in a household decreased the level of welfare by 7.0 and 26.6 percent respectively. Those households whose heads had primary education in 1996 had 20.2 percent higher welfare than those without formal education. In addition, households whose heads had tertiary education in 2004 had 123.1 percent higher welfare than those without formal education.

Farming is also seen as an inhibitor of welfare. Those households whose heads were primarily engaged in farming in 1996 had 63.3 percent lower welfare than those whose heads were primarily otherwise engaged. With respect to housing, households living in single rooms and those living in flats/duplex/whole buildings had 31.8 and 58.7 percent higher welfare in 2004 than those households living in huts, boats, trailers, caravans, and so on. Also, those households living in houses with safe toilets had 32.4 percent higher welfare in 2004 than those living in houses without them.

From Table 2 in Appendix C, the Chow Test of differences in the parameters of the coefficients obtained from the rural poverty determinants among South West households between 1996 and 2004 shows that there are significant differences. So, analyzing the datasets separately, for 1996 and 2004, for South West rural households is plausible and datasets should not be pooled.

Table 14: Determinants of rural poverty among South Western households.

Variable	1996 OLS		2004 OLS	
	Coeff.	t-value	Coeff.	t-value
constant	1.607*	1.834	1.686***	5.037
gender	.313	1.046	.110	1.072
age	-.002	-.427	.004	1.405
hh size	-.070***	-3.313	-.266***	-13.758
prim_edu	.202*	1.650	.196	.923
sec_educ	-.278	-.918	.095	.970
ter_educ	-.136	-.259	1.231***	6.414
monogamo	-.152	-.777	.073	.349
polygamo	-.065	-.333	.007	.033
divo/sepa	.329	1.471	.161	.689
farming_	-.636***	-2.846	.034	.359
single room	.037	.048	.318*	1.707
flat dupl	.349	.448	.587***	2.651
safe water	-.104	-.943	.029	.340
safe toilet	-.623	-1.155	.324*	1.707
Diagnostics	R ² = 0.066 Adj.R ² = 0.048 F = 3.647***		R ² = 0.185 Adj.R ² = 0.175 F = 19.094***	

Source: Computer print-out of regression results

*, **, and *** signify statistical significance of the coefficient of the variable at 10, 5 and 1 percent respectively.

Difference in Regression Parameters (between 1996 and 2004)

Beyond testing for differences in the regression parameters between 1996 and 2004 (between year comparison as seen in appendix 4), I also tried to see if there were differences within each year in the regression parameters among the various sub-groups based on the gender of the household head and the geopolitical zone. The summary result of the Chow Test is shown in the table below.

Table 15: Results of Chow Test of Differences in Parameters by Gender and Geopolitical Zone

S/N	Pair	1996			2004		
		F-Cal	F-Tab	Decision	F-Cal	F-Tab	Decision
1	male-female	6680.913	2.039	Parameters differ	13507.27	2.039	Parameters differ
2	North Central-North East	2304.537	2.039	Parameters differ	5140.615	2.039	Parameters differ
3	North Central-North West	2660.448	2.039	Parameters differ	5545.375	2.039	Parameters differ
4	North Central-South East	2409.003	2.039	Parameters differ	4890.744	2.039	Parameters differ
5	North Central-South South	2222.401	2.039	Parameters differ	4850.397	2.039	Parameters differ
6	North Central-South West	1849.368	2.039	Parameters differ	3784.96	2.039	Parameters differ
7	North East-North West	2583.053	2.039	Parameters differ	5535.384	2.039	Parameters differ
8	North East-South East	2351.027	2.039	Parameters differ	4858.359	2.039	Parameters differ
9	North East-South South	2155.109	2.039	Parameters differ	4901.585	2.039	Parameters differ
10	North East-South West	1801.692	2.039	Parameters differ	3916.788	2.039	Parameters differ
11	North West-South East	2711.958	2.039	Parameters differ	5264.728	2.039	Parameters differ
12	North West-South South	2510.432	2.039	Parameters differ	5428.8	2.039	Parameters differ
13	North West-South West	2167.462	2.039	Parameters differ	4407.254	2.039	Parameters differ
14	South East-South South	2280.742	2.039	Parameters differ	4479.901	2.039	Parameters differ
15	South East-South West	1914.463	2.039	Parameters differ	3336.214	2.039	Parameters differ
16	South South-South West	1737.714	2.039	Parameters differ	3341.725	2.039	Parameters differ

Source: Results of data analysis

The table above showed that all this study's regressions were justified because there was no single case in which the estimated parameters did not differ. So the disaggregation of the data into male/female and also into various geopolitical zones was indeed justified. In the case of the male-female dichotomy, the disaggregation shows that male-headed households and female-headed households are different. Also no geopolitical zone is exactly like another, even when both zones were in the north or in the south. This is so because there are recognizable differences in the agro-ecology as one moves from south to north. This area spans the mangrove swamp in the south and the Sahel in the north.

Conclusion and Implications for Policy

This study sought to extend the understanding of rural poverty and welfare in Nigeria beyond the bi-variate analysis of the poverty profile to the structural determinants of welfare, not only among rural households in general but also by gender and geopolitical zone. In addition, the study showed the changes in poverty and its determinants between 1996 and 2004 in line with the above. These findings, imply the following conclusions

Education is a key factor in the reduction of rural poverty in general, whether the households are headed by men or women and regardless of the zone in which the household resides. Welfare levels increase as educational attainment increases, so that households whose heads attain tertiary education were least poor while those without any formal education were poorest. In line with this finding, existing educational efforts by government and non-governmental organizations should be geared toward every person of school age so that no one is left out. In addition, since a vast majority of the people are poor, government should intensify its effort to make the Universal Basic Education program compulsory, and require a minimum of nine years of uninterrupted education leading to the award of a junior school certificate. A better-educated person will make better life choices. One of the most important of these choices is how many children to have in one's lifetime.

Second, larger households were found to significantly decrease the level of welfare among the rural households in general and male- and female-headed households, and households in all the geopolitical zones. This is because an increase in the number of people living together on the same budget without commensurate contribution to the budget will always depress the per capita expenditure which brings down welfare. Efforts at further sensitizing the populace on the need to control birth and to remove all cultural beliefs that tend to lead to overpopulation should be encouraged through proper advocacy.

The fixed-effect model showed that the excluded community variables and geopolitical factors were important determinants of welfare. Also from the poverty profile, poverty in the southern zones was lower than those of the northern zones as a result of the differences in agroecology and a group of soil factors that have harmed the environment and soil fertility. And since the bulk of the residents of the rural north were basically agrarian, the poor soils and environment have lowered their welfare.

References

- Adeyokunnu, T.O. 1975. Rural poverty in Nigeria: A case study of Ife division. Paper presented at the Nigerian Economic Society's Annual Conference.
- Aigbokhan, Ben E. 2000. Poverty, growth and inequity in Nigeria: A case study. African Economic Research Consortium (AERC) Research Paper 102. Nairobi: African Economic Research Consortium.
- Alayande, B. and O. Alayande. 2004. A quantitative and qualitative assessment of vulnerability to poverty in Nigeria. Paper presented at the Centre for the Study of African Economics (CSAE) conference "Poverty Reduction, Growth and Human Development in Africa," March 21-22., Oxford, U.K.
- Anthonio, B.O. 1975. Sectoral analysis of rural poverty in Nigeria. Paper presented at the Nigerian Economic Society's Annual Conference.
- Anyanwu, J.C. 1997. Poverty in Nigeria: Concepts, measurements and determinants. Paper presented at the Nigerian Economic Society's Annual Conference.
- _____. 2005. Rural poverty in Nigeria: Profile, determinants and exit paths. *African Development Review* 17 (3): 435–460.
- Appleton, S. 1995. *The Rich are Just like Us, Only Richer— Poverty Functions or Consumption Functions?* Centre for the Study of African Economics Working Paper 95–4. Oxford, U.K.: Oxford University
- _____. 1996. Women-headed households and household welfare: An empirical deconstruction for Uganda. *World Development*, 24 (12): 1811–1827.
- _____. 1998. *Changes in poverty in Uganda, 1992–1996*. Centre for the Study of African Economics Working Paper . 98–15. Oxford, U.K.: Oxford University.
- Baulch, B., and N. McCulloch. 1998. *Being poor and becoming poor: Poverty status and poverty transitions in rural Pakistan*. Working Paper No. 79. Institute of Development Studies, University of Sussex, Brighton, U.K.
- Behrman, J. R. and A.B. Deolalikar. 1993. Unobserved household and community heterogeneity and Labor market impact of schooling: A case study of Indonesia. *Economic Development and Cultural Change*. vol. 41: 461–88.
- Bidani, B and M. Ravallion. 1993. A new regional poverty profile for Indonesia. *Bulletin of Indonesian Economic Studies*. 29 (3): 37–68.
- Birdsall, N. 1979. Siblings and schooling in urban Colombia. PhD dissertation. : Yale University, New Haven, Conn., U.S.A.
- Boateng, E.O, K. Ewusi, K. Kaubur, and A. McKay. 1991. *A Poverty Profile for Ghana, 1987–1988*. Social Dimensions of Adjustment in Sub-Saharan Africa Working Paper 5. Washington, D.C.: World Bank
- Canagarajah, S., J. Ngwafon, and S. Thomas. 1997. *The evolution of poverty and welfare in Nigeria, 1985–1992*. Policy Research Working Paper 1715. Washington, D.C.: World Bank.

- Coulombe, H. and A. McKay. 1996. Modeling determinants of poverty in Mauritania. *World Development*, 24 (6):1015–1031.
- Datt, G. 1994. *Poverty in India 1951– 59* . Washington, D.C.: World Bank.
- Datt, G. and D. Joliffe. 1999. *Determinants of poverty in Egypt*. Food Consumption and Nutrition Division Discussion Paper 75. Washington, D.C.: International Food Policy Research Institute.
- Datt, G. K. Simler, S. Mukherjee and G. Dava. 2000. *Determinants of poverty in Mozambique: 1996–97*. Food Consumption and Nutrition Division Discussion Paper 78. Washington, D.C.: International Food Policy Research Institute.
- Dercon, S. and P. Krishnan. 1988. *Changes in poverty in rural Ethiopia 1989–95: Measurement, robustness tests and decomposition*. Centre for the Study of African Economies Working Paper 98–7. Oxford, U.K.: Oxford University.
- Dike, N. 1997. Understanding the multidimensional nature of poverty. Paper presented at the Nigerian Economic Society's Annual Conference.
- Dreze, J. 1990. Famine prevention in India. In *The Political Economy of Hunger*, ed. J. Dreze and A. Sens. New York: Oxford University Press.
- Dreze, J. and A. Sen. 1989. *Hunger and public action*. Oxford: Clarendon Press
- Echeberi, R.N. 1997. The structure of income inequality and poverty in rural South Eastern, Nigeria. Paper presented at the Nigerian Economic Society's Annual Conference.
- Englana, D and A. Bamidele. 1997. Measurement issues in poverty. Selected Papers for the Nigerian Economic Society's Annual Conference.
- FOS. 1999a. Poverty profile for Nigeria, 1980-1996. Abuja Nigeria: Federal Office of Statistics.
- FOS. 1999b Poverty and agricultural sector in Nigeria. Abuja Nigeria: Federal Office of Statistics.
- Gaiha, R. 1988. On measuring the risk of poverty in rural India. In *Rural Poverty in South Asia*. eds. N. Srinivasan and P. Bardhan. New York: Columbia University Press.
- Glewwe, P and J. Van der Gaag, J. 1988. *Confronting poverty in developing countries: Definitions, information and policies*. Living Standards Measurement Study Working Paper. 48. Washington, D.C.: World Bank.
- _____. 1991. Investigating the determinants of household welfare in the Côte d'Ivoire. *Journal of Development Economics*, 35 (2): 307-37
- Glewwe P. and G. Hall. 1995. *Who is most vulnerable to macroeconomic shocks? Hypotheses tests using panel data from Peru*. Living Standards Measurement Study Working Paper. 117. Washington, D.C.: World Bank.
- Grootaert, C. and J. Braithwaite. 1998. Poverty correlates and indicator-based targeting In Eastern Europe and the former Soviet Union: Poverty reduction and economic management

network, and environmentally and socially sustainable development network. Washington, D.C.: World Bank.

Gujarati, D.N. 1988: *Basic econometrics* 3d ed. New York: McGraw-Hill.

House, W.J. 1989. Demography, employment and poverty at the household level in urban Juba, southern Sudan Population and Labor Policies Program, World Employment Program Working Paper 168. Geneva: International Labor Organization.

IFAD (International Fund for Agricultural Development) 1992. The state of world rural poverty: An enquiry into causes and consequences. New York: New York University Press.

Lanjouw, P and M. Ravallion. 1994. *Poverty and Household Size*. Policy Research Working Paper 1332. Washington, D.C.: World Bank.

Lipton, M., and M. Ravallion. 1995. Poverty and policy. In Handbook of development economics. ed. J. Behrman and E.N. Srinivasan. Washington, D.C.: World Bank.

Lloyd, C.B. and A.J. Brandon. 1991. Women's role in maintaining households: Poverty and gender inequality in Ghana. Washington, D.C.: International Center for Research on Women.

Lipton, M. 1983. *Labor and poverty*. World Bank Staff Working Paper. 616. Washington, D.C.: World Bank.

Maddala, G.S. 1983. *Limited-dependent and qualitative variables in econometrics*. Cambridge, U.K.: Cambridge University Press.

Mason, A.D. 1996.: Targeting the poor in rural Java. *International Development Studies Bulletin*. 27 (1): 69–82.

Meesook, O. 1979. *Income, consumption and poverty in Thailand*. Working Paper 364. Washington, D.C.: World Bank.

Musgrove, P. 1980. Household size and composition, employment, and poverty in urban Latin America. *Economic Development and Cultural Change*. 28 (2). 249-66

NBS. 2007. Nigeria poverty assessment (harmonised). Abuja: National Bureau of Statistics

Obadan, M.O. 1997. Analytical framework for poverty reduction: Issue of economic growth versus other strategies. Paper presented at the Nigerian Economic Society's Annual Conference.

Odusola, A.F. 1997. Poverty in Nigeria: An eclectic appraisal. Paper presented at the Nigerian Economic Society's Annual Conference.

Ogwumike, F.O. and Ekpeyong, D. 1996. *Impact of Structural Adjustment Policies on Poverty in Nigeria*, African Economic Research Consortium (AERC) Research Report Nairobi: African Economic Research Consortium.

_____. 1987. Poverty and basic needs: An approach to development in Nigeria. PhD Thesis, University of Ibadan, Ibadan. Nigeria.

Okojie, C.E.E. 2001. Gender and education as determinants of household poverty in Nigeria. Discussion Paper No. 2002/37. Paper presented at the World Institute for Development Economics (WIDER) Development Conference, May 25-26 Helsinki.

Okunmadewa, F.Y., S.A. Yusuf, and B.T. Omonona. 2005. Social capital and poverty reduction in Nigeria. Research Report Submitted to the African Economic Research Consortium (AERC), Nairobi for the Second Phase Collaborative Poverty Research Project.

Okunmadewa, F. 1999. Overview of the measurement of poverty and inequality Centre for Econometric and Allied Research. University of Ibadan, Ibadan Nigeria.

Olaniyan, O. 2000. The role of household endowments in determining poverty in Nigeria. <www.csaee.ox.ac.uk/conferences/2000-OiA/pdfpapers/olaniyan-95.PDF>.

Olaniyan, O., and S. Abiodun. 2005: Human capital, capabilities and poverty in rural Nigeria Research Report submitted to the African Economic Research Consortium (AERC), for the Second Phase Collaborative Poverty Research Project. Nairobi: African Economic Research Consortium.

Olayemi, J.K. 1998. Elements of applied econometrics 2nd ed. Ibadan: Department of Agricultural Economics, University of Ibadan

Omonona, B.T. 2001. Poverty and its correlates among rural farming households in Kogi State, Nigeria. Ph.D. Thesis, University of Ibadan, Ibadan. Nigeria.

_____. 2009. *Knowledge review on poverty and rural development in Nigeria*. Nigeria Strategy Support Program (NSSP) Background Paper. Washington, D.C.: International Food Policy Research Institute, forthcoming.

Onah F.E. 1996. Post-adjustment policies toward poverty alleviation in Nigeria. *The Nigerian Journal of Economic and Social Studies*. 38 (1, 2 and 3): 197–218.

Oni, O.A., and S. A. Yusuf. 2007. Determinants of expected poverty among rural households in Nigeria. Paper presented at the Centre for the Study of African Economics (CSAE) conference “Economic Development in Africa,” March 18-20, Oxford, U.K.

Oshuntogun, A. 1975. Poverty as an issue in rural development policy. A case study from Western State of Nigeria. Paper presented at the Nigerian Economic Society’s Annual Conference.

Oyekale, A.S., and T.O. Oyekale. 2008: An assessment of income shocks and expected poverty dynamics in Nigeria. Paper presented at the Ninth Annual Conference of the Global Development Network, January 28–February 2. Brisbane.

Ravallion, M. 1996. Issues in measuring and modeling poverty. *The Economic Journal* 106 (September): 1328–1343.

Reardon, T. and J.E. Taylor. 1996. Agroclimatic shock, income inequality, and poverty: Evidence from Burkina Faso. *World Development* 24(5) 901–914.

Rodriguez, A.G. and S.M. Smith. 1994. A comparison of determinants of urban, rural and farm poverty in Costa Rica. *World Development* 22 (3): 381-397

Schubert, K. 1994. Poverty in developing countries: Its definition, extent, and implications. *Economics* 49/50: 17–40.

Standing, F.I. 1985. Women’s employment and the household: Some findings from Calcutta. *Economic and Political Weekly* 20:(17): 23–38.

Tobin, T. 1958. Estimation of relationship for limited dependent variables *Econometrica* 26: 26–36.

Visaria, P. 1977. *Living standards, employment, and education in western India*. ESCAP/JBRD Project on Asian Income Distribution Data Working Paper 1, Washington, D.C.: World Bank.

_____. 1980. *Poverty and living standards in Asia: An overview of the main results and lessons of selected household surveys* Living Standard Measurement Study. Working Paper 2. Washington, D.C.: World Bank.

World Bank 1992. *Poverty Reduction Handbook*. Washington, D.C.: World Bank.

.World Bank. 1992. *Journal of African Economies* 1. (1992). Washington, D.C.: World Bank.

World Bank. 1996. *Nigeria—Poverty in the midst of plenty. The challenges of growth with inclusion*. Report 14733 UNI. Washington, D.C.: World Bank.

World Bank. 1990. *World Development Report*. New York: Oxford University Press.

World Bank. 1991. *Indonesia: Strategy for a sustained reduction in poverty*. Washington, D.C.: World Bank

Appendix 1:

Deflating Welfare Aggregates

Price variations across region and time required the computation of an index to normalize expenditures to a reference period and geographic point. The study used prices weighted by population share as a reference base in January of 2004, while a basket of food and nonfood representative of the poorest 40 percent of the population were chosen as the base month since it was the beginning of the year and well into the survey period.

In Nigeria, prices of goods and services differ among States of the Federation and between urban and rural areas. Prices also differ between socioeconomic groups. This can be explained by the fact that poor households often can only buy food in very small quantities and pay a higher price per item unlike the better-off households that buy in large quantities and enjoy lower prices per item. The comparison of expenditures across geographical zones and socioeconomic groups must take into account these differentials. In actual fact, the prices of food items are cheaper during the harvesting season than planting season.

Standard of Living Measure

Prices vary across regions and time due to inflation and seasonality of supply. In order to account for these price differentials, this study computed a Standard of Living measure to deflate the welfare aggregate and express the monetary measure of welfare to a reference point. In the case of this study, the reference month is January, 2004 and the prices used are a national average weighted by the population share attributable to that State. CPI data was the main source of price data. In some cases, when the CPI data was inconsistent or unavailable, the study relied on the price information from the market survey (Schedule 3 Questionnaire) conducted concurrently with the survey. I computed deflators by state and sector (urban and rural) for the twelve months of the survey for food and non-food. This study computed 128 indexes.

Appendix 2: Weighting Processes and Estimation

Derivation of Weights for the NLSS

The NLSS, like most household surveys, is based on the NISH frame. The NISH design is a two-stage design with EA's as first-stage units and households as second-stage units. Ten enumeration areas (EAs) were randomly selected each month and five households were systematically selected from the household listing of each of the selected EAs. Population level estimates came from multiplying the data for each household by two factors, one equal to the inverse of the probability of selecting that household from the total list of households in its EA, and one equal to the inverse of the probability of selecting that EA from the list of EAs in its state. The selections can be done by treating every unit as the same and using simple random selection. Or, if the data is available, researchers can select a more efficient sample using some variables known for every unit of the population thought to be correlated with the variables of interest for measurement. So the weighting factor is at the EA level in each State:

$$\sum(Nh / nh) \sum(Mhi / mhi) \sum Xhij Phij$$

where

Nh = the total number of EAs in state h.

nh = the number of sampled EAs in state h.

Mhi = the number of listed households in ith EA of state h.

mhi = the number of sampled households in ith EA of state h.

Xhij = the number of people in the jth household in ith EA of state h.

P_{hij} = the poverty score for the j th household in i th EA of state h .

Therefore, the above will apply to all the individual members in order to give the population. However, a weighting factor will be multiplied by average household size, when there is need to obtain household aggregates for the population.

Appendix 3: Summary of all the Regression Result

Variable	Rural		Males		females		NC		NE		NW		SE		SS		SW	
	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004
constant								+	+	+	+	+		+	+	+	+	+
gender	+	+						+	+				-				+	
age	+	+	+	+		+		-			+			+		+		
Hh size	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
prim_edu		+	+	+		+		+	+	+		+					+	
sec_educ		+		+		+		+		+		+		+				
ter_educ		+		+		+		+		+		+		+		+		+
monogamo		+		+		+		-							-			
polygamo		+		+	+	+		-								-		
divo/sepa		+		+	+	+									-			
farming_	-		-	-		+		-		-	-	-		-		-	-	-
single room	+	+	+	+	+	+		-		-								+
Flat/dupl	+	+	+	+	+	+		-		-								+
safe water				+				+					-	+		-		
safe_toilet		+		+		+		-					-	+		+		+

Source: Regression results.

NC, NE, NW, SE, SS AND SW denote North Central, North East, North West, South East, South South, and South West.

Appendix 4: Results of Chow test of differences in parameters between 1996 and 2004 datasets

S/N	Pair	1996		
		F-Cal	F-Tab	Decision
1	1996 and 2004 rural poverty	20455.92	2.039	Parameters differ
2	1996 and 2004 Male households poverty	17689.09	2.039	Parameters differ
3	1996 and 2004 female households poverty	2680.851	2.039	Parameters differ
4	1996 and 2006 North Central poverty	3824.838	2.039	Parameters differ
5	1996 and 2004 North East poverty	3697.935	2.039	Parameters differ
6	1996 and 2004 North West poverty	4459.957	2.039	Parameters differ
7	1996 and 2004 South East poverty	3491.716	2.039	Parameters differ
8	1996 and 2004 South South poverty	3308.44	2.039	Parameters differ
9	1996 and 2004 South West poverty	1867.295	2.039	Parameters differ

Source: Results of data analysis

