INCOME POLARISATION AND POVERTY AMONG RURAL HOUSEHOLDS IN NIGERIA

Oluwole Ibikunle Oyedokun OGUNYEMI

(B. Agric. Tech. Minna; M.Sc. Ibadan)

(Matriculation No: 83705)

A THESIS IN THE DEPARTMENT OF AGRICULTURAL ECONOMICS
SUBMITTED TO THE FACULTY OF AGRICULTURE AND FORESTRY IN
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY, UNIVERSITY OF IBADAN

JANUARY 2013

ABSTRACT

Poverty in Nigeria has been on the increase with consequence for Income Polarisation (IP). The IP which is the sum effect of alienation and identification between two groups at polar ends of the income distribution could worsen poverty. Studies on income distribution and poverty have mostly focused on income inequality to the total neglect of IP. Therefore, the extent and pattern of IP and its relationship with poverty among rural households in Nigeria were investigated.

Data covering households' socio-economic characteristics and consumption expenditure were obtained from secondary sources through the National Consumer Survey of 1980, 1985, 1992, 1996 and National Living Standards Survey of 2004 conducted by the National Bureau of Statistics. As a result of data collection and cleaning with elimination of households with some missing values considered important for the study, samples of 4,685, 4,044, 5,712, 11,358 and 22,152 households with relevant variables: household's consumption expenditure, occupation, gender, education, age, household size and marital status were used for the survey periods. Analysis was done for the six geopolitical zones of rural Nigeria. Data were analysed using Duclos-Esteban-Ray (DER) polarisation index, Foster–Greer–Thorbecke poverty index and Tobit regression at $p=0.05$.

Mean per capita household expenditure at 1980 prices was lowest (₦89.75 ± ₦60.31) in 1996 and highest (₦1,124.78 ± ₦1,072.00) in 2004. The IP decreased between 1980 (0.2389) and 1985 (0.2111), increased in 1992 (0.2371), then decreased in 1996 (0.2189) and 2004 (0.1874). The IP was highest in the southsouth in 1980 (0.2551), 1985 (0.1991) and 1996 (0.2147). In 1992, the southeast had the highest (0.2373) while the southwest was highest (0.1851) in 2004. The IP was lowest in the northcentral in 1980 (0.2019) and 1985 (0.1753). The southwest (0.2119) and northwest (0.1885) had the least values in 1992 and 1996 respectively. In 2004, the southsouth had the least IP of 0.1757. Among farming households, IP was highest (0.2169) in 1980 and lowest (0.1792) in 1985. Non-farming households had highest IP (0.2115) in 1980 and lowest IP (0.1806) in 2004. Male IP (0.2411) was higher than that of female (0.1792) in 1980. Also in 1996, IP was higher for male (0.1958) than female (0.1890). Except in 1992 when IP for educated households was higher (0.2140) than that of non-educated (0.2120), the other periods had non-

ii

educated being more polarised. Non-wage employed had higher IP over the periods with 0.1833 than wage employed 0.1799 in 2004. Polarisation increased with poverty level at ₦714.80 poverty line. A unit increase in age, household size and poverty significantly increased IP by 0.01%, 0.01% and 0.73% respectively. However, years of education and being married significantly decreased IP by 0.01% and 0.27% respectively.

Income polarisation reduced among households over the periods but higher in the southern geopolitical zones as well as among farming households. Income redistribution policy should be based on poverty reduction.

Keywords: Income polarisation, Poverty reduction, Rural households consumption expenditure
Word Count: 468

DEDICATION

This thesis is dedicated to God Almighty for the benefit of the human race.

ACKNOWLEDGEMENTS

CERTIFICATION

I certify that this work was carried out by Oluwole Ibikunle Oyedokun OGUNYEMI in the Department of Agricultural Economics, University of Ibadan.

_____

(Supervisor)

Dr. Omobowale A. Oni

B. Agric. (O.A.U.), M.Sc., Ph.D. (Ibadan)

Senior Lecturer

TABLE OF CONTENTS

CHAPTER ONE   INTRODUCTION

CHAPTER TWO   LITERATURE REVIEW

CHAPTER FIVE   SUMMARY, CONCLUSION AND POLICY
                    RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

CBN	Central Bank of Nigeria
CSDP	Community and Social Development Project
DAD	Distributive Analysis Software
DER	Duclos Esteban and Ray
DFRRI	Directorate of Food Road and Rural Infrastructures
FCT	Federal Capital Territory
FIG	Figure
FW	Foster Wolfson
GE	Generalised Entropy
GR	Green Revolution
H.H.	Household
LEEMP	Local Empowerment and Environmental Management Project
LU	Lasso de la Vega and Urrutia
MC	Middle Class
NAPEP	National Poverty Eradication Programme
NBS	National Bureau of Statistics
NC	North Central
NCS	National Consumption Survey
NE	North East
NLSS	Nigeria Living Standards Survey
NW	North West
OFN	Operation Feed the Nation
P^{FW}	Foster Wolfson Polarisation
P^{LU}	Lasso de la Vega and Urrutia Polarisation
P^{TW}	Tsui and Wang Polarisation
SAP	Structural Adjustment Programme
SE	South East
SS	South South
SW	South West
TW	Tsui and Wang

CHAPTER ONE
INTRODUCTION

1.1 Background to the study

Income distribution analysis is a phenomenon that has attracted the attention of researchers in recent times. The importance of income becomes more apparent as poverty is characterised by low income. About 52 and 61 per cent of Nigerians lived on less than US$1 per day in 2004 and 2010 respectively, implying 39 per cent living on above US$1 in 2010 (NBS, 2012). This is indicative of the uneven distribution of income in Nigeria; while some people are in the lower part, some are in the middle class and the remaining in the upper group. According to NBS (2007), the high rate of poverty and income inequality have threatened the Nigerian middle class with extinction, creating doubts about the relevance and impact of most macroeconomic reforms of the past. Polarisation exists if the distribution is at either side of the divide, lower or upper class, with the middle class shrinking or becoming extinct; and such income distribution is said to exhibit polarisation (Chakravarty and Majumder, 2001; Vander puye-Orgle, 2002; Rodriguez, 2006).

According to Chakravarty and Majumder (2001), income polarisation is the decline of the middle class, and there are two types. The first type, called polarisation or increased polarity, occurs if a distribution is more spread out from the middle position to the tails, thus increasing the distance between two groups below and above the median income level. This is a directional movement from the middle level income towards the two ends of the income distribution. The second type is increased bipolarity (bipolarisation) where incomes below or above the middle position become closer to each other. It is a situational gathering of individuals at the two ends of the income distribution and an extreme case of polarisation. Therefore, polarisation engenders clustering of the elements in the income distribution at polar nodes. This markedly shows that income polarisation is quite different from income inequality, another feature of income distribution, which means the overall dispersion of the distribution. But Rodriquez (2006) mentions that many empirical comparisons of inequality and polarisation measures suggest that they are closely related.

However, the achievement of equitable distribution of income, alleviation of poverty and eradication of extreme hunger will continue to be major development objectives. In the past, efforts at achieving these in Nigeria include Operation Feed the Nation (OFN), Green Revolution and Directorate of Food, Road and Rural Infrastructures (DFRRI). Other poverty-alleviation related programmes/policies include National Directorate of Employment, FADAMA, Community and Social Development Project (CSDP), Local Empowerment and Environmental Management Project (LEEMP), National Poverty Eradication Programme (NAPEP) and other economic reforms and reconstructions like deregulations and privatization of key sectors of the economy. Some of these programmes/policies positively impacted on the economy; some have negative impact on some socio-economic groups, while some, like Structural Adjustment Programme, reduced poverty in the rural areas (Aigbokhan, 2000). The study, therefore, further shows empirically the extent to which these programmes reduced income polarisation as well as poverty in rural Nigeria.

1.2 Statement of the problem

The implementation of economic policies may leave some people poor, make some poorer and others rich. According to Aigbokhan (2000), there might have been increased polarisation in income distribution, resulting in a wider gulf between the poor and the rich, shown by reducing middle class. The high rate of poverty and inequality that threaten the existence of the middle class creates distrust for the importance and effect of most policies (NBS, 2007). The disappearance of the middle income group, occasioned by movement of households in middle income to both the lower and upper tails of the distribution, would make such distribution to be inequitable and, in terms of welfare, some people will be worse off while some are better off. The potential of the crisis such inequality can pose to the system has rekindled researchers' interest to understand the causes of income polarisation both in developed and developing countries (Zhang and Kanbur, 1999; Aigbokhan, 2000; Gradin, 2000; Awoyemi *et al*., 2009).

Awoyemi *et al*. (2009) identify low level of education, poverty and unemployment as some of the possible causes of polarisation. Progressive income transfers which reduce inequality can also lead to polarisation (Chakravarty and Majumder, 2001). Other factors

that can be used to explain polarisation are individuals' socio-economic and demographic characteristics which include household size, employment status, gender, age and spatial population (Gradin, 2000). Others are policy shifts and economic structural changes (Gradin and Rossi, 2006). According to Ezcurra (2009), income polarisation is in opposition to regional economic growth and the effect becomes heightened with other variables like education. With the Nigerian population that is spread over a large area with different levels of socio-economic features of households and individuals, one would expect income polarisation to exist with the resultant violence.

Polarisation is related to the alienation that individuals and groups feel from one another, fuelled by ideas of within-group identity. Group identity and alienation are essential to polarisation and enhance social tensions and revolt. The high rate of poverty and the majority of the poor living in the rural area reduce the middle class in Nigeria. An income distribution that is polarised between households or between and within male- and female- headed households, for instance, gives a situation that could breed antagonism and conflict among these groups as a result of envy, feelings of deprivation and dis-satisfaction. Conflict could lead to disruption of peace and destruction of social infrastructure and other physical structures like houses. If the conflict starts in the rural area, some people may leave for semi-urban and urban areas, thereby aggravating rural-urban drift. There could also be spill-over effect of the conflict to the urban areas. This is a possibility as 70 per cent of the population lives in the rural areas (Akinyele, 2009). The economy would also be negatively affected as the rural sector was reported as highest contributor (41.84%) to Nigeria's GDP in 2009 (NBS, 2010). Examining polarisation within and between socio-economic groups would engender the possibility of determining which characteristics contribute more to income polarisation through comparisons.

There is evidence of polarisation in Nigeria. Aigbokhan (2000) reports national polarisation of 0.64, 0.65 and 0.53 for 1985, 1992 and 1996 respectively, while in 1996, there was polarisation of 0.51 in the rural sector. Also, polarisation of 0.24 in 2004 was reported by Awoyemi *et al*. (2009). This shows that there is a widening income gap between the two extreme income bands due to polarisation coupled with rising poverty level among the rural households. The rising social tension in the urban and semi-urban areas may be considered the spill-over effect of income polarisation in the rural areas.

These are the problems and issues on which there is a dearth of empirical evidence and little insight in the country. Therefore, it is necessary to examine income polarisation and bipolarisation in rural Nigeria and its relationship with poverty among rural households. Consequently, the following questions are germane to the study:

1. What is the pattern of income polarisation and bipolarisation among the Nigerian rural households?
2. What is the pattern of income polarisation and bipolarisation in the rural sector of Nigeria along socio-economic and geographical dimensions?
3. What is the linkage between poverty and bipolarisation?
4. What are the effects of socio-economic characteristics on income polarisation?

1.3 Research objectives

The main objective of the study is to examine the incidence and extent of income polarisation and its relationship with poverty among the rural households in Nigeria. The specific objectives are to:

1. analyse the extent and pattern of income polarisation and bipolarisation in the rural sector of Nigeria over the period 1980-2004,
2. analyse the pattern of income polarisation and bipolarisation along socio-economic and geographical dimensional groupings,
3. establish the linkage between poverty and bipolarisation, and
4. determine the effects of socio-economic characteristics on income polarisation.

1.4 Justification of the study

Polarisation is a phenomenon referring to the disappearing middle class (Wolfson, 1997; Aigbokhan, 2000; Chakravarty and Majumder, 2001; Vanderpuye-Orgle, 2002) and a more polarised income distribution is one that is more thinned out from the middle, allowing fewer individuals or families/households with middle level income (Gradin and Rossi, 2006). The concept has so far not been apparent in the income-welfare dialogue in Nigeria as many studies have been done on income distribution analysis with main focus on inequality. Some of such studies are Aigbokhan (2000), Alayande (2003), Awoyemi (2004), Awoyemi and Adeoti (2004), Olaniyan and Awoyemi (2005), Oyekale *et al.*

4

(2006) and Babatunde (2008). Aigbokhan (2000) notes that it is not sufficient to establish whether there was a rise or reduction in inequality during economic reforms but it is more important to determine if such change gave rise to polarisation. According to him, if there is polarisation, the consequent social tension may have implications for the sustainability of the reform.

This study, therefore, becomes appropriate from the foregoing due to the fact that economic reforms have been undertaken in Nigeria between 1980 and 2004. Many programmes targeted at improving rural income and welfare have been implemented as well during these periods. However, there is paucity of knowledge on income distribution analysis that focuses on polarisation in Nigeria because outcomes of empirical research on the problem of disappearing middle class with the Nigerian data are very lean. Apart from the pioneering works of Aigbokhan (2000) and the work of Awoyemi *et al.* (2009), there has not been enough literature aimed at addressing the issue. Aigbokhan (2000) establishes inequality and polarisation trends for both the rural and urban sectors in Nigeria, using three data sets of 1985, 1992/93 and 1996/97. The study analysed poverty level, using food energy intake variant of the consumption-based method. It used Gini-coefficient to determine inequality and Wolfson polarisation index for the trends and levels of polarisation. Poverty, inequality and polarisation estimates by gender and geo-political zones were generated for the three data sets. The study indicated that there was positive growth during the period with increased poverty, inequality and polarisation in income distribution.

On the other hand, Awoyemi *et al.* (2009) used different multiple indices to establish polarisation with two data sets of 1996 and 2004. The study used Duclos-Esteban-Ray Polarisation Index (2004) with identification parameter, $\alpha = 0.5$; Foster-Wolfson Bipolarisation Index (1992); Esteban-Gradin-Ray Polarisation Index (1999) and Zhang-Kanbur Index (2001) for dimensions of polarisation determination. Further, the study used decomposition approach of Duclos *et al.* (2004) to determine income polarisation among sub-groups on occupation, gender, education and geographical zone dimensions, and established the contribution of each dimension to total income polarisation**.**

The difference of this study from that of Aigbokhan (2000) and Awoyemi *et al*. (2009) is in the use of five data sets as against three of 1985, 1992, and 1996 in the former and two data points of 1996 and 2004 in the latter. Other critical areas of differences between this study and the earlier studies are in the use of Lasso de la Vega and Urrutia Bipolarisation Index (2006) and the exposition of the linkage between poverty level and bipolarisation. Though this study used polarisation index of Duclos, Esteban and Ray (2004) with identification parameter, α = 1.0 and Foster-Wolfson's bipolarisation index like in Awoyemi *et al*. (2009), years under consideration and methodology differ.

This study applies Duclos, Esteban and Ray Index (2004) to analyse income polarisation among the rural households in Nigeria, using household real consumption survey data of 1980, 1985, 1992, 1996 and 2004; the same data sets used for Nigeria poverty profile analysis by NBS (2005). Duclos, Esteban and Ray Index (2004) dealt with the problems of pre-grouping that characterized Esteban and Ray Index (1994) in measuring polarisation as it is not restricted to pre-grouping of data. Similarly, Foster-Wolfson (1992) and Lasso de la Vega and Urrutia (LU) (2006) measures of bipolarisation were adopted. Foster-Wolfson is an improvement on and a shift away from inequality measurement as it is derived from the Lorenz curve and the Gini-coefficient. Another reason for adopting DER and FW in the study is because Distributive Analysis Software (DAD) 4.5 (Duclos *et al*., 2008) is readily available to apply in the analysis.

Foster-Wolfson's (1992), Tsui and Wang's (1998) and Lasso de la Vega and Urrutia's (2006) indices were used to compute bipolarisation indices. Lasso de la Vega and Urrutia's bipolarisation index and Foster-Greer-Thorbecke's poverty index as demonstrated by Rodriguez (2006) were used to link polarisation with poverty among the rural households to contribute to the concept of polarisation in income distribution-poverty dialogue. It is on this basis that this research is justified as it contributes to the knowledge on income-distribution-poverty dialogue in Nigeria with focus on polarisation and poverty status of rural households in Nigeria.

The linkage of bipolarisation and poverty is desirable due to the fact that poverty level is high in Nigeria with poverty incidence of 54.5% in 2004, while it was 43.2% and 63.3% in urban and rural areas respectively (NBS, 2005). Also NBS (2012) reports that poverty measurement increased to 69% in 2010 and that it could rise to 71.5% in 2011. It

6

is, therefore, worth measuring income bipolarisation between the poor people and the rest of the society and to make policy makers aware of the possible social conflict which could be measured by the bipolarisation index due to poverty (Rodriguez, 2006). Therefore, LU bipolarisation index-linked poverty has been applied to establish if the rural income distribution poses a danger of social conflict in Nigeria.

This is the first time Lasso de la Vega and Urrutia (2006) bipolarisation index is being used on Nigerian data, based on available literature. The analysis of covariance approach by Tobit regression is also a novel approach in polarisation study in Nigeria. Since polarisation is a feature of income distribution and most of the polarisation indices like Foster-Wolfson capture inequality measurement, Gini coefficient and Generalised Entropy (GE) measurements of inequality were adopted in this study for comparing pattern of inequality with polarisation. Aigbokhan (2000) did not use GE and the Wolfon Index used is that proposed by Wolfson (1994). Consequently, this study adds to the lean literature on income distribution-poverty analysis that focuses on polarisation in Nigeria. Rodriguez (2006) submits that the similarities and differences between welfare, inequality and poverty measures are well known but little is known about the meaning of income polarisation in terms of welfare, poverty and inequality. Also in the words of Wang and Tsui (2000:362), "the literature on polarisation is still small, and much remains to be done". Thus, the study is relevant methodologically and by literature.

This study can also be justified based on the period (1980 -2004) chosen for the study. With the reforms during the periods, the study could serve as a basis for policy adjustment. The pattern of income distribution remains one source of input to policy formulation and implementation. This study, by exposing the extent of income polarisation, provides a basis for developing appropriate policy and the continuation of existing policies and programmes for improving the income level and its redistribution among rural Nigerians. With appropriate policy, there would be more equitable distribution of income and possible social conflict and tension could be checked.

The study also reveals the extent of the influence of poverty status on income polarisation and the nature of income polarisation among the rural households in terms of gender, other socio-economic variables and geographical dimensions. Some researchers have pointed out that women are rendered poorer than men during adjustment policies

(World Bank, 1996) while some suggested the reverse (Canagarajah *et al*., 1997). The outcome of this research will add to existing information not only in this area of gender dilemma but along other socio-economic and geographical variables. It will also establish the pattern of income polarisation among the socio-economic groupings. This study thus provides valuable information for more precise rural targeting of poverty assistance and income redistribution policy in rural Nigeria and also offers insights into rural income distribution in gender, employment, education and other socio-economic dimensions.

1.5 Plan of the study

The thesis is organized in five chapters. In Chapter Two, the theoretical/conceptual framework of the research is presented along with literature review on poverty and polarisation as well as the adopted definitions of terms used in the study. Chapter Three covers the methodology used in the study, enveloping the scope of study, polarisation indices that are applied and the linkage of polarisation, poverty and socio-economic features of households. Chapter Four focuses on the discussion of results presented in tables and graphs with their implications. In Chapter Five, the summary of major findings, conclusion and policy recommendations are provided.

CHAPTER TWO
LITERATURE REVIEW

2.1 Theoretical framework

2.1.1 Theories of income distribution

Income distribution theory started with the neoclassical economists. The term distribution theory refers to any theory that makes clear how the national income is shared among a country's citizens. Three theories have so far been put forward (Lipsey and Chrystal, 2005): the neoclassical theory of distribution comprising factor price theory of distribution and market theory of resource allocation; the theory of functional distribution of income, and the size distribution of income theory.

2.1.1.1 Functional income distribution theory

The theory of functional distribution of income was developed by the classical economists including Adams Smith and David Richardo. The theory deals with the distribution of income between the owners of the three production factors: land, labour and capital (Lipsey and Chrystal, 2005; Giovannomi, 2010). The theory borders on how the distribution of income would be affected by rising population, the accumulation of capital and advancing technological knowledge; how the three groups benefit from the societal progress, and how the landowners and capitalists receive a larger share of the national income while workers get a shrinking share.

2.1.1.2 Neoclassical theory of income distribution

According to Lipsey and Chrystal (2005), any theory that explains distribution on the basis of market forces is a factor price theory of distribution and a market theory of resource allocation. These theories use marginal products of inputs to explain their demands and they are, therefore, called marginal productivity theories, developed by neoclassical economists about a century ago (Lipsey and Chrystal, 2005; Eileen, 2012).

2.1.1.3 Size distribution of income theory

Though modern economists have addressed the issues of functional distribution of income, they have been more concerned about the theory that explains income distribution

9

as the distribution of income between different households and individuals without reference to the source of their incomes or each individual's social class (Lipsey and Chrystal, 2005). Functional distribution of income refers to the share of total national income going to owners of different resources, focuses on the source of income and differentiates income from employment and income from property. The size distribution of income refers to the proportion of total income received by various groups and so focuses on inequality of income between various income earners, irrespective of the source from which that income is derived (Lipsey and Chrystal, 2005; McConell and Brue, 2005; Eileen, 2012). For instance, if someone is poor, it matters little whether that person is a landowner or a worker. Also, a capitalist such as a small retail store owner is in lower part of the income scale while a wage-earner like a professional footballer is in the upper end.

Apart from inequality, other features that have been used to characterise income distribution in the direction of size distribution are poverty and polarisation (Aighokhan, 2000; Gradin, 2000; Wang and Tsui, 2000; Chakravarty and Majumder, 2001; McConell and Brue, 2005; Gradin and Rossi, 2006 and Rodriguez, 2006). In analysing these features of income distribution, consumption expenditure data are often used (Zhang and Kanbur, 1999; Chakravarty and Majumder, 2001; Duclos *et al*., 2004 and Chakravarty, Majumder and Roy, 2007). The size distribution of income theory has the advantage of showing relative position of all on income distribution scale, being used where it is difficult to get reliable measure of individual's income and providing avenue for promoting the middle class. This study, therefore, adopts polarisation as a characteristic of income distribution and used consumption expenditure for the analysis of the phenomenon in Nigeria.

2.1.2.1 Theory and measures of income polarisation

Polarisation is a phenomenon in income distribution analysis, referring to a shrinking middle class, such that the distribution features a gathering of the members of a society at polar ends and it is different from inequality which refers to the distance of every individual from the median or mean income (Zhang and Kanbur, 1999; Aigbokhan, 2000; Chakravarty and Majumder, 2001; Vanderpuye-Orgle, 2002). This view is supported by Hornby (2000) in the *Oxford Advanced Learners Dictionary* which describes

10

polarisation as separating or making people separate into two groups with complete opposite opinions, and inequality as a situation where income is not the same for everyone. For polarisation, the opposite opinions will be in terms of income characteristics such that one group is of a higher income and the other group is of a lower income; and within each group the incomes of members are very similar but dissimilar between the two groups (Wolfson, 1997 and Vanderpuye-Orgle, 2002).

The measures of income polarisation started in the early nineties with some indices measuring increasing spread (polarisation): Esteban and Ray (1994), and others measuring increasing bipolarity (bipolarisation): Foster and Wolfson (1992), Wolfson (1994, 1997) up to the indices developed by Esteban, Gradin and Ray (1999), Zhang and Kanbur (1999), Wang and Tsui (2000), Chakravarty and Majumder (2001) and, Duclos *et al*. (2004). Esteban *et al*. (1999) can be applied to data for which the density function has been defined parametrically or non-parametrically, and it is an extension of the Esteban and Ray (1994) in measuring income polarisation.

The assumption and division of the elements or individuals in the income distribution into a finite number of groups weakens Esteban and Ray index (Awoyemi *et al*., 2006) which the authors themselves admitted (Schmidt, 2009) because income is a continuous variable. Using Esteban and Ray index implies an extent of arbitrariness in the choice of the number of income groups, continuous changes in polarisation are not captured in some cases due to the pre-grouping and this creates both conceptual and practical problems (Duclos *et al*., 2004).

Though Esteban and Ray index is restricted to pre-grouped data with emphasis on identification and alienation forces, both acting together to give effective antagonism, such pre-grouping may not translate directly to group income identification and alienation, that is intra-group homogeneity and inter-group heterogeneity in terms of income. Also, Wolfson (1994) index is a special case of measuring income bipolarisation (Esteban, Gradin and Ray, 1999). However, both Wolfson (1994) and Esteban and Ray (1994) indices do not agree with the basic Pigou-Dalton axiom of transfers in their approaches to polarisation but embrace pre-grouping of the income distribution data.

Zhang and Kanbur (1999), Aigbokhan (2000), Gradin (2000), Chakravarty and Manjumder (2001), Vanderpuye-Orgle (2002), Gradin and Rossi (2006), and Awoyemi *et*

11

al. (2009) are empirical studies of income polarisation in different countries. In Nigeria, Aigbokhan (2000) derived polarisation estimates for Nigeria from 1985 to 1996, using food energy intake option of consumption approach of poverty measurement. In the study, poverty was related to growth and inequality, using real per capita expenditure of the populace and analysed for the urban and rural sectors.

Aighokhan (2000) used Wolfson polarisation index and provided estimates for the country's urban and rural areas under national, male-headed, female-headed, north-east, north-west, middle belt, south-east, south-west and south-south dimensions. The Wolfson index was derived from estimated value of the Gini index. It was found out that there was a higher degree of polarisation in the rural areas in the 1990s and while polarisation increased in the country between 1985 and 1992, it declined in the rural area, which is in contrast with the general belief of increased polarisation. For the rural sector, polarisation index was 0.72 in 1985, 0.65 in 1992 and 0.51 in 1996. For male-headed household, it was 0.66, 0.62 and 0.50; while for female-headed households, it was 0.43, 0.33 and 0.24 for the stated years respectively. This means that polarisation is higher among male-headed households than in female-headed ones.

Awoyemi *et al*. (2009) used consumption expenditure of the 1996 and 2004 household consumption data in Nigeria to examine the effect of zonal differences on the distribution of per capita expenditure in terms of polarisation and inequality. With Gini inequality, Foster-Wolfson bipolarisation and Duclos-Esteban-Ray (2004) polarisation indices, there was a decline in the level of inequality and polarisation in Nigeria. The alienation parameter, α, of the polarisation index used was 0.5. The study reports that an increasing level of identification implies polarisation scaling up and the dimensions of polarisation include geopolitical zone, education, and gender. Polarisation was 0.29 and 0.24 while bipolarisation was 0.49 and 0.37 in 1996 and 2004 respectively in the rural sector.

In a similar vein, Vanderpuye-Orgle (2002) studies inequality and polarisation in Ghana between 1987 and 1999; the period of economic reform. Polarisation estimates were generated for seven dimensions using Kanbur-Zhang index. The dimensions are Administrative regions, Ecological zones, Locality 7, Locality 5, Locality 3, North and

Rural. For the entire country, polarisation was 0.13, 0.16, 0.10 and 0.13 in 1987, 1988, 1992 and 1999 respectively.

In Spain, Gradin (2000) studies polarisation by sub-populations between 1973 and 1991. The sub-populations were based on socio-political and economic characteristics which included town size, urban-rural, autonomous region, household composition, province, gender, gender/age, migration, relationship with economic activity and socio-economic condition. According to the study, during the 1980s, polarisation reduced for education and occupational variables; it was stable in the case of town size and gender/sex but increased for autonomous regions and provinces together with household composition and size, gender and migration condition. The study empirically shows that educational level appears to be the element which generates the highest polarised expenditure distribution. Under education, he obtained 0.89, 0.89, and 0.87 for group polarisation, 0.08, 0.07 and 0.05 for polarisation between groups for 1973, 1980, and 1990 respectively. Using Esteban, Gradin and Ray polarisation index for two groups with an optimal partition, overall polarisation in Spain varies from 0.12 to 0.16. Their confidence intervals are established at 95 per cent using bootstraps estimation techniques. He assumed α (group identification) = β (degree of sensitivity towards group cohesion) = 1 with 2 and 3 groups. Esteban, Gradin and Ray polarisation index was used for two groups while Esteban and Ray index was used for three groups. The polarisation estimates were statistically significant at 95 per cent. Gradin (2000) states that if β = 0, Esteban, Gradin and Ray index becomes Esteban and Ray that was applied to the groups distribution.

Gradin and Rossi (2006) in the study of income distribution and income sources in Uruguay between 1989 and 1997 used the extension of the index proposed by Esteban and Ray (1994) as applied by Esteban, Gradin and Ray (1999) for operational purposes because that of Esteban and Ray (1994) was difficult to apply on personal income distributions. Gradin and Rossi (2006) estimated for extended polarisation, bi-polarisation and tri-polarisation. Their results show that there was increased polarisation for two and three income classes but in different ways. Under three groups, and in 1997, wage earners were 20 per cent more polarised in labour incomes than in 1989; the index moved from 0.11 to 0.13. This was attributed to a big increase in the distance between extreme groups. The increase in polarisation in pensions was more limited at 13 per cent from 0.12 to 0.14

and had nothing to do with increasing distance between groups. The study posited that polarisation increased because of extreme groups based on pensions being internally more homogeneous (within-group dispersion went from 0.058 to 0.55) and because of the increasing size of endogenous extreme groups (there was a 32.7 per cent of population in the middle group in 1997 versus 35.6 per cent in 1989).

Labour income was stated to show substantial increase in inequality, Gini rose from 0.38 to 0.44 against stability in the case of pensions which was around 0.43. The effect of distributional changes on the distribution of total income is unchanged, as low increase in Gini coefficient was found (0.46 to 0.47) with no relevant change in polarisation (from 0.152 to 0.150). Household equivalent income that is relevant for welfare slightly increased (5 - 6%) in both polarisation (from 0.12 to 0.13) and inequality (from 0.39 to 0.41). Elements such as correlation between income sources in a household, the number of earners or the household composition might explain the increasing inequality and polarisation. For all the estimates, their confidence intervals were not determined.

Chakravarty and Majumder (2001) show that all indices of inequality can be used to get alternative indices of polarisation. Wolfson polarisation index was interpreted in terms of welfare which has Gini component; and it was mentioned that any polarisation measure should satisfy six principles or postulates of increased spread, increased bipolarity, symmetry, principle of population, normalisation and continuity. Polarisation index should be a continuous function. Increased spread is a monotonicity principle; since a movement from the median indicates an increase in the spread of the income distribution, polarisation should increase if there are rank-preserving reductions (increments) in incomes below (above) the median income. For increased bipolarity, a rank-preserving equalizing transfer between two individuals on the same side of the median increases polarisation. In this type of transfer, inequality should reduce very clearly. So, establishing that polarisation and inequality are two different concepts.

Symmetry means that a re-ordering of incomes does not change the level of polarisation. Therefore, any characteristics apart from income, like individuals' names, are irrelevant to the measurement of polarisation. Chakravarty and Majumder (2001) explain

14

that symmetry has the implication of a polarisation index being directly defined on ordered income distribution. The principle of population states that if an income distribution is pooled several times, then the degrees of polarisation of the pooled and the original distributions are the same, which may make polarisation to be tagged an average concept. The principle of population helps for cross-population comparisons of polarisation, the median income remaining unchanged under replications of the population. Normalisation attaches zero polarisation to a perfectly equal income distribution while continuity means that polarisation will not take an abrupt jump for small changes in its arguments, meaning that a continuous polarisation index will not be oversensitive to minor observational errors in incomes.

Using household expenditure data of rural and urban India, Chakravarty and Majumder (2001) obtained polarisation estimates under six states for each sector along with their respective welfare estimates; all for 1987-88 and 1993-94 accounting periods. The welfare estimates obtained, using Atkinson measure varied from 0.02 to 0.20, while the polarisation estimates by Wolfson index ranged from 0.01 to 0.16 in rural India. It was concluded that every homothetic social welfare function had a dimension of polarisation index and for each social welfare function the associated index could be made to satisfy all the major properties of a polarisation measure.

Zhang and Kanbur (1999) studied the patterns and trends of regional inequality and polarisation in China from 1983 to 1995, using per capita real consumption expenditures from the countries' statistics year book. The study used two inequality indices (Gini coefficient and the Generalised Entropy) and three polarisation indices Esteban-Ray (1994) index, Tsui-Wang (1998) index and Wolfson (1994) index for comparison, using the provincial level data in China in the reform period. Tsui-Wang index is based on Wolfson (1994) index as is derived from the Lorenz curve and the tangent line at the median point. Esteban and Ray (1994) index reduces to Gini coefficient if the degree of polarisation sensitivity, identification, is zero. The population of China is close to that of Nigeria in terms of composition: more than 65 per cent of China's total population is rural (Zhang and Kanbur, 1999) while that of Nigeria is about 70 per cent (NBS, 2006). Esteban and Ray (1994) index gives estimates ranging from 0.14 in 1983, 0.15 in 1989 and 0.19 in 1995, showing an increase in polarisation during the thirteen-year

period. The same trend was shown by Wolfson index and Tsui-Wang index. The former gave 0.11, 0.10, and 0.12 while the latter provided 0.36, 0.37 and 0.41 for 1983, 1989 and 1995 respectively.

However using an alternative polarisation measure called Scalar Polarisation Index otherwise known as Zhang and Kanbur Polarisation Index, which is the ratio of inter-group or between inequality to within-group inequality, the estimates obtained varied from 0.17 to 0.51 for the study period under coastal and inland areas while the estimates varied from 2.41 to 3.56 under rural and urban areas. These results show an exception, perhaps for absolute income distribution, to the general notion that polarisation index varies from 0 to 1.

Chakravarty, Majunder and Roy (2007) analyse polarisation, using monthly per capita expenditure data in rural and urban India under six states for the period 1993-94. In the study, total expenditure was used in the absence of income data. Like Chakravarty and Majunder (2001), the study demonstrates that an index of polarisation must fulfil six principles: non-decreasing spread, non-decreasing bipolarity, symmetry, principle of population, normalisation and continuity. Chakravarty, Majunder and Roy (2007) further state that two characteristics are considered to be peculiar to the idea of polarisation: non-decreasing spread and non-decreasing bipolarity. Non-decreasing spread means that as the distribution becomes more spread out from the middle position, polarisation does not reduce. In other words, a movement of incomes from the middle position to the tail of income distribution makes the distribution at least as polarised as before. Non-decreasing bipolarity requires that a clustering of incomes below or above the median leads to a distribution at least as prolonged as before. That is, a reduction of gaps between any two incomes above or below the median does not reduce polarisation. Chakravanty, Majunder and Roy (2007) conclude that polarisation involves both an inequality-like constituent, the non-decreasing spread criterion which does not decrease either inequality or polarisation, and an equality-like constituent, the clustering or bunching principle which neither lowers polarisation nor augments any inequality measure that fulfils the Pigou- Dalton transfers principle, a requirement under which inequality is non-decreasing for a transfer of income from the rich to the poor.

Since different polarisation indices could generate different levels of polarisation, Chakravarty, Majumder and Roy (2007) establish that it is reasonable to identify the class of indices that will give a similar ordering of different income distributions. So the study adopts absolute polarisation indices that do not alter under equal absolute changes in all incomes by scaling up the Foster-Wolfson polarisation curve by the median to generate the absolute polarisation curve. The study uses household expenditure survey data for rural and urban, suggests the use of Kolm (1976)–Blackkorby and Donaldson (1980) ethical absolute inequality index and states that to each social welfare function that satisfies certain regularity conditions, there corresponds an absolute inequality index and hence an absolute index of polarisation.

Wang and Tsui (2000) also studied polarisation measures that are applicable to empirical studies and demonstrates that polarisation is a different concept from inequality. If elements in the distribution move away from the middle income to the tails, a condition of increased spread, there is increased polarisation (and increased inequality). Whereas if elements above or below the middle income move closer to each other, there is increased bipolarity, the extreme case of polarisation; while inequality reduced. They conclude that all polarisation indices are continuous functions and must satisfy these two movements and the normalisation axiom, which are a subset of the principles demonstrated by Chakravarty, Majumder and Roy (2007) and in agreement with Zhang and Kanbur (1999). The indices, shown theoretically like Foster-Wolfson index, have in-built Gini-coefficient.

Finally, Wolfson (1997) posits that any measure of disappearance of the middle class which has used inequality indicators such as quintile shares is unable to detect the polarisation it claims to be measuring. Conceptual differences between Lorenz inequality and polarisation in terms of increased polarisation and increased bipolarity are presented while differing populations of interest and sampling variability in income distribution analysis as well as the problems of concept clarity and construct validity are noted. Two sets of time series data were used; one on labour income for full-time male workers and the other on labour income for all individuals with annual labour income of at least 5 per cent of the average wage. The polarisation estimates vary between 0 and 1 with standard errors.

2.1.2.2 Polarisation in normalised density distribution

Duclos *et al*. (2004) developed measurement theory of polarisation, using normalise density functions to describe the income distribution of income, consumption or wealth. The study states that polarisation is related to the alienation that individuals and groups feel from one another which is fuelled by ideas of within-group identity. Group identity and alienation are fundamental to polarisation and enhance social tensions: strikes, demonstrations, processions, violence and revolt. Alienation boosts polarisation while identification makes polarisation to rise. Polarisation anchors on the interaction of these two forces and it is the product of average alienation, average identification, and the mean-normalised covariance between alienation and identification.

Duclos *et al*. (2004) propose and prove four axioms on polarisation phenomenon, stating that if a distribution is composed of a single basic density, then a squeeze of that density cannot increase polarisation; if a symmetric distribution is composed of three basic densities with the same root and mutually disjoint supports, then a symmetric squeeze of the side densities cannot reduce polarisation. But with four basic densities, if the two middle densities are slided to the extreme sides of each other, polarisation increases. Finally, if one situation shows higher polarisation than the other, it must continue to do so when populations in both situations are scaled up or down by the same amount, leaving all (relative) distributions unchanged. Introducing skewness and multimodality to the income distribution with the assumption of normality, Duclos *et al*. (2004) report that the existence of several nodes may bring average alienation down and a highly skewed distribution with a single node may still exhibit greater polarisation relative to other bimodal distributions.

Using Luxembourg Income Survey (LIS) data sets on twenty one countries for each of Wave 3 (1989-1992) and Wave (1994-1997), Duclos *et al*. (2004) analysed household disposable income (post-tax-and-transfer income) normalised by a defined adult-equivalence scale denoted as $S^{.5}$, where S is household size. Observations with negative incomes and those that exceeded 50 times the average income were removed. Normalisation of the incomes was done by multiplying with their mean. Five per cent significant level was used and it was established that 90% of the possible cross-country comparisons were statistically significant regardless of the level of identification (α). The

results show that Czech Republic has the lowest Gini index of all countries but ranks 11th in terms of polarisation, while Canada, Australia and the United States exhibit high Gini inequality but relatively low polarisation. The study establishes that polarisation and inequality have high correlation coefficient, the lowest value across the countries is 0.6753, showing that polarisation and inequality correlated but are empirically different in the data set that was used. The extent to which the two will be closer depends on the level of identification which is denoted by parameter α. This is a guide for the present study in the comparison of polarisation and inequality estimates.

2.1.2.3 Extended measure of polarisation

Esteban, Gradin and Ray (1999) develop extensions of Esteban-Ray and Wolfson indices. Polarisation is viewed as an increasing function of identification and alienation. Distribution is assumed to be pre-grouped into income classes in a way that individuals within each of the classes identify with their class members and feel alienated from members of other classes, but available data is generally statistically grouped in a way that has little to do with such notions. The interplay of identification and alienation forces gives rise to antagonisms; polarisation is the sum of all effective antagonisms. It is the presence of identification that makes a measure of polarisation fundamentally different from one of inequality. If there is no identification (α = 0), Esteban-Ray polarisation index equals Gini inequality. The Esteban-Ray polarisation index extension is based on grouping of the distribution on the basis of degree of identification and the extension is a derivative of Gini coefficient. Esteban and Ray index has the short-comings of not satisfying and fulfilling all the six axioms of a polarisation index (Rodringuez, 2006).

Answering the questions of how close the distribution is on the formation of two large groups, which identified within each and standing in antagonism to each other, Esteban *et al*. (1999) extends the measure of Wolfson polarisation index with degree of identification α, as unity. Using Luxembourg Income Study (LIS) database for Organisation for Economic Cooperation and Development (OECD) countries and only five countries (the United States, the United Kingdom, Canada, Germany, and Sweden) of which there were data for five/six years, the study computed extended polarisation measure for two, three and four groups and for different values of the identification

sensitivity parameter, α (1, 1.3 and 1.6) while polarisation sensitivity was unity throughout. High polarisation and high inequality were observed. During the period, the United States polarisation and inequality followed a sustained increase, with two periods of rapid increases (1979 – 1986 and 1991 – 1994), which were common to all groupings and values of α. In the United Kingdom, inequality substantially increased in 1979- 1986 and 1986 – 1991, while polarisation decreased in every period except for a dramatic increase in 1986 to 1991. The remaining three countries had lower polarisation, lower inequality and both tended to decrease over the period of the study. Esteban *et al*. (1999) reported that with higher degree of identification, higher number of groups should be used; and for low identification parameter, the income distribution should be represented by two groups.

2.1.3 Measure of inequality

It should be noted that while the Gini-coefficient is sensitive to changes that occur at the middle of the distribution, Generalised Entropy is sensitive to all parts of the distribution and it is additively decomposable into within-group and between-group components (Cowell, 2000; Vanderpuye-Orgle, 2002; Mussard *et al*., 2003). The GE measure of inequality is not affected by the shortcomings of Gini-coefficient which does not provide neat decomposition into within-group and between-group components which has rendered it less frequently used for income inequality of a population divided into sub-groups based on socio-economic characteristics like gender, geographical location (Foster and Shneyerov, 2008). However this present study is less concerned about this as none of the objectives requires decomposition by Gini. According to Cowell (1998, 2003 and 2006), any measure of inequality should satisfy certain assumptions of scale invariance, decomposability, principle of transfer, among others. Gini-coefficient is less decomposable because it will not satisfy consistency requirements for arbitrary partitions of the population.

2.1.4 Analysis of covariance regression model

2.1.4.1 Empirical studies on regression analysis with multiplicative interaction coefficients (Analysis of covariance)

Friedrich (1982), Braumoeller (2004), Brambor *et al*. (2005), Whisman and McClelland (2005), Hargens (2006), and Gujarati and Porter (2009) report the use and demonstrate the application of multiplicative interaction terms in multiple regression equation. Braumoeller (2004) uses multiple regression equation in which there are multiplicative terms in order to capture interaction effects and posits that the statistical significance of the lower order coefficients is largely useless for the purposes of hypothesis testing, thus indicating the inclusion of the independent variables in additive and interactive forms. Likewise, Brambor *et al*. (2005) point out that the omission of any constitutive term may lead to biased estimates in multiplicative interaction models; consequently all the variables to be multiplicatively interacted should be included individually in additive forms. Otherwise, there are at least two necessary conditions that must be met before an analyst considers omitting a constitutive term. First, the analyst must have a strong theoretical expectation that the omitted variable has no effect on the dependent variable in the absence of the other modifying variables. The only situation in which this theoretical expectation can be justified *a priori* is if the independent variable X to be interacted is measured with a natural zero. Secondly, the analyst should estimate the fully specified model to establish that the coefficient of the constitutive term to be omitted in the equation is zero. The mentioned studies provide guide for this study in that the constitutive term is the poverty status of households which is to be interacted with other variables like gender, education and marital status.

Similarly, Whisman and McClelland (2005) demonstrate the interaction effect of two independent variables and present the equation as $D = b_0 + b_1L + b_2F + b_3LF$. According to the study, a common error when testing the interaction (moderation) regression model is to include the product (LF in our example) while failing to include both of the individual components (L and F). Leaving out the individual components in the regression model inherently confounds the additive and multiplicative effects, producing biased and misleading results. The study claims that the simple rule is that the components of any products must always be included when testing the moderator effect,

which upholds the position of Brambor *et al*. (2005). The interpretation of interaction term in the stated equation was demonstrated by a rearrangement and regrouping of the terms to give D = (b₀+b₂F) + (b₁ + b₃F)L, which describes the "simple" relationship between L and D. That is, this equation describes the line relating the two variables for any fixed value of F. The term in the first set of parentheses represents the intercept, and the term in the second set of parentheses represents the regression slope (Friedrich, 1982; Whisman and McClelland, 2005; Hargens, 2006; Gujarati and Porter, 2009).

The interesting part is that both the intercept and the slope depend on the level of F. As F changes, so too do the intercept and the slope of the relationship between L and D. Braumoeller (2004) states that because interactive relationships imply that the impact of L on D varies, depending on the level of F, the idea of "the impact of L on D in general" is in fact a meaningless one. Also the impact of F on D varies depending on the level of F. This type of model is called Analysis of Covariance (ANCOVA) model as it contains an admixture of quantitative and qualitative variables (Gujarati and Porter, 2009).

2.1.4.2 Importance of multiplicative interaction terms in ANCOVA model

According to Gujarati and Porter (2009), ANCOVA models are an extension of the analysis of variance (ANOVA) models in that they may provide a method of controlling the effects of quantitative regressors (independent variables) known as covariates or control variables in a model that features both quantitative and qualitative (dummy) regressors. Two independent dummy variables may have both additive and multiplicative effects on the dependent variable and such can be accounted for through ANCOVA model. Gujarati and Porter (2009) explain this usefulness as follows: Taking a model $Y_i = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \beta X_i + \mu_i$, where Y = hourly wage in naira, X = Education (years of schooling of household head), D_2 = Gender dummy variable (1 if female household head, 0 otherwise) and D_3 = Household's poverty status dummy (1 if poor, 0 non-poor).

In the model, gender and poverty status are qualitative independent variables and education is a quantitative independent variable. An assumption is implied in the stated model, which is that the differential effect of the gender dummy D_2 is constant across the two categories of poverty status and the differential effect of the poverty dummy D_3 is also constant across the two sexes. This implies that if the average wage (Y) is higher for

males than for females, it is so whether they are poor or non-poor. Likewise, if one say, poor household heads have lower average wage (Y), this is so whether they are females or males. This assumption may not hold in many cases as a poor female may earn lower wages than a poor male. This implies that there may be interaction between the two qualitative variables D_2 and D_3 in both additive and multiplicative forms shown as $Y_i = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 (D_{2i} D_{3i}) + \beta X_i + \mu_i$ with all the variables as defined before.

From the foregoing equation, the average wage function of poor female is ($\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \beta X_i$) and the summation of α_2, α_3, and α_4 ($\alpha_2 + \alpha_3 + \alpha_4$) shows the difference between poor female wage function on one hand and the poor or female or non-poor male on the other hand. If all these three differential dummy coefficients, α_2, α_3, and α_4 are negative, it implies that poor-female household heads earn lower average wages than the poor or female as compared with the non-poor male household heads. The level of significance of the coefficient is also important to know whether such difference is significant or not at 1, 5, or 10 per cent *p* value. Thus interaction dummy, the product of two qualitative or dummy variables, modifies the effect of two attributes that are considered individually in additive forms (Gujarati and Porter, 2009).

2.1.5 Poverty phenomenon in Nigeria
2.1.5.1 Meaning of poverty

The Central Bank of Nigeria (1999) defines poverty as a state where an individual is not able to cater adequately for his or her basic needs of foods, clothing and shelter; is unable to meet social and economic obligations; lacks gainful employment, skills, assets and self-esteem; has limited access to social and economic infrastructure such as education, health, potable water, and sanitation; and consequently has limited chance of advancing his or her welfare to the limit of his or her capabilities. It somewhat appears that once poverty is solved or alleviated, other Millennium Development Goals become less problematic to attain. Aigbokhan (2000) defines poverty as the inability to attain a minimal standard of living. The minimum standard of living is complex as it is relative. What is accepted as minimal standard of living in a particular place may be unacceptable in another place even within the same region. Due to this, there will always be the problem of measuring standard of living that will be acceptable without argument.

23

Similarly, Hornby (2001) describes poverty as a state of being poor; a level of having very little money, not having enough money for basic needs. This definition is in tandem with that of CBN (1999). Looking at the various definitions of poverty, along with that of polarisation, one would realise that a more polarised income distribution is one that features the poor and the rich with the middle income disappearing or having disappeared. Therefore, poverty concept in this study means a state of income for an individual that is not enough to cater for his or her basic needs.

2.1.5.2 Poverty measurement and indicators

There are four basic ways of analysing poverty indicators (NBS, 2005; NBS, 2012). These are:

i.) Relative poverty measurement: Relative poverty is defined by reference to the living standards of a majority in a given society and separates the poor from the non-poor. Households having expenditure greater than two-thirds of the total household per capita expenditure are non-poor whereas those below it are poor. Households with less than one-third of total household per capita expenditure are core-poor (extremely poor) while the households with greater than one-third of total expenditure but less than two-thirds of the total expenditure are moderately poor. Therefore, the poor category is sub-divided into those in extreme poverty and those in moderate poverty, where extreme poverty is more severe than moderate poverty. Those in moderate poverty constitute a greater portion of the growing middle class in Nigeria who are at the point of crossing over to the non-poor category. Similarly, the non-poor are divided into the fairly rich and the very rich.

ii.) Absolute poverty measurement approach: Poverty is defined in terms of the minimal requirements necessary to afford minimal standards of food, clothing, health care and shelter. This method considers both food expenditure and non- food expenditure, using the per capita expenditure approach. This method is otherwise known as Food Energy Intake measure of poverty. In this approach, one would firstly obtain the food basket of the poorest 40 per cent of the population, then compute the food expenditure that can give 3000 calories per day based on the national food basket for the poorest 40 per cent.

iii.) Dollar per day measurement approach: This refers to the World Bank's Purchasing Power Parity (PPP) index, which defines poverty as the proportion of those living on less than US$1per day poverty line.

iv.) Subjective Poverty Measurement approach: is based on self-assessment and "sentiments" from individuals. It is based on individuals' opinion on whether or not they consider themselves to be poor.

The procedure for measuring poverty starts with the determination of the standard to be used out of the four methods sated above. Poverty line is determined below which an individual is taken as poor. Under relative poverty measure, the third step is to determine the incidence, depth and severity of poverty, using Foster-Greer-Thorbocke (1984) poverty index. The incidence of poverty or head count gives the number of individuals with income or expenditure below the poverty line. The depth of poverty provides the percentage of income/expenditure needed to bring each individual below the poverty line up to the poverty line. The severity of poverty shows the seriousness of extreme poverty by giving larger weight to the core-poor. It is achieved by squaring the gap between their income/expenditure and the poverty line in order to increase its weight in the overall poverty measure.

2.1.5.3 Poverty levels in Nigeria

Poverty is a world problem with the majority of the poor in Asia and Africa. In Nigeria, NBS (2005; 2012) reports that poverty level, that is, the population in poverty, declined between 1985 and 1992. The trend of poverty in percentage was 28.1, 46.3, 42.7, 65.6, 54.4 and 69 in 1980, 1985, 1992, 1996, 2004 and 2010 respectively. The population of the poor Nigerians increased in absolute terms, four-fold between the same periods. The poor population was 17.7m, 34.7m, 39.2m, 67.1m and 68.7m in total population of 65m, 75m, 91.5m, 102.3m and 126.3m for the same years respectively. By sector, poverty trends were shown to increase for the urban sector and more for the rural sector as shown in Table 1. Moreover, the distribution of the population in poverty indicates that the rural sector has higher proportions for the core poor and the moderately poor, while the non-poor are more in the urban sector than in the rural sector for all the years (see Table 2).

Table 1. Poverty trends in Nigeria by sector

Year	Urban (%)	Rural (%)
1980	17.2	28.3
1985	37.8	51.4
1992	37.5	46.0
1996	58.2	69.8
2004	43.2	63.3
2010	61.8	73.2

Source: National Bureau of Statistics (2005; 2012)

Table 2. Percentage distribution of the population in poverty

Year	Core Poor			Moderately Poor			Non-Poor		
	Overall	Rural	Urban	Overall	Rural	Urban	Overall	Rural	Urban
1980	6.2	6.5	3.0	21.0	21.8	14.2	72.8	71.7	82.8
1985	12.1	14.8	7.5	34.2	36.6	30.3	53.7	48.6	62.2
1992	13.9	15.8	10.7	28.9	30.2	26.8	57.3	54.0	62.5
1996	29.3	31.6	25.2	36.3	38.2	33.0	34.4	30.7	41.8
2004	22.0	27.1	15.7	32.4	36.2	27.5	43.3	36.7	56.8

Source: National Bureau of Statistics (2005)

In 2004, according to NBS (2005), the national poverty was made up of 65% and 35% contributions from rural and urban sectors while the incidence of poverty were 63.3% and 43.2% respectively. The North-West contributed the highest 33.6% to national poverty followed by North-Central and North-East (17.7% each), South-West 15.5% and South-South 9.7% and the South-East which contributed the least (5.9%). The incidence of poverty was highest in the North-East (72.2%), followed by North-West (71.2%), South-South (35.1%), South-West (43%), and North-Central (67%) and least for South-East (26.7%).

Aigbokhan (2000) reports that rural poverty is higher than urban poverty. Poverty profile in Nigeria between 1985 and 1997 measured by head-count index (incidence of poverty) in terms of consumption poverty were 0.38, 0.43 and 0.47 in 1985, 1992 and 1996 respectively. Some 38%, 43% and 47% of the population were living in absolute poverty defined by local cost of living. The study notes that while the level of poverty increased between 1985/86 and 1992/93 by 13%, it increased by 9.3% between 1992/93 and 1996/97. The estimates for the urban areas were 38%, 35% and 37% while for the rural areas 41%, 49% and 51% were estimated. In both the urban and rural areas, poverty was more pronounced among male-headed households. Male-headed households experienced an increase in the incidence of poverty between 1985 and 1996 while female-headed households fared relatively better, having experienced some improvement between 1985 and 1992.

2.1.5.4 Factors that affect poverty among households

Many socio-economic factors have been identified and analysed to influence poverty either positively or negatively. These factors include age, household size, gender, marital status, farming occupation, membership of socio-economic group, wage employment and credit access. NBS (2005) reveals that male-headed households are more likely to be in poverty than female-headed ones and that female-headed households are smaller in size and their educational level generally high. The size of the household was found to be a major determinant of the poverty level; the larger the household, the higher the level of poverty. Also, it was reported that formal education of household heads is negatively related to level of poverty. Canagarajan *et al*. (1997) state that poverty in

Nigeria is both rural and regional, and it is influenced by age, education and nature of employment, and that most poor people are uneducated.

Amao *et al.* (2009), Omonona and Okunmadewa (2009) and Apata *et al.* (2010) report that access to credit reduces poverty among household heads. Location of households also affect poverty status as poverty was higher among households in the savannah belt than in the southern part of forest zone (Ennin *et al.*, 2011). Membership of socio-economic group and being married reduces poverty among households according to Amao *et al.* (2009) and Asogwa *et al.* (2012) while formal education which is the year of schooling of household heads is negatively related to poverty among households (Ibrahim and Umar, 2008; Anyanwu, 2010; Akerele and Adewuyi, 2011). Poverty increases with age (Akerele and Adewuyi, 2011), retirement age (Lee and Shaw, 2008) but decreases with religion affiliation (Ayoade *et al.*, 2011). The factors are applied in this study to analyse their effect on income polarisation which moves in the same direction with poverty.

2.2 Conceptual framework

2.2.1 Concept of income

Income is the wage earned by or paid to the giver of a factor of production. It is the price paid to householders for their productive inputs. At an aggregate level, it is the total of all prices received by all households for their factors of production and by firms as their profits on current production. Income is what affects individual's consumption. This view is shared by Anyanwu and Oaikhenan (1995), Olayemi, (2004) and Lipsey and Chrystal (2005).

The principal factor affecting an individual's consumption expenditure is his level of income and that consumption expenditure is directly proportional to disposable income (Bowden, 1986; Anyanwu and Oaikhenan, 1995). Disposable income is the income less tax deductions. Other dimensions of income are money income and real income. Money income measures a consumer's income in terms of some monetary units like so many Naira or Dollars (Lipsey and Chrystal 2005) while real income is what money income can buy or the purchasing power of money income, measured by an index of price level (Adegeye and Ditto, 1985; Lipsey and Chrystal, 2005).

The distribution of income in the economy has an influence on consumption expenditures. The higher the income of households, the lower is their propensity to consume out of their income and vice versa, based on the assumption that people in higher income bracket, having met their basic needs, tend to spend less on such needs as compared to those who are in the low income bracket that are yet to meet those needs (Anyanwu and Oaikhenan, 1995). Income distribution is the share of every element of a population in the overall income. This study adopts size distribution of income which is the distribution of income between different households without reference to the source of their incomes or each individual's social class (Lipsey and Christal, 2005). It has to do with the size of income received and the values of the factors of production owned by individual households in the population which is also related to labour market, social protection system and policy shifts that will in turn evolve distributive transformation (Gradin and Rossi, 2006). Income may be distributed among households such that some may be at the lower level, some at middle level and others at upper level of the distribution continuum, income inequality. It may be in such a way that the elements cluster at different polar points, polarised income distribution. These views were supported by Aighokhan (2000), Gradin (2000), Wang and Tsui (2000), Chakravarty and Majumder (2001), Gradin and Rossi (2006), and Rodriguez (2006). All these scholars identified inequality and polarisation as two basic features of income distribution and gave their differences lucidly.

2.2.2 Concept of polarisation

According to Rodriguez (2006), polarisation is a useful characteristic of income distribution. Polarisation brings the income distribution together on several focal nodes while the distributional characteristic that exposes the spread from the middle level income is inequality. This spreading out from the middle level income is associated with a tendency towards bimodality; a clumping of formerly middle level income at either higher or lower tails (Wolfson, 1997).

As shown in Figure 1, Wolfson (1997) illustrates how polarisation is different from inequality, using the Lorenz curve in a square plane. The slightly shaded area corresponds to polarisation while the area between the forty-five degree line and curve is
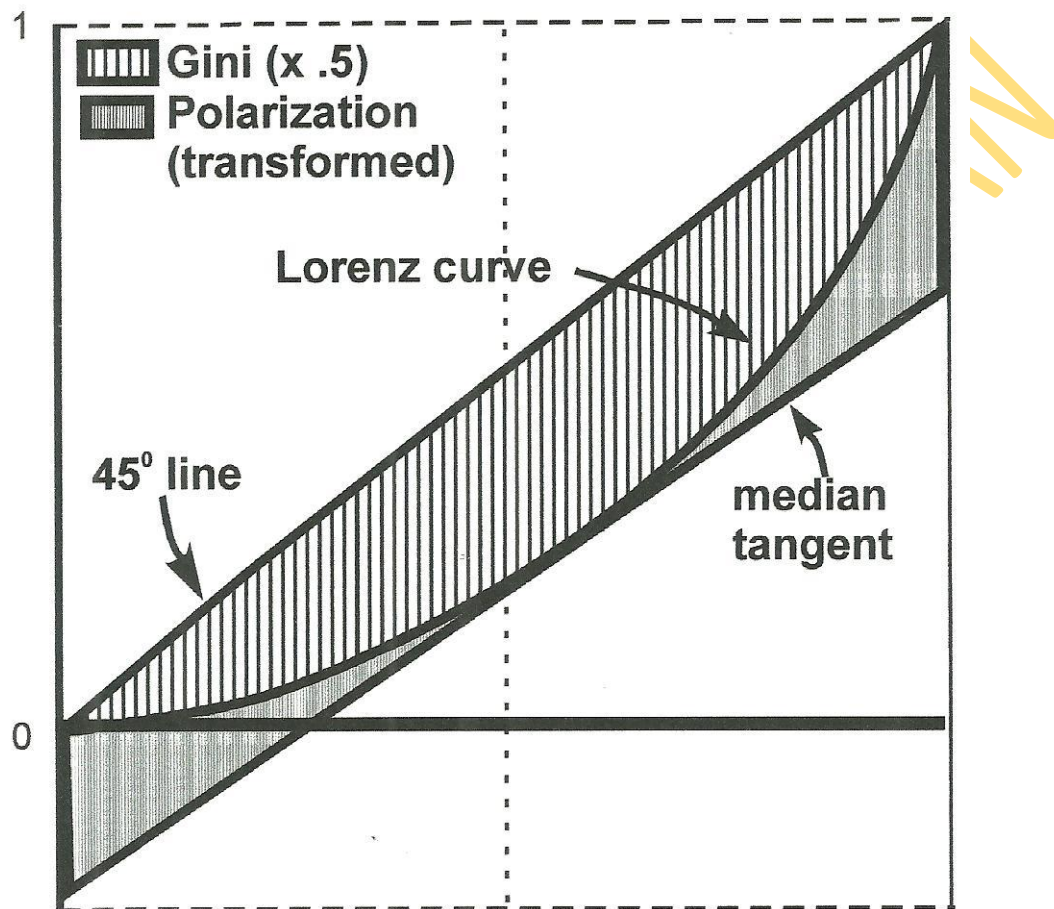
Fig. 1. Polarisation and inequality on square plane

Source: Adopted from Wolfson (1997: 407)

inequality of the distribution. The two areas together form a trapezoid as median tangent is not parallel to the 45 degree line. The two areas may either move in the same or different directions.

Several authors have presented the differences between polarisation and inequality. Chakravarty and Majumder (2001) define polarisation as the decline of the middle class and it is an important issue in income analysis. A greater distancing between two groups below and above the median or mean increases polarisation and there can be increased bipolarity if incomes below or above the middle position become closer to each other. Polarisation thus have both 'inequality-like' component (the greater distancing criterion which increases both inequality and polarisation) and 'equality-like' component (the bunching or clustering criterion, which increases polarisation while lowering any measure of inequality, satisfying the Pigou-Dalton transfer principle, a requirement which demands that inequality should reduce under a transfer of income from rich to a poor person).

Further, Esteban and Ray (1994) through Gradin (2000), clearly distinguish between convergence to the global mean and clustering around local means in income distribution. The former reduces inequality and polarisation while the latter increases polarisation in any given society displaying decreasing inequality. For this study, polarisation implies the disappearance of the middle class such that elements in the income distribution gather at polar ends and there is homogeneity within each group.

2.2.3 Polarisation, poverty and their linkage

The relationship between polarisation and poverty can be inferred from Wolfson (1997) and Wang and Tsui (2000). A polarised income distribution is one that has hollowed out middle such that there are fewer individuals or families with middle level incomes as shown in Figure 2 and it is inequality increasing. The spreading out may also feature individuals moving out from the middle to the tails of the distribution which is a tendency towards bimodality which means clumping of formally middle level incomes at either higher or lower level (see Figure 3).

Consider an income distribution continuum of $x = (x_1, \ldots, x_n)$ where x_i is the positive income level of the ith person and $m(x)$ is the median income of x. An increased

—————————————————————————————

y_i x_i **m(x)** x_j y_j

←   →

Lower Tail (Poor Levels)   **Upper Tail (Rich Levels)**
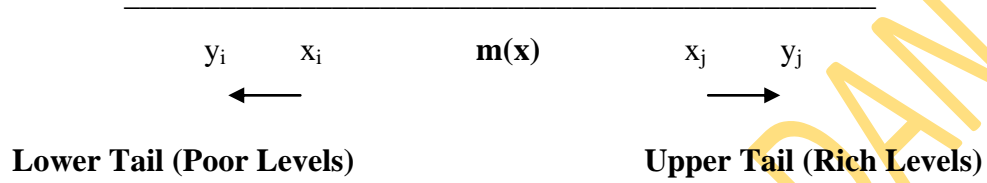
Fig. 2. Increased Spread (Increased Polarisation)

Source: Inferred from Wang and Tsui (2000: 350)

—————————————————————————————

y_i x_i **m(x)** x_j y_j

→ ←   → ←

Lower Tail (Poor Levels)   **Upper Tail (Rich Levels)**
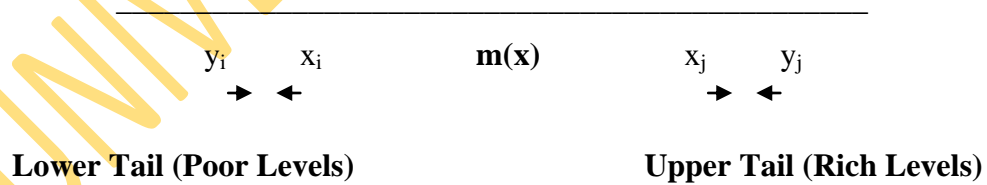
Fig. 3. Increased Bipolarisation

Source: Inferred from Wang and Tsui (2000: 350)

spread (increased polarisation) pertains to a situation in which x_i below m(x) decreases to y_i or x_j above the median income increases to y_j, thus making the incomes of some persons farther away from the middle. Force of identification increases and inequality reduces between y_i and x_i at the tail end and between x_j and y_j at the upper end. However, there is increasing alienation between the two groups of i individuals at the tail end and j individuals at the upper end. The other type of polarisation increasing movement which is increased bipolarisation occurs when income levels below or above m(x) move closer to each other; polarisation will increase if y_i and x_i below and y_j and x_j above m(x) move closer to each other with increasing identification within the group and alienation between the two groups. The distribution, therefore, features poor and rich groups (Esteban and Ray, 1994). An individual eventually falls into either of the groups, the distribution exhibiting a population that is either rich or poor with no middle class bridging the gap (Figure 2).

Identification is inequality-reducing among individuals of the same group as they become similar in their income levels, while alienation is inequality-increasing between the two groups as individuals in a group become dissimilar in their income levels from the other group. Also, for polarisation or bipolarisation to exit between the two groups, they must be of significant sizes for effective alienation and identification (Esteban and Ray, 1994).

Figure 4 shows the imaginary alienation and identification forces of income polarisation as explained by Esteban and Ray (1994) and Duclos *et al*. (2004) on the basis of Figures 2 and 3. The poor individuals feel indentified within their group and alienated from the rich. The rich income group individuals also feel alienated from the poor and identified with themselves. If individuals are moving away from the middle income group, the majority will move to the lower tail. The more the individuals that become poor the more the distribution is polarised. It is not only socio-economic factors of households that could be responsible for such movement; other factors are economic structural changes and policies. The distribution can change from that featuring the middle class to that with the middle class having thinned out. Socio-economic forces, structural changes and economic policies could as well bring back and restore the middle class. Rodriguez (2004) links this by reporting that polarisation is the difference between the richer income

Economic policy changes
Socio-economic changes
Structural changes

Income inequality

High Income Group (The Rich)

Upper Income Group (the Rich)

Income distribution $x = (x_1, \ldots x_{n)}$

Middle Income Group (Middle Class MC)

M C

Lower Income Group (the Poor)

Low Income Group (The Poor)

Income polarisation

Economic policy changes
Socio-economic changes
Structural changes
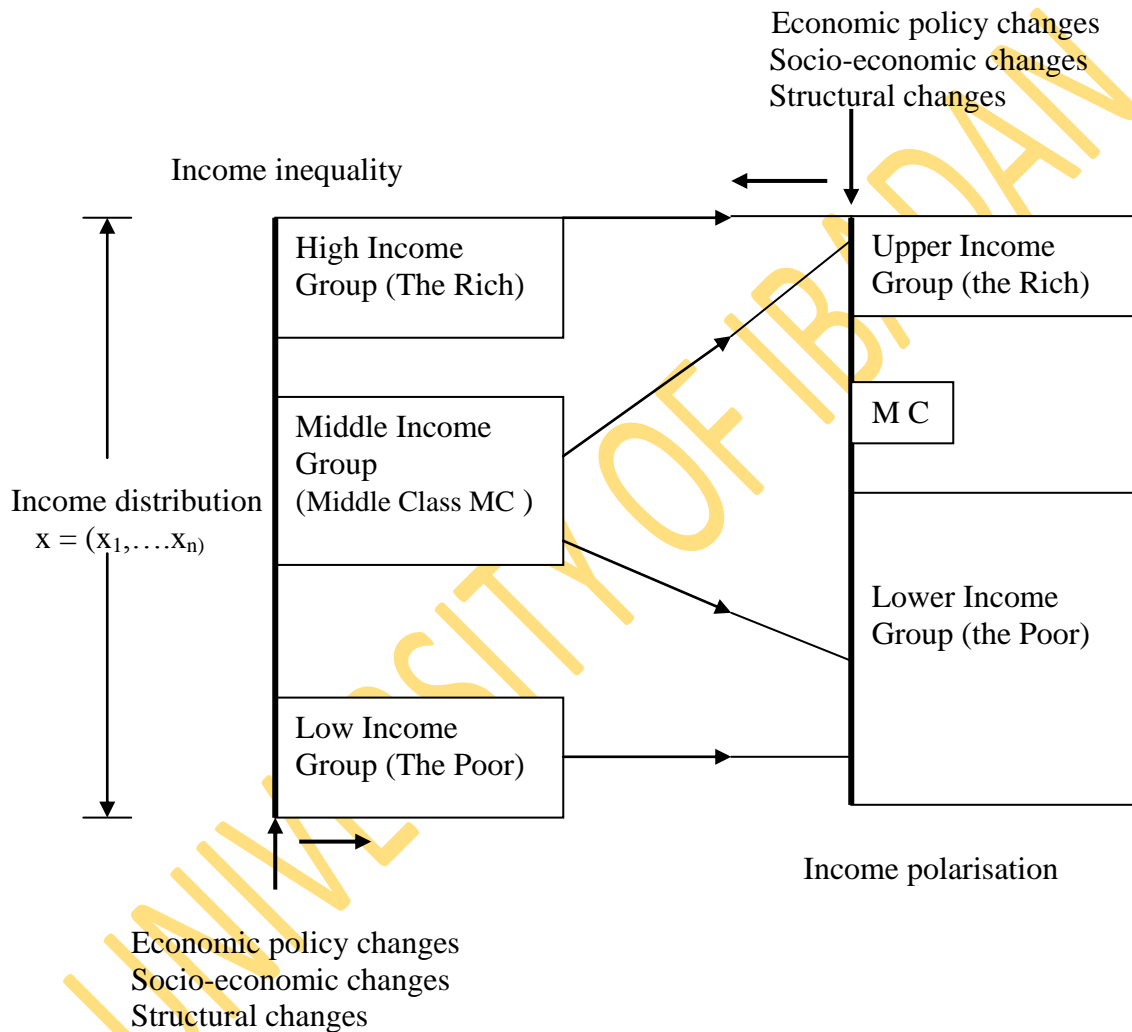
Fig. 4. Change in income distribution: disappearance of the middle class

Source: Author's Construction

group's welfare and the poorer income group's welfare when the satisfaction of individual depends on individual's group incomes. An income distribution that is polarised could lead to demonstration and unrest (Duclos *et al*., 2004). Hever (2007) as cited by NBS (2007) mentioned that a shrinking middle class shows an increase in social and economic inequality and an equitable society is that with a large middle class and small upper and lower classes.

2.4 Synthesis of reviewed literature
2.4.1 Synthesis of reviewed literature on polarisation indices

Duclos, Esteban and Ray (2004) polarisation index is used in this study because it deals with the problems arising from pre-grouping of the populations that are associated with Esteban and Ray (1994) in measuring polarisation. DER index is not restricted to dividing individuals into income groups. Similarly, Foster-Wolfson (FW) (1992), Tsui-Wang (TW) (1998) and Lasso de la Vega and Urrutia (LU) (2006) measures of bipolarisation are adopted. Foster Wolfson index is an upgrade of inequality measurement as it is derived from common measures of inequality which are the Lorenz curve and the Gini-coefficient. FW (1992) index provides an avenue to compare the inequality estimates to be generated with the polarisation estimates. DER, LU, FW and TW indices support the fact that polarisation is different from inequality. Like DER, the use of LU, FW and TW does not require pre-grouping of the population to income group. All the four indices obey the six principles that any measure of polarisation should satisfy as expounded by Chakravarty and Majumder (2001).

However, Lasso de la Vega and Urrutia (2006) bipolarisation index, as explained by Rodriguez (2006), provides the linkage of bipolarisation and poverty which is desirable due to the fact that poverty level is high in Nigeria with poverty incidence of 54.5% in 2004 while it was 43.2% and 63.3% in urban and rural areas respectively (NBS, 2005). LU index thus gives the opportunity to measure income bipolarisation between the poor people and the rest of the society on the basis of which policy makers could be made aware of the possible social conflict which could be measured by the bipolarisation index due to poverty (Rodriguez, 2006). If the poverty line separates the poor from the rich, the index serves as a basis for knowing how far apart the two groups are.

Aighokhan (2000) primarily focuses on inequality, poverty and growth but according to the author "it is not sufficient to know whether inequality increased or declined during the reform period; it is more helpful to know if such a change resulted in polarisation". His view is that, if there is polarisation, social tension will arise with possible implications for the sustainability of the reform measures. The failure of the study to link the gender polarisation estimates with their demographic features, somehow weakens their validity. However, the study has provided a useful guide for the present study in that it has established the existence of polarisation among the rural households in Nigeria. The outcome of this study may corroborate the findings along socio-economic and geographical dimensions. Awoyemi *et al*. (2009) confirms the use of multiple indices in polarisation study in Nigeria with consumption expenditure data. The polarisation and bipolarisation estimates for the rural sector of Nigeria and along socio-economic dimensions and geopolitical zones are reference and comparable bases for the estimates generated in this research.

Gradin (2000) and Vanderpuye-Orgle (2002) sub-populations are based on socio-political, economic characteristics and geopolitical dimensions. They provide useful guide for this study. Polarisation estimation was done on the basis of socio-economic and geographical characteristic groupings using Duclos-Esteban-Ray polarisation and Foster-Wolfson bipolarisation indices as well as Tsui-Wang bipolarisation index. Multiple indices are being used in this study as against one index used in Gradin (2000). The study could have used another polarisation index for comparison purposes in line with other studies (Esteban, Gradin and Ray, 1991; Zhang and Kanbur, 1999; Vanderpuye-Orgle, 2002).

Gradin and Rossi (2006) is a pointer to the fact that all measures of polarisation indices have their respective income type to which they can be applied. There can be wage income, pension income and income distribution obtained from consumption expenditure. This study used consumption expenditure. The joint application of household size, income sources and household earning capacity in explaining polarisation in the study equally serves as a guide.

Chakravarty and Majumder's (2001) proposition that any measure of polarisation must satisfy six basic principles is of great use in shaping this present study. The

polarisation indices to be used satisfy virtually all the six principles of increased spread, increased bipolarity, symmetry, principle of population, normalisation and continuity which is in line with Chakravarty, Majunder and Roy (2007). The study also adds to the argument that polarisation index has inequality derivatives, a point that is clear with the two indices (Foster-Wolfson and Tsui-Wang) being used in this study. In a similar vein, Chakravarty, Majunder and Roy (2007) show that inequality and polarisation are two different concepts. Relative and absolute indices of polarisation reflect two different ideas of polarisation and many ambiguous relative polarisation comparisons may become unambiguous in the absolute case or the reverse in some cases. Relative polarisation indices are dependent on income shares while absolute polarisation indices are functions of absolute income differentials. This study used the relative consumption expenditure emanating from size distribution of income theory to analyse polarisation.

Chakravarty, Majunder and Roy (2007) further explain that since income is not only a measure of welfare, it should be supplemented with other variables like literacy, education, life expectancy, housing and provision of public goods, among others in a polarisation study. The study opines that welfare is inherently multifaceted, having capabilities and functionings. Functionings deal with what a person can ultimately do and capabilities indicate the freedom that a person enjoys in terms of functionings. This observation will not affect the outcome of this research adversely, as the interest is only in income polarisation and poverty, while dimensions like education is considered. Once the income of an individual is good, that person can easily meet the basic needs of good housing, food and health among others.

The present study applies Foster Wolfson (1992) and Tsui and Wang polarisation indices in line with Zhang and Kanbur (1999) with relative income share (Chakravarty, Majunder and Roy, 2007). Relative income of the population of a study implies that polarisation estimates will vary between 0.0000 and 1.0000 (Zhang and Kanbur, 1999; Chakravarty, Majunder and Roy, 2007). Zhang and Kanbur (1999) assist the present study, having shown that different types of polarisation indices could generate estimates of wide margins, and for robust debate on polarisation indices, one should not limit analysis to one particular type of index like in the study of Aigbokhan (2000).

Wang and Tsui (2000), though theoretical in nature without empirical applications, assist the present study as they make the feature of polarisation clearer like Duclos *et al*. (2004). Income polarisation has inequality-reducing aspect, known as bipolarisation, and inequality-increasing aspect, called polarisation. By this, income polarisation is re-emphasised to be different from inequality. Some measures of polarisation like Esteban and Ray (1994) and Foster-Wolfson (1992) polarisation indices are derivative of inequality. Gini coefficient and Generalised Entropy as shown by Cowell (2000 and 2006), Vanderpuye-Orgle (2002) and Mussard *et al*. (2003) are being used to generate level of inequality to further show that inequality is different from polarisation.

Wolfson (1997) suggests that one should try to use comprehensive and consistent populations for comparison, or at least present results as background when focusing on sub-populations and take advantage of modern computing power to produce more comprehensive suites of statistical indicators and new kinds of tabular or diagrammatic methods for visualization of trends. These suggestions are suitable for the present study as results are presented graphically along clear socio-economic sub-populations.

Esteban *et al*. (1999) and Duclos *et al*. (2004) are improvements on the previous studies of Esteban-Ray and Wolfson indices. Esteban *et al*. (1999) developed extensions of Esteban-Ray and Wolfson indices. Though the present study adopts polarisation indices that do require identification parameter, it will still be guided by their propositions. The grouping of the population in the present study does not exceed two for all characteristics. So the use of identification parameter α, which is zero or greater than zero, is thus applicable and would be applied with discretion (Esteban and Ray, 1994; Esteban *et al*., 1999; Awoyemi *et al*., 2009) for better results and objective discussion. Esteban *et al*. (1999) and Duclos *et al*. (2004) also agree with other theoretically and empirically established facts that though polarisation and inequality may be related, they are two different concepts (Zhang and Kanbur, 1995; Aigbokhan, 2000; Chakravarty and Majumder, 2001; and Vanderpuye-Orgle, 2002). It is a further proof that the polarisation phenomenon could be investigated distinctively from inequality which this study demonstrates.

2.4.2 Synthesis of reviewed literature on analysis of covariance regression

In regression analysis that focus on analysis of covariance, several authors make mistakes in the interpretation of interactive terms in both linear and non-linear models (Norton *et al*., 2004). Other authors including Friedrich (1982) and Whisman and McClelland (2005) also agree that the interpretation of regression coefficients in interaction models is an issue about which there is much confusion in published results, though the equation is sound statistically, it is difficult to interpret. The studies also assert that the issue of multicollinearity does not arise in interaction equation if all the terms are included additively and multiplicatively. Friedrich (1982) particularly notes that an interactive model can provide an accurate and more detailed description of the relationships in a set of data, increased explanatory power and engender an improvement in the prospects for statistically significant results. A multiplicative term opens the door to all these advantages at relatively little cost. This encourages the use of multiplicative terms in the multiple regression applied in this study.

Gujarati and Porter (2009) note that with ANCOVA model containing mixture of qualitative and quantitative variables (such as gender and age), and dummy multiplicative term (like gender and poverty status of household heads), one can establish the relationship between the dependent variable and each of the categories of the dummy variables and know the relationship that is higher. This is achieved through the values of the intercept coefficients of the dummy variables. In multiplicative term of two dummy variables, one can know the relationship between the dependent variable and the combined dummy variables, establish the relationship that is higher between the dependent variable and the combined dummy variables, the two dummy variables when they are considered singly and their combined benchmark categories.

Also, the beta coefficient of the multiplicative term involving a dummy variable like gender and quantitative variable such as age, indicates the difference in the response of the dependent variable to a unit change in age between the two categories of the dummy variable. ANCOVA model, though difficult to interpret, is of advantage. With the model, one can do comparison of the behaviour of a dependent variable between the two categories of a dummy variable through running of one equation instead two equations with tools like the Chow test which saves time and cost.

40

From the foregoing review, income polarisation as a characteristic of income distribution is receiving growing attention both in developed and developing countries as income is unevenly distributed with growing poverty in Africa. All the reviewed studies provide insights into this research.

CHAPTER THREE
METHODOLOGY

3.1 The scope of study

The sample frame is all the rural households enumerated by the National Bureau of Statistics (NBS) in 1980, 1985, 1992, 1996, and 2004. The same research design and procedure were used by NBS to get the five data sets. Therefore, the secondary data of the four national consumer surveys done in 1980/81, 1985/86, 1992/93 and 1996/97 by the Federal Office of Statistics, renamed National Bureau of Statistics (NBS), and that of 2004 Nigeria Living Standards Survey were used. The World Bank and British Council provided the NBS with technical assistance and training on the survey and the questionnaire (NBS, 2005). Nevertheless, the data sets were not without some shortcomings which are stated under limitations of the study in the last section of this chapter.

The 1996/97 survey was alike in design and execution as the 1992/93 survey, the sample of which was also like 1985/86 survey sample, involving a two-stage stratified sampling technique. In the first stage, one hundred and twenty (forty-eight urban, twelve semi-urban and sixty rural) EAs were selected. The survey took place between April 1992 and March 1993 (Aigbokhan, 2000). For all the surveys, information obtained covered income in kind, cash income, consumption from own production, imputed rent, other receipts, and household expenditure on food and non-food items. Households were tagged rural and urban in the data sets.

The rural household data were extracted from the recordable compact discs obtained from the national statistical office. The data were cleaned with the elimination of households with some missing values that were important for the study. Consequently, samples of 4,685, 4,044, 5,712, and 11,358 households were used for the survey periods 1980, 1985, 1992 and 1996 respectively.

The sample design of the 2004 survey was two-stage stratified, involving the cluster of housing units referred to as Enumeration Areas (EAs) and the housing units as the first stage and second stage respectively. One hundred and twenty EAs were selected in twelve replicates in each state from the National Integrated Survey of Households

(NISH) for running household based survey in the NBS. One hundred and twenty EAs were equally selected in the Federal Capital Territory, Abuja (FCT). Five housing units (HUs) were scientifically selected in each of the selected EAs (Awoyemi, 2011). The survey had an anticipated national sample size of twenty-two thousand and two hundred HUs for the country for the 12-month survey period (Awoyemi, 2011) and ninety-two thousand six hundred and ten individual observations for both urban and rural sectors. This is robust enough to provide reasonable estimates at national and sub-national (state) levels (NBS, 2005). However, twenty-one thousand, one hundred and fifty two sample size of households was found usable. All the samples contained relevant socio-economic variables: household's consumption expenditure, occupation, employment status, gender, education, age, household size and marital status of household heads. However, only the 2004 data had information on religious status, credit access and membership of social group of household heads.

3.2 Data analysis

3.2.1 Measures of income polarisation along socio-economic and geographical dimensions over the period 1980-2004

Duclos, Esteban and Ray (2004) Polarisation Index here-in-after referred to as DER Index was used. According to Esteban and Ray (1991, 1994) and Duclos *et al*. (2004), the interest is in a population of individuals that have a continuous density function of income. Assume that f is such a density; the interest is in its polarisation P(f). Each individual has two properties of alienation and identification with income located in the support of f. Assume that an individual located at x feels alienation vis-a-vis another located at y, and that this alienation is monotonic in distance |x - y|. For effective polarisation, which is the combined effect of identification and alienation, the individual must identify with others in the population closer to his income. An individual located at income x experiences a sense of identification that depends on the density at x, f(x). The same consideration goes for an individual located at y with a domain density of f(y). However, the interest is in effective antagonism (Esteban and Ray, 1994) of x towards y, which can be represented in abstract form as some non-negative function T(i, a), where i =

43

f(x) and a = |x−y| (Duclos *et al*., 2004). It is assumed that T is increasing in its second argument and that T(i, 0) = T(0, a) = 0.

Therefore, Duclos *et al* (2004) declares polarisation to be proportional to the "sum" of all effective antagonisms, that is, identification and alienation as:

$$P(F) = \iint T[f(x), |x - y|] f(x) f(y) dx dy \qquad \qquad \text{.................……………………………. (1)}$$

This measure of polarisation satisfies a set of axioms: if it is proportional to

$$P_\alpha(F) = \int f(y)^\alpha g(y) dF(y) \qquad \qquad \text{.................……………………………. (2)}$$

where,

F= income distribution in the population (density function)

α= degree of alienation between groups x and y as stated above

T = 0 as defined above

$f(y)^\alpha$ = identification effect

P(F) = polarisation of F

x = income group or level of income x

y = income group or level of income y

|x-y| = monotonic distance between x and y

These axioms are;

i. If a distribution is made up of a basic density, then a squeeze cannot increase polarisation.

ii. If a symmetric distribution is composed of three basic densities then a squeeze in the outer densities should not reduce polarisation. Here the squeeze is local and not global.

iii. If a symmetric distribution is made up of four basic densities with disjoint supports, then a move of the centre distributions towards their outer neighbours, while keeping the disjoint supports, should increase polarisation. This means that a symmetric outward slide will increase polarisation.

iv. Given two distributions F and G, if P(F) ≥ P(G), being P(F) and P(G), the respective polarisation indices, it must be that P(αF) ≥ P(αG) where αF and αG represent a rescaled version of F and G.

Equation (1) satisfies the four polarisation axioms stated above, if and only if it is proportional to

$$P_\alpha(f) = \iint f(x)^{1+\alpha} f(y)|y - x|dydx, \qquad ....\ldots\ldots\ldots\ldots\ldots \ldots (3)$$

where $\alpha \in [0.25, 1.0]$, values were analytically derived and choice is at the researcher's discretion (Esteban and Ray, 1994; Duclos *et al*., 2004 and Awoyemi *et al*., 2006)

Since the study is interested in socio-economic dimensions of polarisation, following Duclos *et al*. (2004), polarisation measure is rewritten as

$$P(F) = \sum_{j=1}^{G} \sum_{k \neq j} \iint_{x\ y} f_j(x)^\alpha |x - y|dF_j(x)dF_K(y) \qquad ....\ldots\ldots\ldots\ldots\ldots (4)$$

where, G = number of groups

  F= income distribution in the population (density function)

  α= degree of alienation between groups x and y as stated above

  $f(x)^\alpha$ = identification effect

  P(F) = polarisation of F

  G = 1 = un-dimensional polarisation

  x = level of income x

  y = level of income y

  x_i = individual i, located at x

  y_j = individual j located at y

  |x-y| = monotonic distance between x and y

This index was used to estimate the extent of polarisation of the rural sector and its pattern along socio-economic and geographical dimensions. DAD 4.5 software (Duclos *et al*., 2008) was used for the analysis.

3.2.2 Measures of income bipolarisation along socio-economic and geographical dimensions over the period 1980-2004

3.2.2.1 Lasso de la Vega and Urrutia (2006) bipolarisation index

This was used to estimate the extent and pattern of bipolarisation among the rural households. As demonstrated by Rodriguez (2006), the index is given as:

$$P^{LU}(X;\alpha,\beta) = \left[\prod_{1}^{\alpha}(1-G_1)^{\beta} + \prod_{2}^{\alpha}(1-G_2)^{\beta}\right]G_h^B(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. \text{ (5)}$$

where,

P^{LU} = Lasso de la Vega and Urrutia bipolarisation index

$x = x_1,\ldots, x_n$ = income levels

x_i = the income of the ith household

$\prod_i = percentage\ of\ the\ population\ of\ group\ i$

$\prod_i^{\alpha} = the\ identification\ term$

α = 1 or 1.6 = analytically derived positive constant, reflecting the importance of group identification and choice is at researcher's discretion (Rodriguez, 2006)

$\beta \geq 0 = the\ degree\ of\ sensitivity\ towards\ group\ cohesion$(Analytically

established, and choice is at researcher's discretion (Rodriguez, 2006; and Lasso de la Vega and Urrutia, 2006))

$\prod_i^{\alpha}(1-G_i)^{\beta} = identification\ term\ of\ group\ i$

i = 1, 2 (Income Group 1 and 2)

G = Gini-coefficient

h = income that separates the income distribution into two different income groups, 1 and 2, that is, the group below (low income group) and that above (high income group) the middle level income respectively.

if h= m, the median income

Equation (5) becomes

$$P^{LU}(X;\alpha,\beta) = \left(\frac{1}{2}\right)^{\alpha}\left[(1-G_1)^{\beta} + (1-G_2)^{\beta}\right]G_m^B(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ (6)}$$

where variables are as defined for equation (5)

3.2.2.2 The Foster-Wolfson (1992) Index

This index is based on the Lorenz curve and it is derived from the Gini Coefficient (Awoyemi *et al*., 2009). The index is defined as follows:

$$P^{FW} = \frac{2[2(0.5 - L[0.5]) - Gini]}{\frac{m}{\mu}} \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (7)$$

where,

P^{FW} = Foster-Wolfson Bipolarisation Index

$L(0.5)$ = the value of the Lorenz curve at the 50th percentile, meaning the income share of the bottom half of regions of the index, that is, the value of the Lorenz curve at the median percentile

Gini = Gini Inequality

m = median income (Naira)

μ = mean income (Naira)

However, the analysis is based on the equation demonstrated by Duclos *et al*. (2008) for the group k which is similar to equation (7) and is expressed as

$$FW(k) = 2[2[0.5 - L(k, 0.5)] - I_2(k)] \frac{\mu(k)}{Q(k,0.5)}$$

$$= \frac{\xi(k;\rho=2) - 2GL(k,p=0.5)}{Q(k,p=0.5)} \quad \dots \dots \dots \dots \dots \dots \dots (8)$$

Where:

FW = Foster-Wolfson Index

$\xi(\rho)$ = The Gini social welfare Index

GL(p) = The Generalised Lorenz Curve

Q(p) = The Quantile function

$I_2(k)$ = The Gini index of inequality

The index was used to establish the extent of bipolarisation among the rural households and its pattern along socio-economic and geographical dimensions.

3.2.2.3 Tsui and Wang (TW) bipolarisation index

Tsui and Wang (1998) bipolarisation index, as demonstrated by Zhang and Kanbur (1999), was also adopted to estimate the extent of bipolarisation of the rural households between socio-economic and geographical dimensions. This is to make the research robust and in line with past studies that used multiple indices to measure polarisation and bipolarisation as a way of reinforcing the results obtained.

According to Zhang and Kanbur (1999), Tsui and Wang (1998) generalised a new class of indices based on the Wolfson index, using two basic axioms: increased bipolarity and increased spread, which any measure of polarisation must satisfy (Chakravarty and Manjumder, 2001). Consequently, the bipolarisation index is expressed as:

$$TW = \frac{\theta}{N} \sum_{i=1}^{K} \Pi_i \left| \frac{\bar{y}_i - m}{m} \right|^r$$ ....………………………. (9)

where,

TW = Tsui-Wang Bipolarisation

N= the total population.

Π_i = the number of population in group i or the population share of group i.

k = the number of groups.

$\bar{y}_i$ = the mean value of income in group i.

m   = the median income.

θ   = a positive constant scalar (0.5 or 1.0; 0.5 was used as 1.0 doubled the estimate).

r $\in (0,1)$, for this research r = 0.5.

The TW index was used to add to the robustness of the results in terms of magnitude and direction of estimates across the period under consideration. This is also in line with past studies that used multiple indices of polarisation and bipolarisation as a way of reinforcing the results obtained (Awoyemi *et al*., 2009; Zhang and Kanbur, 1999). The bipolarisation estimates of TW and FW between selected socio-economic dimensions were then compared with t-test to establish if their mean estimates over the five data periods were the same.

The four polarisation indices shown above have the advantage of satisfying all the six properties that any polarisation index should have increased spread, increased bipolarity, symmetry, normalisation, continuity and population independence (Chakravarty, Majumder and Roy, 2007). The indices equally agree with the principle of progressive transfer. This requires that transferring income from a richer to a poorer person while preserving the order of income ranks, inequality should reduce while polarisation scales up. Also, the division of the population of interest into sub-groups

before they are applied is not necessary. They provide no conceptual and application problems associated with pre-grouping of data based on income levels of the individuals in the population. There would be overlapping and boundary determination problems if the population is pre-grouped on the basis of income since income is a continuous variable.

3.2.3 Estimation of inequality

Gini Coefficient and Generalised Entropy (GE) were adopted. These are indicated below as demonstrated by Cowell (2000 and 2006), Vanderpuye-Orgle (2002) and Mussard *et al*. (2003). The inequality estimates were then compared with the polarisation and bipolarisation estimates in their patterns over the years of consideration.

3.2.3.1 The Gini-coefficient

The Gini-coefficient, also called Lorenz consistent (relative) measure of inequality, is stated as follows:

$$G = \frac{1}{\mu} \sum_{i=1}^{k} \sum_{j=1}^{k} f(y_i) f(y_j) \mid y_i - y_j \mid \qquad \text{.......................……………… (10)}$$

Where,

G = the Gini-coefficient.

y_i = value of the welfare index in the given dimension i.

μ = the average value for the whole population.

$f(y_i)$ = the population share of the dimension i in the total population.

k = the number of dimensions.

y_j = value of the welfare index in the given dimension j.

3.2.3.2 The Generalised Entropy (GE) Class of measure

The GE measure of inequality is given as follows:

$$GE = \sum_{i=1}^{k} f(y_i) [(\frac{y_i}{\mu})^c - 1] \qquad \text{if c} \neq 0, 1 \qquad \text{.......................………………… (11)}$$

49

$$= \sum_{i=1}^{k} f(y_i)(\frac{y_i}{\mu})\log(\frac{y_i}{\mu}) \qquad \text{if c = 1} \qquad \text{...............…………………….. (12)}$$

$$= \sum_{i=1}^{k} f(y_i)\log(\frac{y_i}{\mu}) \qquad \text{if c = 0} \qquad \text{...............………………………… (13)}$$

Where,

c = Theil index; y_i, μ, $f(y_i)$ and k are as defined in equation (10)

The mean logarithm deviation of equation (11) (when C = 0) is sensitive to incomes at the bottom of the distribution, while the index would be responsive across all ranges of the distribution if c= 1 (Theil Index); and if c ≠ 0 or 1, it would be sensitive to changes that occur at the middle part of the distribution. C = 0.5 was used to establish GE inequality since the concern is about the middle income group.

3.3 Relationship between income polarisation, poverty and socio-economic variables of the rural households

3.3.1 Relationship between income bipolarisation and poverty among the rural households

Lasso de la Vegga and Urrutia bipolarisation index is linked with poverty through the expression of the index as a function of the normalised poverty deficit index which belongs to the Foster-Greer-Thorbecke (FGT) (1984) family of poverty measures (Rodriguez, 2006). FGT poverty index is used because it does not satisfy the principle of progressive transfer (when income is moving from high to low income level) and, therefore, in agreement with bipolarisation measure (Rodriguez, 2006). NBS (2005) and Rodriguez (2006) show FGT indices as P.alpha (P_α) for α = 0, 1 or 2 to indicate incidence (head count), depth and severity of poverty respectively as shown thus:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{Z - y_i}{Z}\right)^{\alpha} \qquad \text{........................………………………… (14)}$$

where,

y_i = the income of the ith household.

q = number of households/individuals below poverty line.

Z = the poverty line.

P = poverty level.

α = FGT index or parameter or aversion to poverty as measured by the index = 0, 1 or 2.

N = total number of households/individuals in the distribution in which household/individual i lives.

$\left(\dfrac{Z - y_i}{Z}\right) = the$ proportionate shortfall of expenditure/income below the poverty line.

If α = 0;

FGT = $P_0 = \dfrac{1}{N}q = \dfrac{q}{N}$ = incidence of poverty or head count (proportion of the population

that falls below the poverty line).

If α = 1;

FGT = $P_1 = \dfrac{1}{N}\sum_{i=1}^{q}\left(\dfrac{Z - y_i}{Z}\right)^1 = HI = \dfrac{q}{N}\sum\left(\dfrac{Z - y_i}{Z}\right)^1$ = depth of poverty or poverty gap.

If α = 2;

FGT = $P_2 = \dfrac{1}{N}\sum_{i=1}^{q}\left(\dfrac{Z - y_i}{Z}\right)^2$ = severity of poverty.

The Poverty Line:

In this study, the poverty line is based on the expenditure of the households (NBS, 2005; Omonona *et al*., 2006). A relative approach is used in which a household is taken as poor relative to others. One-third of the mean is the line for extreme poverty while two-thirds of the mean per capita expenditure is used as the moderately poverty line.

The mean per capita household expenditure (MPCHE) is derived by dividing the total of all individual household per capita expenditure by the number of households as follows:

Per Capita Expenditure (PCE) $= \dfrac{Total\ Expenditure}{Household\ Size}$

Mean Per Capita Expenditure (MPCE) =

$$\dfrac{Total\ Household\ PCE}{Total\ Number\ of\ Respondents\prime Households}$$

The classification of the poverty line in line with poverty study (NBS, 2005; Omonona *et al*., 2006) is given as:

Extreme Poor = those spending < 1/3 of MPCHE

Moderately Poor = those spending < 2/3 of MPCHE (used in the study as it contains the
extreme poor households)

Non-poor = those spending > 2/3 of MPCHE.

However, two-third (2/3) of the MPCHE is used as poverty line in this study.

Rodriguez (2006) indicates that poverty deficit index $D_Z(x) = \sum_{i=1}^{s}\left(\dfrac{Z-x_i}{n}\right)$ is the sum of

income distances to the poverty line for the poor people, where x_s is the largest poor
income.

3.3.2 Linking poverty with polarisation

Rodriguez (2006) posits that if poverty line, z, is the income level that divides the
income distribution in two groups, the bipolarisation between poor people and others is
explicitly based on a poverty index and LU bipolarisation index is a function of the
normalised poverty deficit index of FGT as stated here-under.

$$P^{LU}(X;\alpha,\beta)=\left[\Pi_1^{\alpha}(1-G_1)^{\beta}+\Pi_2^{\alpha}(1-G_2)^{\beta}\left[T_Z^{FGT}(x;1)+\frac{\Pi_1\,\mu_1}{\mu}\left(\frac{\mu-Z}{Z}\right)\right]\right] \quad ....\,(15)$$

where

$T_Z^{FGT}(x;\gamma)=$ *product of headcount and income gap ratios.*

This shows bipolarisation being defined by poverty index and it is expressed as:

$$T_Z^{FGT}(x;\gamma)=\frac{1}{N}\sum_{i=1}^{n}\Gamma(x_i)^{\gamma} \qquad ....\,(16)$$

$$\Gamma(x_i)=\max\left[\frac{Z-x_i}{Z};0\right] \qquad ....\,(17)$$

The terms in equations (15), (16) and (17) are as follows:

FGT = Foster-Greer-Thorbecke family of poverty measure

γ = FGT parameter = 1 = poverty gap or depth of poverty

x_i = income of the ith household, i = 1, 2,…, n.

x = the household distribution, $x_1, x_2, …, x_n$.

n = number of households below the poverty line.

N = the total sample population.

Z = poverty line (2/3 of mean expenditure).

μ = mean income of the total population distribution.

$μ_1$ = mean income of the poor in x-distribution below Z.

This family of poverty measures is the normalised poverty deficit index or the product of the headcount and income gap ratios, $D_Z(x)/Z = \prod_1 I_Z(x)$, when $\gamma = 1$, $\prod_1 = q/n$ and $I_Z(x)$ is the income gap ratio. The analysis was done for 2-3rd of the mean expenditure as poverty line. The index, equation (15), is sensitive to incidence of poverty and its intensity because $\gamma = 1$. Rodriguez (2006) mentioned that it might be more suitable to use the poverty line to measure income bipolarisation instead of using the median or mean incomes to divide the income distribution into two groups. By this, bipolarisation and poverty measures are closely related, capturing normalised poverty deficit index as bipolarisation is between the poor and the non-poor in the income distribution. Stata software package and distributive analysis software were used for the analyses.

3.4 Analysis of the relationship between polarisation and socio-economic variables

Polarisation/bipolarisation indices were generated for each state of the federation using 2004 data point and the estimates were adopted for all households by states. This is because income polarisation and bipolarisation indices cannot be directly measured for each household. Analysis of Covariance (ANCOVA) was done using Tobit Regression Model with the polarisation/bipolarisation indices as the continuous dependent variable, while the explanatory variables were poverty status and other socio-economic variables of the households. The analysis was based on 2004 data point because the five data points cannot be pooled together as they were collected from different households. The 2004 data is the most recent of the five and reliable with complete documentation and more variables. The ANCOVA model was used because the analysis looked mostly at explanatory dummy variables (Gujarati and Porter, 2009) and the model contains both quantitative and qualitative variables. Ordinary Least Square should give similar result in this circumstance as all the complete variables were included. However, Tobit regression was adopted for the analysis because it can be used to generate different marginal effects

of changes in the unobserved, truncated expected, censored expected or uncensored dependent variable with respect to changes in the regressors.

The Tobit model used for the regression analysis is expressed statistically following Mcdonald and Mofitt (1980) and Omonona *et al*. (2006) as:

$$Y_i = \begin{cases} Y_i = \beta X_i + \mu_i & \text{if } Y_i^* > 0 \quad \text{...............…………… (18)} \\ \\ 0 = \beta X_i + \mu_i & \text{if } Y_i^* < 0 \quad \text{...............…………… (19)} \end{cases}$$

where,

$i = 1, 2, …, n$ observation (ith observation)

Y = Polarisation, a continuous variable

X = Socioeconomic Variable (qualitative, quantitative and multiplicative variables)

The regression equation (18) is detailed as:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_1^2 + \alpha_3 X_2 + \alpha_4 X_3 + \alpha_5 X_4 + \beta_1 X_5 + \beta_2 X_6 + \beta_3 X_7 + \beta_4 X_8 + \beta_5 X_9 + \beta_6 X_{10} +$$
$$\beta_7 X_{11} + \beta_8 X_{12} + \beta_9 X_{13} + \beta_{10} X_{14} + \beta_{11} X_5 X_1 + \beta_{12} X_5 X_2 + \beta_{13} X_5 X_3 + \beta_{14} X_5 X_6 + \beta_{15} X_5 X_7 +$$
$$\beta_{16} X_5 X_8 + \beta_{17} X_5 X_9 + \beta_{18} X_5 X_{10} + \beta_{19} X_5 X_{11} + \beta_{20} X_5 X_{12} + \beta_{21} X_5 X_{13} + \beta_{22} X_5 X_{14} +$$
$$\beta_{23} X_6 X_1 + \beta_{24} X_6 X_3 + \mu_i \qquad \text{...............……………… (20)}$$

where,

Y = Income Polarisation or Bipolarisation of household

X_1 = Age of Household Head (in years).

X_1^2 = Age Square

X_2 = Household Size (number of individual in each household).

X_3 = Father's Formal Education in Years (No education = 0, Primary education = 6 years, Junior Secondary School = 9 years, Senior Secondary School = 12 years, NCE/ND = 15 years, HND/B.SC = 17 years, PGD/Master's degree = 18 years, Ph.D = 21 years).

X_4 = Mother's Formal Education in Years (No education = 0, Primary education = 6 years, Junior Secondary School = 9 years, Senior Secondary School = 12 years, NCE/ND = 15 years, HND/B.SC = 17 years, PGD/Master's degree = 18 years, Ph.D = 21 years)

X_5 = Household's poverty Status (Poverty Dummy: 1= Poor, 0 = Non Poor).

X_6 = Household Head's Gender (Dummy: 1 = Female, 0 = Male).

X_7 = Household Head's Marital Status (Married Dummy: 1 = Married, 0 = Otherwise).

X_8 = Household Head's Religion Status Dummy (1 = Christian/Muslim, 0 = Otherwise).

X_9 = Household Head's Occupational Group Dummy (1 = Farming, 0 = Non-Farming).

X_{10} = Household Head's Membership of Socio Group (Membership Dummy: 1 = Membership, 0 = Non- Membership).

X_{11} = Household Head's Retirement Age Status Dummy (1 = Minimum of 60 years-Retired, 0 = Below 60 years- Active age).

X_{12} = Household Head's Wage employment Status (Wage Dummy: 1 = Wage employment, 0 = Non Wage employment).

X_{13} = Geographical location of Household (South Dummy: 1 = South, 0 = North).

X_{14} = Household Head's Credit status (Credit Access Dummy: 1= Access to Credit, 0 = No Access to credit).

$X_5X_1, X_5X_2, X_5X_3,$ = Multiplicative variables as defined for X_i

$X_5X_6, X_5X_7, X_5X_8, X_5X_9, X_5X_{10}, X_5X_{11}, X_5X_{12}, X_5X_{13}, X_5X_{14}, X_6X_1, X_6X_3$ = Interactive Multiplicative Dummies

α_0 = Constant

$\alpha_{1,\dots,}\alpha_5$ = Slope Coefficients.

$\beta_{1,\dots,}\beta_{10}$ = Differential effects of the respective dummy variable (or Differential Intercepts Coefficients).

$B_{11,\dots,}\beta_{13}$ = Differential Slope Coefficients

$\beta_{14},\dots,\beta_{22}$ = Differential effects of the interaction dummies in multiplicative form (or Differential Slope Coefficients).

B_{23} and β_{24} = Differential Slope Coefficients

μ = Error term.

All the beta coefficients (β_1 to β_{10}) of the variables X_5 to X_{14} are the differential intercepts coefficients of the variables. Each coefficient accounts for the difference between the mean value of polarisation index of the dummy variable category that receives the value of 1 and the average value of polarisation of the benchmark category, the category that receives the value of 0 which assumes the value of intercept, the constant coefficient. For instance, if β_1 is positive, it means that the dummy category with 1 has average polarisation higher by that positive value than the benchmark category (category with

zero) which takes the value of the intercept coefficient. If the intercept coefficient of the dummy variable is not significant it means the value is the same with the value of the constant. The differential slope coefficient indicates the difference between the average polarisation of a dummy variable category with 1 and the base category with 0, given the quantitative variable it is interacted with.

The model as being used provides the advantage of running single regression to account for the difference in the average polarisation of the categories of respondents like between male and female household heads, and between poor and non-poor households. If alternative methods like Chow test had been adopted, it would have required us to run many regression equations to account for the differences. The model also provides the advantage of increased explanatory power and significant level in the analysis at low cost and time.

3.5 *A priori* expectations of the coefficients

It has been realised that income polarisation moves in the same direction with poverty. The expected coefficient signs of socio-economic variables with respect to poverty are indirectly being used as the a-priori expectations as shown in Table 3.

3.6 Definition and explanation of variables

Dependent variable (polarisation/bipolarisation): This is a continuous variable arrived at by generating polarisation for all the states of the country and adopting same for all the households per state as their polarisation indices. This is because polarisation cannot be directly measured for each household. Same was done for bipolarisation. The value varies from 0 to 1.

Age and age square: Age refers to how old the household head is. It is measured in years. The income of an individual should increase with age, get to a peak and start nose-diving; and the relationship between polarisation and age of the individual may not only be linear but also quadratic. Due to this, the age of household head was squared to know the effect of age on income polarisation throughout the lifecycle of an individual. Polarisation is expected in this study to increase with age of household head.

56

Table 3. *A priori* expectation of variables in polarisation regression

Variable	Expected Sign	Authorities
Age	+/_	Amao *et al*. (2009); Akerele and Adewuyi (2011); Ennin *et al*. (2011)
Age Square	+	Amao *et al*. (2009)
Household Size	+	Omonona (2001); Ibrahim and Umar (2008); Amao *et al*. (2009); Omonona and Okunmadewa (2009); Anyanwu (2010); Ennin *et al*. (2011); Asogwa *et al*. (2012)
Formal Education	_	Ibrahim and Umar (2008); Amao *et al*. (2009); Anyanwu, (2010); Apata *et al*. (2010); Akerele and Adewuyi (2011); Ennin *et al*. (2011); Asogwa *et al*. (2012)
Female Gender	+/-	Amao *et al*. (2009); Omonona and Okunmadewa (2009); Apata *et al*. (2010); Akerele and Adewuyi (2011)
Married Status	_	Lee and Shaw (2008); Amao *et al*. (2009); Akerele and Adewuyi (2011)
Religion Status	_	Achia *et al*. (2010); Ayoade *et al*. (2011)
Farming Occupation	+/-	Amao *et al*. (2009); Omonona and Okunmadewa (2009); Ennin *et al*. (2010)
Membership of Group	_	Amao *et al*. (2009); Asogwa *et al*. (2012)
Retirement Age	+	Lee and Shaw (2008)
Wage Employment	_	Ibrahim and Umar (2008); Amao *et al*. (2009); Akerele and Adewuyi (2011)
Geographical Location: South	_	Ennin *et al*. (2011)
Credit Access	_	Amao *et al*. (2009); Omonona and Okunmadewa (2009); Apata *et al*. (2010); Asogwa *et al*. (2012)

Source: Author's construction

Household size: This is the number of individuals in a given household; comprising the wife, husband, dependants, etc. as the case may be. A household refers to the people who live under the same roof and who take or are subject to others, taking for them joint financial decisions and feeding from the same pot (Lipsey and Chrystal, 2004). Income polarisation should increase with increase in household size.

Formal education: This is the total number of years of formal schooling of the mother, father or the household head as the case may be; from no formal education which assumes the value of 0 to PhD that takes the value of 21 years. The value of this variable is low with the standard deviation greater than the mean value for the five data sets. Formal education is a variable that affects the skill and employment opportunities of individuals. Polarisation is expected to decline with increase in year of education of the household head.

Household poverty status: This is a dummy variable taking on two values, 1 and 0. The households that had per capita consumption expenditure of less than the 2/3 of the mean consumption expenditure are taken to be poor; and take the value of 1. The household having per capita consumption expenditure greater than the 2/3 of the mean consumption expenditure is non-poor and is assigned the value of 0. Polarisation should increase with increase in poverty.

Gender of household head: This is a dummy variable that was given the value of 1 for a female household head and 0 for a male household head. Gender is an issue of consideration in income distribution analysis. This study expects polarisation to increase with female household head.

Marital status of household head: This refers to a household head being married, single or divorced. It is a dummy variable as used with the value of 1 and 0 for household heads that were married and singled/divorced respectively. Marriage is a socio-economic issue in the rural sector of Nigeria. A married household head could enjoy income-generating complementary role with his/her partner and the partners could help in farming activities as well in the rural setting. Polarisation should decrease with married status of household head.

Religion status of household head. This is the religious faith of the head of a household. In Nigeria, it is Christianity, Islam or traditional religion. Most households belong to one

of the three. It is common knowledge in Nigeria that religion organisations do assist their members in the provision of non-food and food items, and income earning opportunities. Ayoade *et al*. (2011) report that Christianity and Islamic affiliations encourage participation in national programme for food security and poverty alleviation. The variable is treated as dummy. A household head that belonged to any of the Nigerian government officially recognised religions (Christian or Muslim) takes on the value of 1, and 0 otherwise. This variable should decrease polarisation among households.

Occupational group: The variable is treated as dummy. All occupations that are directly related to agriculture are taken as farming and given the value of 1 while other economic activities that are not directly related to agriculture are non-farming, taking on the value of 0. The study expects polarisation to decrease with farming households. This is because farming is the major occupation in the rural area.

Membership of socio-economic group: Socio-economic groups encourage production and economic activities of members in terms of social capital and financial assistance. The variable is used as a dummy. A household head that was a member of any socio-economic group like cooperative society is given the value 1, and 0 otherwise. This variable is expected to reduce polarisation.

Retirement age: In Nigeria, the retirement age was generally 60 years as at 2004. The variable was used as dummy. Household heads that were 60 years old and above are taken as retired and assigned the value of 1 and those below 60 years of age are considered not retired and assigned the value of 0. Polarisation is expected to be lower with retirement age and higher among the non-retirement age household heads.

Wage employment status: This was used as a dummy variable. A household head that was on any paid job is taken as wage employed and received the value of 1 and any household head that was not on paid employment or self employed received 0 value. Wage employment augments the income of household members that are involved in other occupations like farming. Wage employment should reduce income polarisation.

Geographical location of household: This is a dummy variable with households in the south taking the value of 1 and those in the northern part of the country assigned 0 value. In Ghana, Ennin *et al*. (2011) report that households living in the north (savannah belt) are

poorer than those in the south (forest zone). Polarisation is expected to reduce with households located in the south.

Credit status: The availability of credit to the household should have positive impact on the income of the household and as such reduce polarisation. Household should also be able to take advantage of credit without hindrance. Access to credit enhances the income of household through the provision of funds for use in the present with a promise to pay in future with or without interest.

Variables in interaction forms: Two dummy variables, poverty status and gender are interacted together and each interacted with other quantitative and qualitative variables to account for the difference in polarisation function between the categories of the dummy variables. The variables interaction terms are as follows:

- **Poverty status-Age:** This accounts for the difference in the polarisation function with respect to age between the poor and non-poor household heads through the beta coefficient. It accounts for the difference in the rate of change of polarisation in response to unit change in age of the poor and non-poor household heads. The coefficient indicates the value with which their polarisation functions differ. If negative, that of the poor is lower but if positive, it is higher than that of the non-poor.

- **Poverty status-Household size:** This is similar with poor-age explained earlier. But instead of age, the polarisation function is with respect to household size for the poor and non-poor household heads. It shows how polarisation response to unit change in household size among the poor and non-poor households, and in which group is change in polarisation higher.

- **Poverty status-Father's years of formal education:** This shows the difference in the response of polarisation to unit change in father's year of formal schooling between the poor and non-poor households. It provides the answer to the question, how does polarisation behaves with respect to changes in father's year of formal education among the poor and the non-poor households?

- **Poor Dummy - Female, Married Status, Religion, Farming, Socio-economic group membership, Retirement age, Wage employment, South location or Access to credit Dummy:** The interaction between poverty (poor dummy) and

60

each of the listed qualitative variables gives the multiplicative term of their interaction. This allows for establishing the total interaction effect of the two dummy variables which is achieved by summing together all the three beta coefficients of the interaction terms in additive forms (when the two dummies are separate) and multiplicative form. Through the total value, one can establish the polarisation function that is higher between, for instance, poor-female, poor, female or non-poor male categories.

- **Female Dummy-Age:** This interaction allows to account for the difference in the polarisation function with respect to age between female and male household heads. It shows the difference in the rate of change of polarisation in response to unit change in age of the female and male household heads. The beta coefficient indicates the value with which the polarisation function differs. If positive, that of the female is higher but if negative, it is lower by that beta coefficient value than that of male.

- **Female Dummy-Father's year of formal education:** This establishes the difference in the response of polarisation function to unit change in father's year of formal schooling between female and male household heads. It provides the answer to the question, how does polarisation behave with respect to changes in fathers year of formal education among the households headed by females and that headed by males.

3.7 Underlying assumptions for the analysis

The study assumes

I. that the classification of households into rural and urban by the National Bureau of Statistics, the source of the data sets used in the study, was correct.

II. six years for primary school, three years for junior secondary school, three years for senior secondary school, three years for National Diploma and National Certificate of Education, five years for Bachelor's Degree, one year for Postgraduate Diploma and Masters degree and three years for Doctoral degree. This implies that a household member with primary or secondary school certificate or Bachelors degree had 6, 12 or 17 years of formal education.

61

3.8 Limitations of the study

I. Households are not the same for all the five data sets. However, since polarisation study does not involve tracking of households as done in poverty vulnerability analysis, the outcome of this research is not affected. The data sets were not pooled together for regression analysis because different households were surveyed at the different periods. Only 2004 data were therefore used for the regression analysis.

II. There were inadequate documentations and information about the survey data sets except for 2004 with an improvement on documentation. So the accuracy of the data is not known. But discussion with the staff that were directly involved in the survey at the National Bureau of Statistics aided better understanding of the data sets.

III. It is recognised that data sets were collected for different purposes and some of the information was presented in a form that did not exactly meet the needs of this study. However, the information was handled to suit the aim of this study especially in the operationalisation of variables like formal education.

IV. There might have been biases in the data that were not known. But the source of the data is reliable, being the National Statistical Office of the Country.

V. The basis and definition of rural area and labelling of households as rural is not known. The study only relied on the classification of urban and rural households in the data and extracted the rural households. Rural households constituted larger proportions of the data sets due to the low rate of urbanisation in Nigeria and the population that is mostly rural.

In spite of the mentioned limitations, the data sets were used for poverty analysis of Nigeria by NBS, the outcome of which is widely accepted. Many researchers including Aigbokhan (2000) and Olaniyan and Awoyemi (2005) have used the same data sets to carry out African Economic Research Consortium sponsored inequality study in Nigeria. However, express recommendations from the results can only be done and taken with caution because of the stated limitations.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-economic features of households

Results from Table 4 show the minimum, maximum and mean values of the real mean per capita household consumption expenditure (PCHE) of the five data points with 1980 as the base year. The mean incomes were ₦133.00, ₦162.00, ₦599.00, ₦90.00 and ₦1,125.00 for 1980, 1985, 1992, 1996 and 2004 respectively, while the standard deviations were ₦68.00, ₦141.00, ₦359.00, ₦60.00 and ₦1,072.00 for the same years. The poverty lines are indicated for 2-3rd of mean consumption expenditure, representing poor threshold. Any household expenditure that falls below the values is considered poor in the distribution. In 2004, the poverty line was ₦714.80 (1980 as base year) which was ₦16,676.28 in nominal value.

Also, as shown in Table 5, the average age of household head over the periods does not show discernible pattern. But father's years of formal education was about 3 in 1980, 1985 and 1996 but increased to 5 in 2004. Average household size increased from 4.5 to 6 in 1996 and 2004 respectively. Of note are the standard deviations of father's years of formal education in 1980, 1985, 1992 and 1996 that were higher than their respective average values. This indicates that there was a high degree of spread in the years of education of the household heads. However, these interpretations should be taken with caution as households were not the same for the five periods.

4.2 Extent and pattern of polarisation and bipolarisation

4.2.1 Pattern of polarisation among the rural households

Table 6 shows that overall polarisation between 1980 and 2004 reduced as it was 0.3037, 0.2609, 0.2974, 0.2710 and 0.2453 in 1980, 1985, 1992, 1996 and 2004 respectively by estimates obtained through Duclos, Estenban and Ray (DER) index with $\alpha = 0.5$, the degree of alienation between groups x and y. However, DER index with $\alpha = 1.0$, the extreme value of alienation force, resulted in 0.2389, 0.2111, 0.2371, 0.2189 and 0.1874 polarisation indices for the same years respectively. The standard errors of the estimates are presented in italics. This is an indication that polarisation reduced from 1980 to 1985, then increased to 1992, and declined through 1996 to 2004, which implies that

Table 4. Summary statistics of per capita household consumption expenditure (₦)

Year	Minimum Value	Maximum Value	Mean Expenditure	Standard Deviation	Poverty Line
1980*	1.36	7,049.96	132.75	67.47	44.97
1985	3.97	3,049.64	161.57	140.86	93.90
1992	0.91	12,741.21	598.51	358.90	239.24
1996	1.50	3,777.26	89.75	60.31	40.20
2004	36.43	77,152.77	1124.78	1,072	714.80

*Base Year

Source: Computed from the 1980, 1985, 1992, 1996 NCS and 2004 NLSS data

Table 5. Socio-economic characteristics of households

Average Households' Features	1980	1985	1992	1996	2004
Age of Household Heads (Years)	43.05	45.32	45.89	44.95	35.02
Standard Deviation	*12.98*	*13.78*	*14.01*	*13.24*	*16.54*
Father's Formal Education (Years)	3.10	2.95	2.58	2.73	5.28
Standard Deviation	*4.34*	*5.18*	*4.21*	*4.26*	*7.67*
Household Size	3.92	5.12	5.38	4.53	6.18
Standard Deviation	*3.32*	*4.43*	*3.69*	*2.68*	*3.29*

Source: Computed from the 1980, 1985, 1992, 1996 NCS and 2004 NLSS data

more middle class was created between 1980 and 1985 similarly between 1996 and 2004. The polarisation estimates are comparable with those of Awoyemi *et al*. (2009) that report DER polarisation with α = 0.5 of 0.29 and 0.24 in 1996 and 2004 respectively.

The polarisation estimates for α = 1.0 are less than those of α = 0.5. All the estimates obtained by α = 1.0 would therefore be the basis for subsequent discussions in order to avoid going into higher estimates and for the fact that the choice of α is subjective and the researcher is free to use any (Esteban and Ray, 1994; Duclos *et al*., 2004; and Awoyemi *et al*., 2009). The pattern of polarisation as shown in Table 6 indicates that middle class increased in 1985, reduced in 1992, and increased in 1996 and 2004. Between 1985 and 1992, the policy of government focused on austerity measures coming historically from 1982/1983. Structural Adjustment Programme was introduced in 1986 to promote agricultural exports, but rather than achieving the objective, rural individuals' income declined as the programme was a failure. By 2004, the economy was stable with various successful programmes like National Poverty Eradication Programme that probably accounts for the better income distribution in that year.

4.2.2 Pattern of income bipolarisation among the rural households by FW and LU indices

Foster-Wolfson (FW) and Lasso de la Vega and Urrutia (LU) bipolarisation indices show similar pattern with those of polarisation indices obtained by DER discussed earlier. Bipolarisation decreased between 1980 and 1985, increased up to 1992 and reduced through 1996 to 2004. This is shown in Table 7. Bipolarisation indices through FW index were 0.6125, 0.4067, 0.4775, 0.4108 and 0.3529 in 1980, 1985, 1992, 1996 and 2004 respectively. This means that the size of the middle class in the rural area increased in 1985, reduced in 1992, then increased in 1996 and further improved in 2004. This calls for sustained policy in encouraging the trend to continue. Compared with Awoyemi *et al's* (2009) report of FW bipolarisation of 0.49 and 0.37 in 1996 and 2004 respectively, the estimates are close and in similar direction. Aigbokhan (2000) also obtained bipolarisation of 0.72, 0.65 and 0.51 for the rural Nigeria in 1985, 1992 and 1996 respectively; these estimates are comparable with those obtained in this study.

Table 6. Extent and pattern of polarisation

Year	DER; $\alpha = 0.5$	DER; $\alpha = 1.0$
1980	0.3037	0.2389
(Standard Error)	*0.0007*	*0.0066*
1985	0.2609	0.2111
(Standard Error)	*0.0071*	*0.0058*
1992	0.2974	0.2371
(Standard Error)	*0.0088*	*0.0021*
1996	0.2710	0.2189
(Standard Error)	*0.0054*	*0.0058*
2004	0.2453	0.1874
(Standard Error)	*0.0020*	*0.0097*

Source: Author's estimates

Table 7. Extent and pattern of income bipolarisation

Year			Bipolarisation Indices			
				Lasso de la Vega and Urrutia		
	Foster-	$\alpha = 1.6$;	Standard	$\alpha = 1.6$;	$\alpha = 1.0$;	$\alpha = 1.0$;
Year	Wolfson	$\beta = 1.0$	Error	$\beta = 0.5$	$\beta = 1.0$	$\beta = 0.5$
1980	0.6125	0.1676	0.0129	0.2024	0.2540	0.3068
1985	0.4067	0.1430	0.0071	0.1667	0.2168	0.2526
1992	0.4775	0.1610	0.0202	0.1951	0.2440	0.1899
1996	0.4108	0.1460	0.0751	0.1703	0.2213	0.2582
2004	0.3529	0.1383	0.0276	0.1586	0.2096	0.2404

Source: Author's estimates

Similar pattern was provided by LU Index. The LU Index with α = 1.6 and β = 1.0 gave the lowest estimates as shown in Table 7. Therefore, the discussion here and subsequently will be based on the estimates obtained with a degree of alienation parameter α = 1.6 and a degree of identification parameter β = 1.0; the extreme conditions of bipolarisation. This perhaps represents modest reporting of bipolarisation as the choice of the parameters is that of the researcher (Rodriguez, 2006). From Table 7 the estimates of FW are higher than the LU estimates but the two show similar pattern between the years under consideration. It should be noted that during the period of SAP, 1985 through 1992, both polarisation and bipolarisation were enhanced as shown in Tables 6 and 7 while in post-SAP era, 1996 to 2004, polarisation and bipolarisation reduced. The probing instinct is: why did both polarisation and bipolarisation decrease between 1980 and 1985 and then increased from 1985 through 1986 to 1992? This might be due to the Structural Adjustment Programme adjudged a failure (NBS, 2005). Instead of improving the income of the rural households, it made it worse. But subsequent years' programmes/policies like NEEDS, SEEDS, NDE, and NAPEP frameworks appear to have helped in promoting the middle income group in the rural areas. This somehow is in agreement with the findings of NBS (2007) which showed that there was an upward movement from the core poor to the upper middle class, and specifically, there was a movement from 12 per cent income of the lowest class to an increase of more than 7 per cent of the upper middle class in 2004. Thus the pattern of both income polarisation and bipolarisation reflects the policy environment of the country.

4.2.3 Pattern of polarisation and inequality

Since the computation of FW bipolarisation indices required the estimation of Gini coefficient, it is noteworthy, therefore, that the pattern of income polarisation is similar to income inequality in the rural Nigeria for the periods 1980 to 2004, using both Gini Coefficient and Generalised Entropy. Though income polarisation and inequality are different in concept, they can either move in the same direction or in opposite directions (Rodriguez and Salas, 2003; Duclos *et al*., 2004; Rodriguez, 2006). Inequality reduced from 1980 to 1985, then increased in 1992 and then decreased through 1996 to 2004 as shown in Figure 5. Therefore, income inequality and income polarisation/bipolarisation
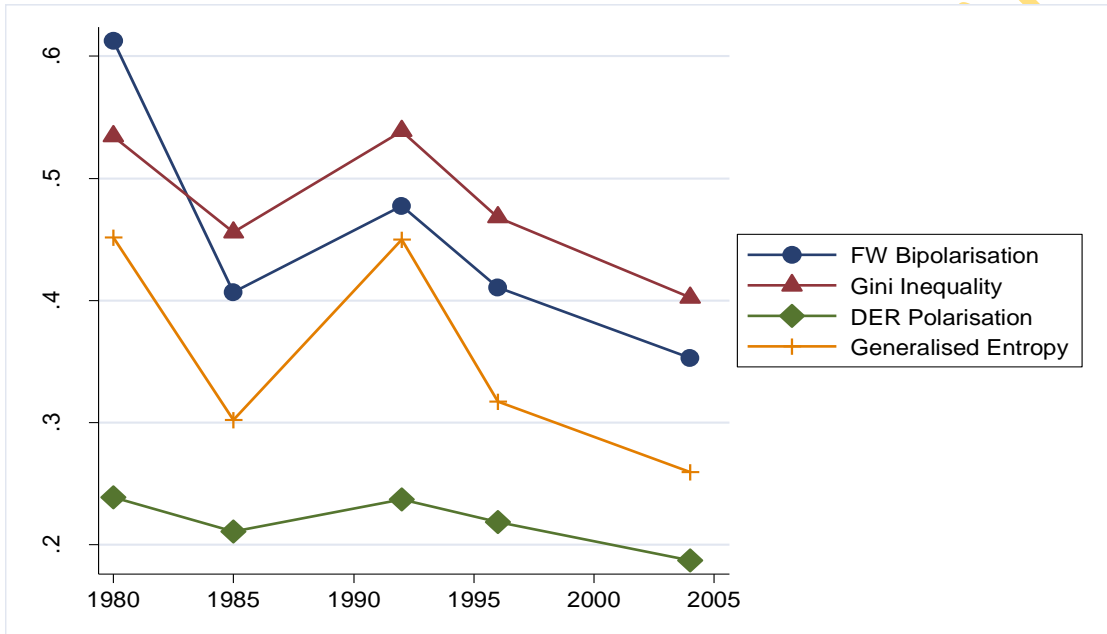
Fig. 5. Pattern of polarisation, bipolarisation and inequality

(as revealed in Figure 5) moved in the same direction but differ in magnitude within the periods under consideration in rural Nigeria.

For 1980, 1985, 1992, 1996 and 2004, inequality by Gini-coefficient was 0.5344, 0.4558, 0.5387, 0.4681 and 0.4024; and by Generalised Entropy, it was 0.4518, 0.3024, 0.4500, 0.3173 and 0.2595 respectively. DER polarisation was 0.2389, 0.2111, 0.2371, 0.2189 and 0.1874 while FW bipolarisation was 0.6125, 0.4067, 0.4775, 0.4108 and 0.3529 for the same years respectively. The similar pattern between inequality and polarisation so observed may be due to the force of identification predominating in effect over alienation force. If identification force increases between individuals, their inequality would reduce and if it decreases, inequality will increase. In such distribution, the identification force in addition to the prevailing alienation force gives effective polarisation. The identification force may thus make polarisation and inequality to move in the same direction.

4.3 Pattern of income polarisation and bipolarisation along socio-economic and geographical dimensional groupings

4.3.1.1 Extent and pattern of bipolarisation between household demographic groups

Bipolarisation was measured between demographic groups with Foster-Wolfson (FW) and Tsui-Wang (TW) indices. T-test was used to determine if there was a difference in the mean values of the FW and TW polarisation estimates over the five-point period. This was to indicate if the two indices measured similar extent of bipolarisation over the period. For TW index, the multiplicative factor, θ, is a constant and is either 0.5 or 1.0 as shown in equation (9) and that influences the magnitude of estimate as that of $\theta = 1.0$ doubles the estimate for $\theta = 0.5$. The estimates obtained based on $\theta = 0.5$ was therefore used. The pattern of FW and TW bipolarisation between the demographic groups reveals a decreasing trend between 1980 and 2004 as shown in Figures 6, 7, 8 and 9.

Figure 6 shows that between households located in the north and south, FW bipolarisation was 0.4814, 0.3702, 0.4537, 0.3651 and 0.3270. Between male and female household heads, FW bipolarisation was 0.4571, 0.3790, 0.5044, 0.4001 and 0.3460. Between wage and non-wage employment household heads, FW bipolarisation was 0.4306, 0.3357, 0.4393, 0.3583 and 0.3463 for 1980, 1985, 1992, 1996 and 2004

71

Fig. 6. FW bipolarisation between north- and south-located households, male and female, and wage and non-wage employment household heads.
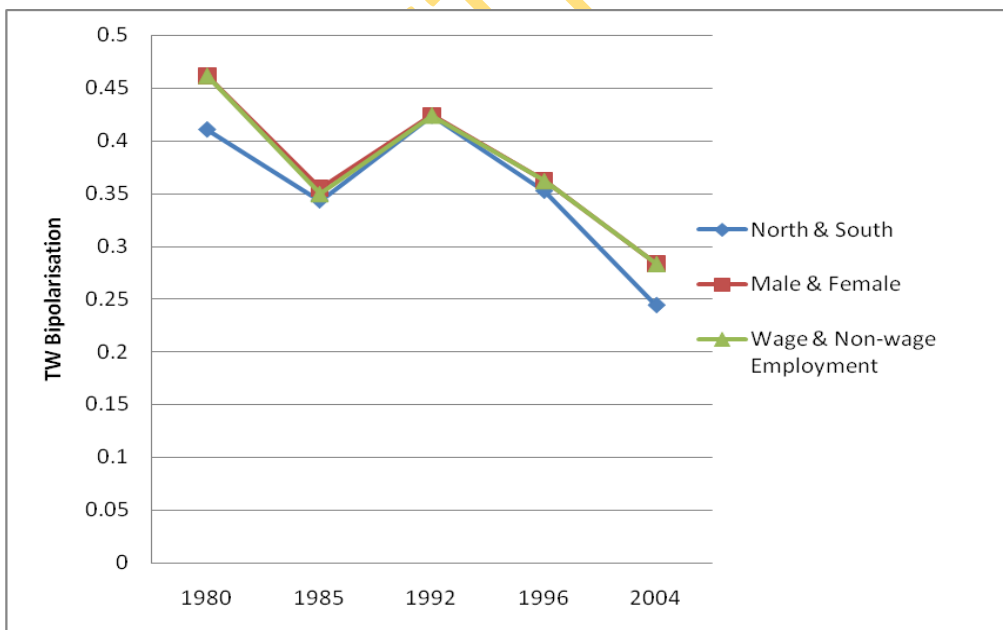
Fig. 7. TW bipolarisation between north- and south-located households, male and female, and wage and non-wage employment household heads.
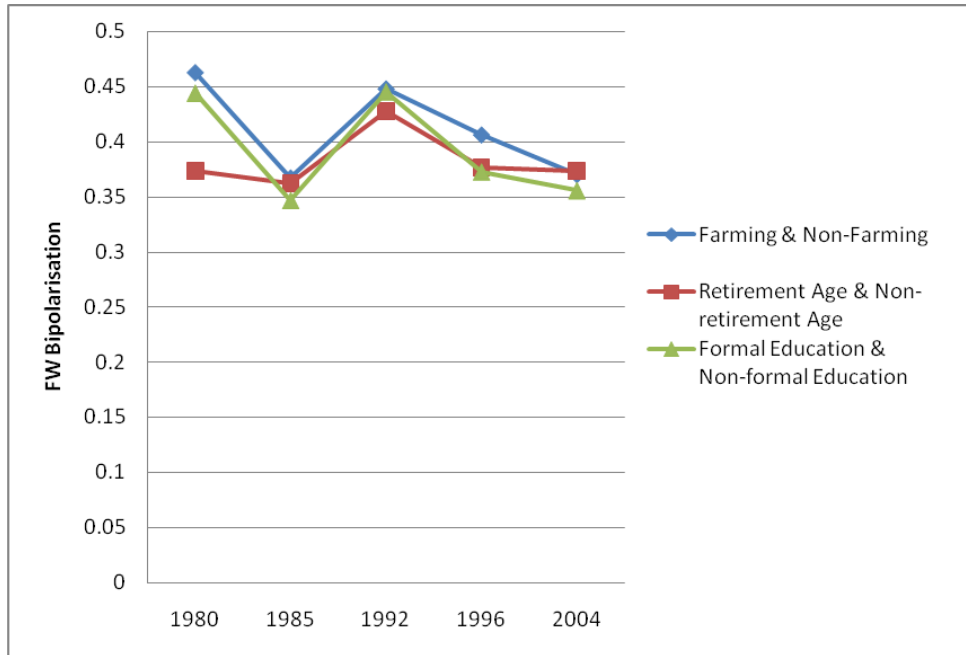
Fig. 8. FW bipolarisation between farming and non-farming, retirement and non-retirement age, and formally and non-formally educated household heads
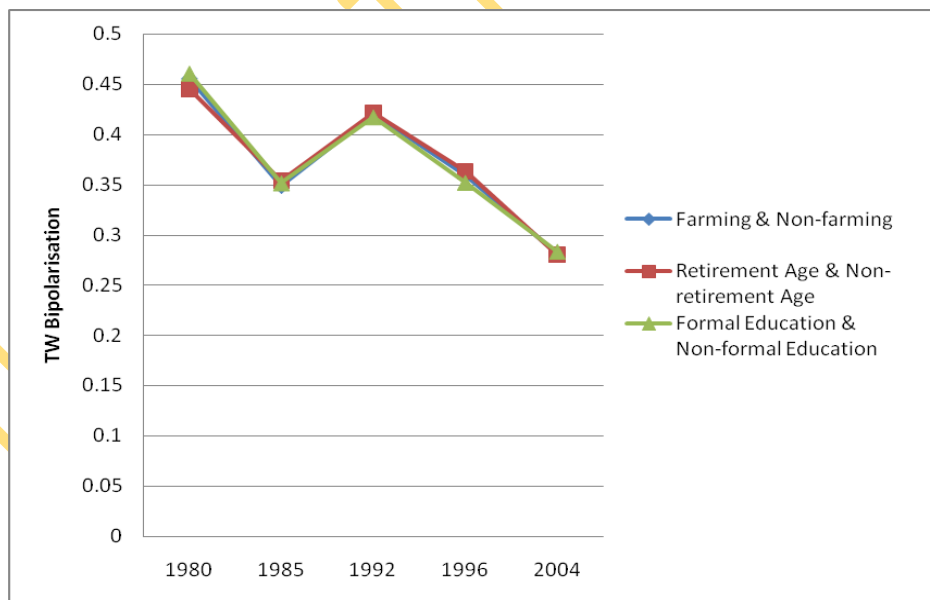
Fig. 9. TW bipolarisation between farming and non-farming, retirement and non-retirement age, and formally educated and non-formally educated household heads

respectively. Compared with Figure 7 for the same period, TW bipolarisation was 0.4103, 0.3431, 0.4233, 0.3522 and 0.2438 between north and south. Between male and female, TW bipolarisation was 0.4611, 0.3547, 0.4239, 0.3622 and 0.2834. However, between wage and non-wage employment, the TW bipolarisation was 0.4611, 0.3494, 0.4237, 0.3615 and 0.2832 for 1980, 1985, 1992, 1996 and 2004 respectively.

Figure 8 reveals that between farming and non-farming household heads, FW bipolarisation was 0.4627, 0.3670, 0.4479, 0.4061 and 0.3699. Between retirement age and non-retirement age household heads, FW bipolarisation estimates were 0.3734, 0.3618, 0.4274, 0.3762 and 0.3730. But between formally educated and non- formally educated household heads, FW bipolarisation was 0.4441, 0.3470, 0.4453, 0.3728 and 0.3559. But Figure 9 shows that TW bipolarisation estimates were 0.4554, 0.3485, 0.4204, 0.3591 and 0.2808 between farming and non-farming households. Between retirement and non-retirement age household heads, TW bipolarisation was 0.4452, 0.3542, 0.4219, 0.3630 and 0.2801 while between formally educated and non-formally educated household heads, TW bipolarisation was 0.4602, 0.3514, 0.4169, 0.3519 and 0.2834 in 1980, 1985, 1992, 1996 and 2004 respectively.

In 1980 the highest FW bipolarisation (0.4814) as shown in Figure 6 came from between north-located and south-located households. Following this is between male and female headed households of 0.4571. Between wage and non-wage employed household heads, FW bipolarisation was least of 0.4306. This shows that in 1980, bipolarisation was more between north and south dimensions, and male and female household heads. This implies that the middle class disappears more between north and south located households and male and female household heads in 1980. Whereas in Figure 7, for 1980, TW bipolarisation highest estimate (0.4611) was from between male and female, and wage and non-wage employment household heads. The least (0.4103) was from between north- and south-located households.

In 1992, highest (0.5044) and least (0.4393) FW bipolarisation were from between male and female household heads, and wage and non- wage employment while highest (0.4239) and least (0.4233) TW bipolarisation were from between male and female, and north- and south-located households as shown in Figures 6 and 7 respectively. Moreover, in 2004 highest (0.3463) and least (0.3270) FW bipolarisation were from between wage

and non-wage employment and north and south location while highest (0.2834) and least (0.2438) TW bipolarisation were from gender and geographical (north and south) location difference also shown in Figures 6 and 7 respectively.

In 1996, Figure 6 shows that least (0.3583) and highest (0.4001) FW bipolarisation were from between wage and non-wage employment, and male and female household heads; while in Figure 7, least (0.3522) and highest (0.3622) TW bipolarisation were from between north and south, and between male and female household heads respectively. Figure 8 reveals that for FW bipolarisation, least (0.3728) estimates from between formally educated and non-formally educated household heads in 1985 and highest (0.4061) estimate from between farming and non-farming in 1980 were observed. Also in 2004, highest (0.3730) followed by 0.3728 and least (0.3699) FW bipolarisation were from retirement and non-retirement age, formal education and non-formal education, and farming and non-farming. From Figure 9, in 2004, TW bipolarisation estimate between formally educated and non-formally educated households was 0.2834 followed by between farming and non-farming of 0.2808 and 0.2801 for between retirement and non-retirement age. This implies that in 2004, formal education account for higher bipolarisation among households.

A closer look at Figures 6, 7, 8 and 9 may indicate that FW and TW bipolarisation indices provided similar estimates over the five-point period of consideration. The following sub-section is, therefore, directed at comparing the two through t-test. Nevertheless, the bipolarisation values for 2004 indicate reduction from previous years' values, which implies that more middle income group was created in 2004. By that year, the political economy was stable and the policy environment contains programmes targeted at improving rural income like NEEDS, FADAMA I and II. Through FADAMA I, II and III, progress is being made with individuals that have been constituted into groups with access to credit, thus improving their asset base, productivity and income.

4.3.1.2 T-test comparison of FW and TW bipolarisation estimates between household demographic groups

As shown in Table 8, t-test reveals that over the five-point period, for between north and south location, the mean bipolarisation estimate of FW (0.3995) significantly

Table 8. Comparison of bipolarisation estimates of FW and TW over the five-point period

Demographic Features	Mean FW Bipolarisation	Mean TW Bipolarisation	t- statistic	Difference in Mean
North and South	0.3995	0.3545	0.0299**	Significant at 5 per cent
Gender (Male and Female)	0.4173	0.3771	0.0522***	Significant at 10 per cent
Wage and No-wage	0.3820	0.3758	0.7165	Not Significant
Farming and Non-farming	0.4107	0.3728	0.0577***	Significant at 10 per cent
Retirement and Non-retirement age	0.3824	0.3729	0.7346	Not Significant
Formal education and Non-formal education	0.3930	0.3728	0.2579	Not Significant

Source: Author's computation

differs from that of TW (0.3545) at 5 per cent level with t-statistic of 0.0299. Between male and female household heads, mean FW (0.4173) and TW (0.3771) bipolarisation are significantly different at 10 per cent level with 0.0522 t-statistic, whereas between wage and non-wage employment, mean FW (0.3820) and TW (0.3758) bipolarisation estimates with the t-statistic of 0.7165 are not statistically different over the period. This implies that the two indices measured different extents of bipolarisation between north and south location and household head gender, but same level of bipolarisation between wage and non-wage employment

Moreover, the mean values of FW (0.4107) and TW (0.3728) bipolarisation estimates between farming and non-farming households are statistically different at 10 per cent level with t-statistic of 0.0577 over the years, 1985 to 2004. This indicates that the two indices measured different levels of bipolarisation between farming and non-farming households. Also, between retirement and non-retirement age, mean FW (0.3824) and TW (0.3729) bipolarisation estimates have t-statistic of 0.7346 which is not significant. Similarly, there is no significant difference between the mean FW (0.3930) and TW (0.3728) bipolarisation between formally educated and non-formally educated household heads over the five-year period with t-statistic of 0.2579. This implies that FW and TW indices measured same level of bipolarisation between retired and non-retired and also between formally educated and non-formally educated over the five-year period. This finding is capable of starting a debate of superiority between the two indices (Zhang and Kanbur, 1999).

4.3.2 Polarisation and bipolarisation within sub-populations of the rural households
4.3.2.1 Polarisation and bipolarisation within farming households

Figure 10 shows DER polarisation and FW polarisation among the farming households. Polarisation and bipolarisation reduced from 1980 to 2004; which implies that more individuals moved to the middle income group among the farming households. Polarisation was 0.2169, 0.1792, 0.2163, 0.1921 and 0.1817 while bipolarisation was 0.4029, 0.3292, 0.4454, 0.3489 and 0.3399 in 1980, 1985, 1992, 1996 and 2004 respectively. Income distribution among farming households tends to be more of bipolarisation than polarisation though the two declined between 1980 and 2004.
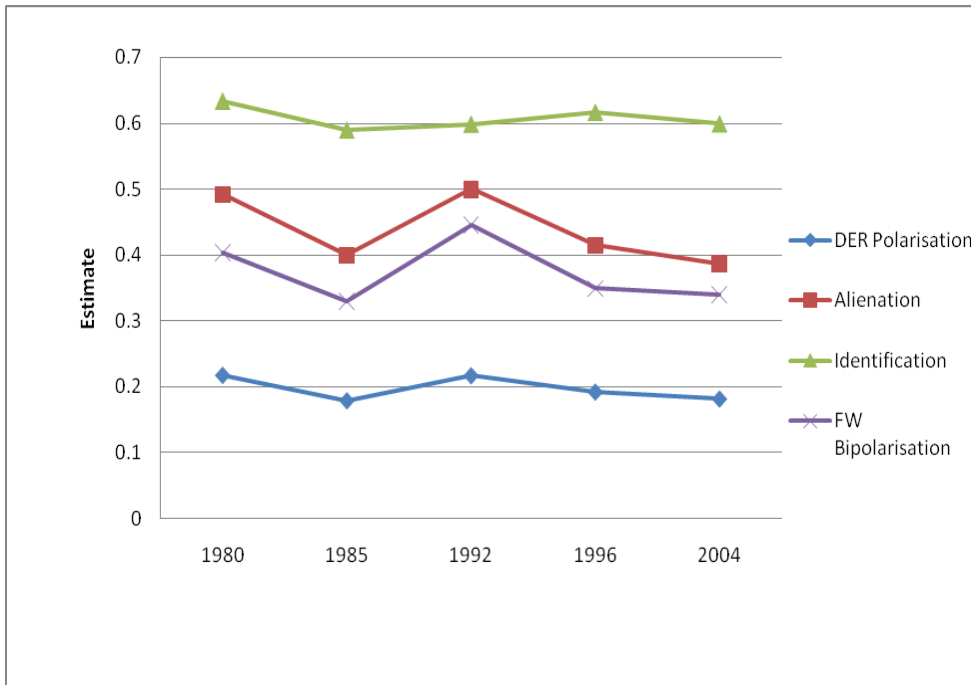
Fig. 10. Bi/Polarisation within farming households
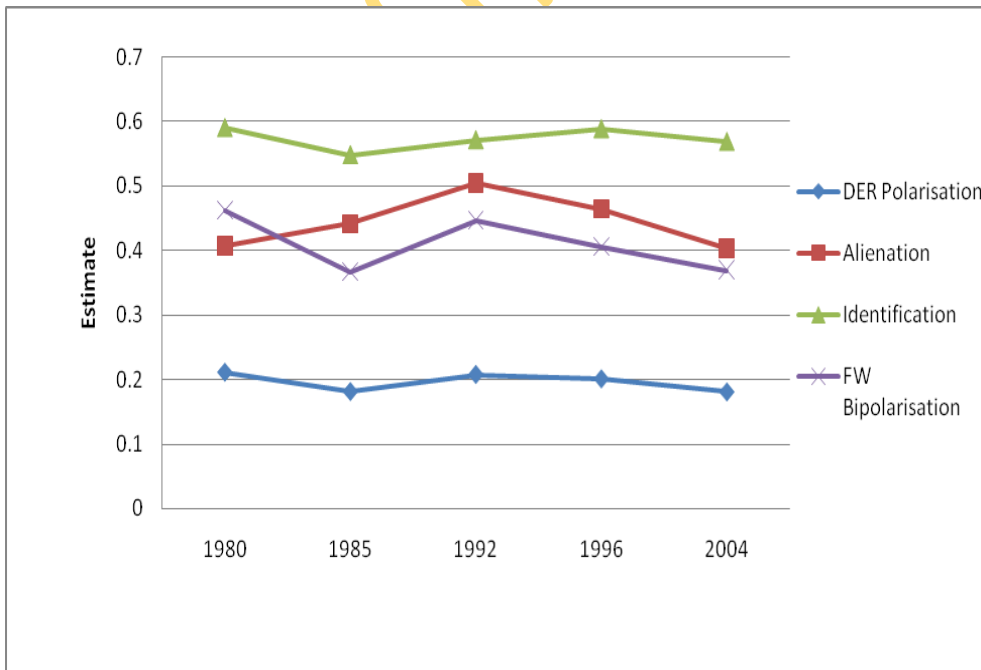
Fig. 11. Bi/Polarisation within non-farming households

Identification and alienation also decreased between the periods. The effective combination of alienation and identification forces between the emerging and opposing two groups in the distribution gives DER polarisation (Duclos *et al.*, 2004).

4.3.2.2 Polarisation and bipolarisation within non-farming households

Figure 11 shows that among non-farming households, polarisation was 0.2115, 0.1812, 0.2081, 0.2012 and 0.1806, while bipolarisation was 0.4627, 0.3670, 0.4479, 0.4061 and 0.3699 in 1980, 1985, 1992, 1996 and 2004 respectively. This reveals that more middle class was being created among non-farming households as the case was with farming households between 1992 and 2004. Alienation and identification forces of polarisation followed the same trend. Both declined over the period though the former was lower. Additional middle income individuals were created by 2004. A comparison of Figures 10 and 11, in 2004, showed that polarisation was higher among farming (0.1817) than non-farming households (0.1806) whereas bipolarisation was higher (0.3699) among non-farming than among farming households (0.3399). Babatunde (2008) reports that farm income is inequality-decreasing while off-farm income is inequality-increasing. Inequality and polarisation can move in the same or different directions (Rodriguez and Salas, 2003; Duclos *et al.*, 2004; Rodriguez, 2006). The majority of the rural households are of farming and they tend to be similar in their income levels.

4.3.2.3 Polarisation and bipolarisation within households located in the north

The north refers to all the rural households in the northern part of Nigeria. As shown in Figure 12, in the northern rural part of Nigeria, polarisation was 0.2025, 0.1750, 0.2171, 0.1910 and 0.1787 while bipolarisation was 0.3635, 0.3301, 0.4294, 0.3495 and 0.3240 in 1980, 1985, 1992, 1996 and 2004 respectively. Alienation and identification were 0.4464, 03937, 0.5031, 0.4155, 0.3732 and 0.6283, 0.5774, 0.6019, 0.6096, 0.6082 respectively. In the north, income distribution was more of bipolarisation than polarisation though the distribution was less polarised and bipolarised by 2004, and the potential source of conflict from polarisation was reduced in that year. This may be related to the higher rate of poverty in the north (NBS, 2005). With more people being poor, the
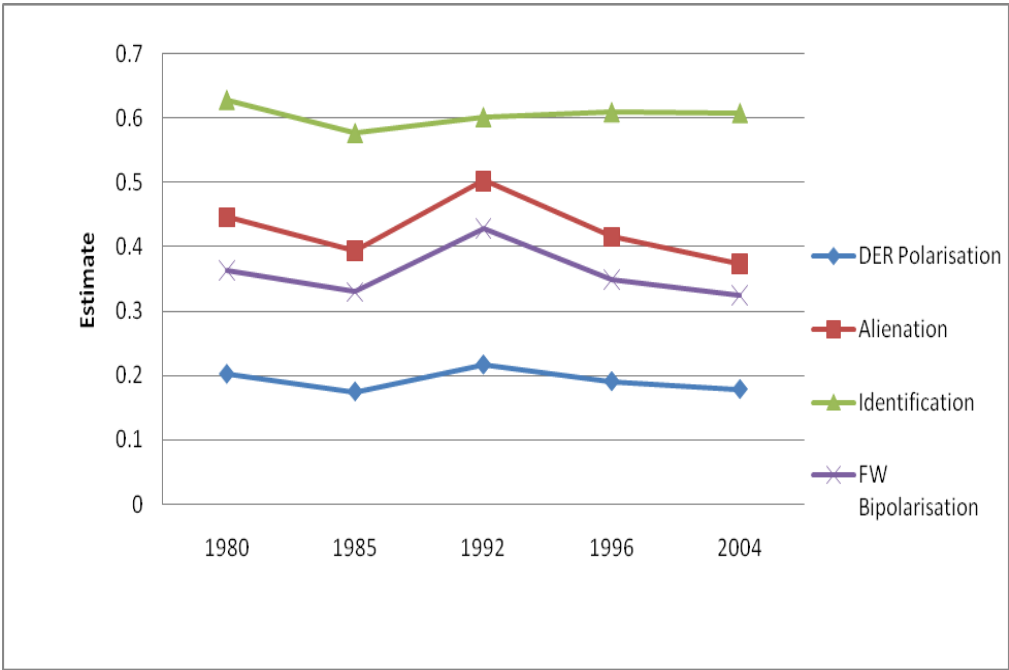
Fig. 12. Bi/Polarisation within households in the North
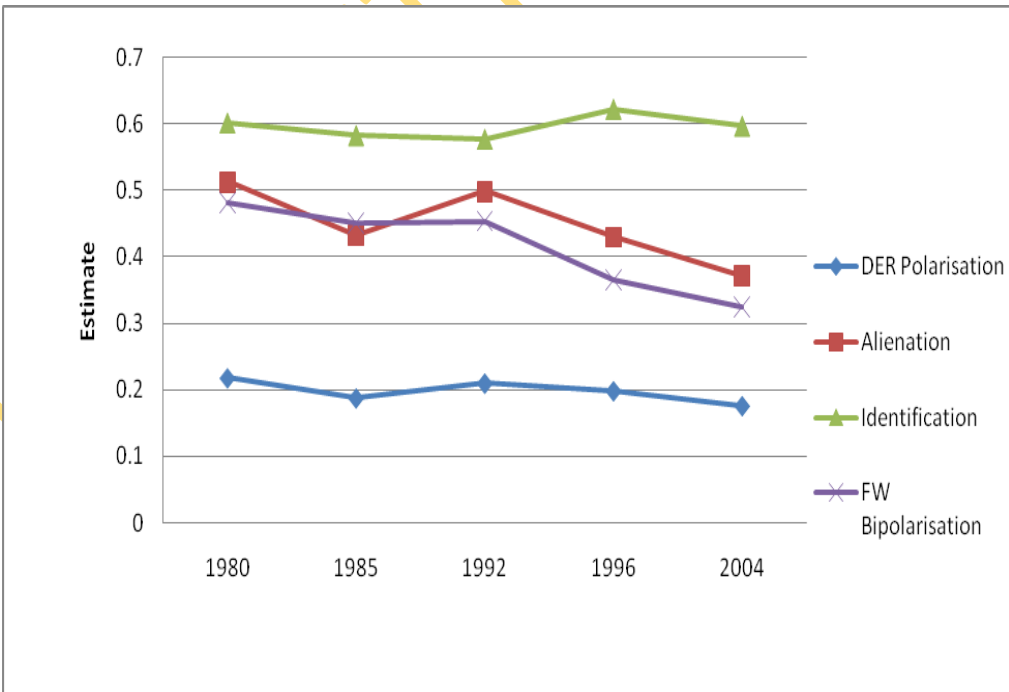
Fig. 13. Bi/Polarisation within households in the South

population of the opposing group, the non-poor, may not be of significant size to give effective antogonism (Esteban and Ray,1994; Duclos *et al*., 2004).

4.3.2.4 Polarisation and bipolarisation within households located in the south

Among the rural households in all the southern part of Nigeria, polarisation was 0.2180, 0.1876, 02101, 0.1985 and, 0.1759 and bipolarisation was 0.4814, 0.4511, 0.4537, 0.3651 and 0.3245 in 1980, 1985, 1992, 1996 and 2004 respectively. Polarisation, alienation, identification and bipolarisation reduced over the period. Comparing Figures 12 and 13 for 2004, bipolarisation was higher in the south (0.3245) than in the north (0.3240) while polarisation was higher in the north (0.1787) than in the south (0.1759). However, middle income group was created in 2004 in both parts of the country as their polarisation and bipolarisation dropped drastically between 1992 and 2004. This may be attributed to the effectiveness of programmes like FADAMA in boosting rural households income in the country.

4.3.2.5 Polarisation and bipolarisation within male and female household heads

Figure 14 shows polarisation among the males. Polarisation was 0.2411, 0.1842, 0.2191, 0.1958 and 0.1823 while bipolarisation was 0.4250, 0.3379, 0.4378, 0.3568 and 0.3449 in 1980, 1985, 1992, 1996 and 2004 respectively. Alienation and identification followed similar pattern over the same period. However, within female household heads, Figure 15, polarisation was 0.1792, 0.1702, 0.1979, 0.1890 and 0.1824 while bipolarisation was 0.4571, 0.3790, 0.5044, 0.4001 and 0.3460 in 1980, 1985, 1992, 1996 and 2004 respectively. This implies that among females, both bipolarisation and polarisation reduced between 1980 and 2004. But the identification force among the females did not follow the pattern of polarisation as the former increased while the latter reduced between 1992 and 2004; which means inequality indirectly reduced among the females within that period.

When income distribution between males (Figure 14) and females (Figure 15) were compared, both polarisation and bipolarisation were higher among females than males in 2004. Bipolarisation was higher among female than male over the five periods under consideration. This implies that a larger middle class was created among male- than
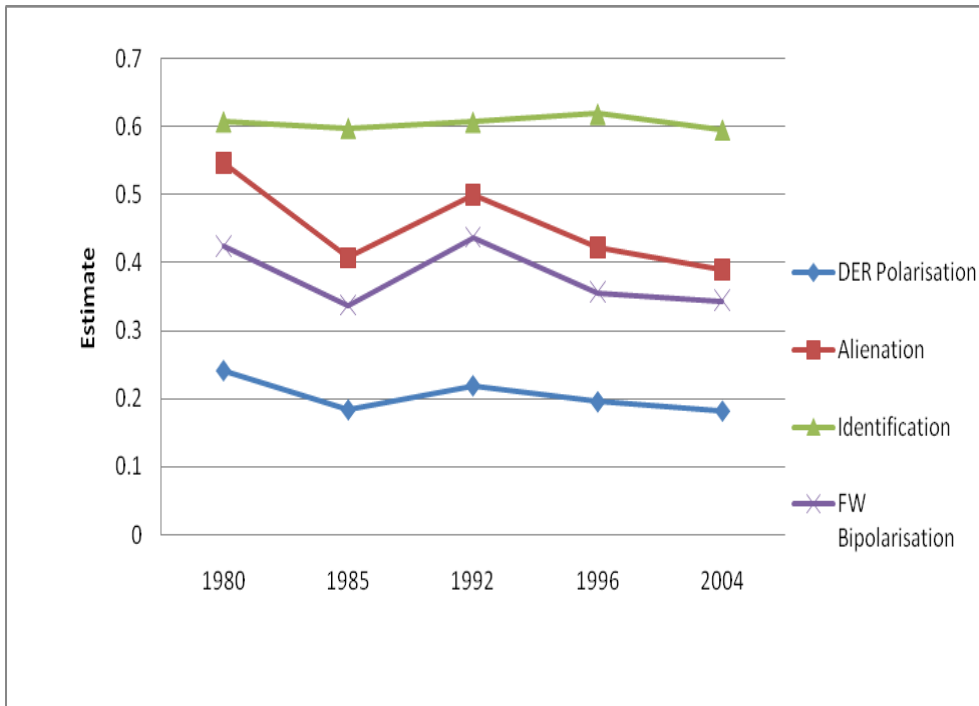
Fig. 14. Bi/Polarisation among male household heads
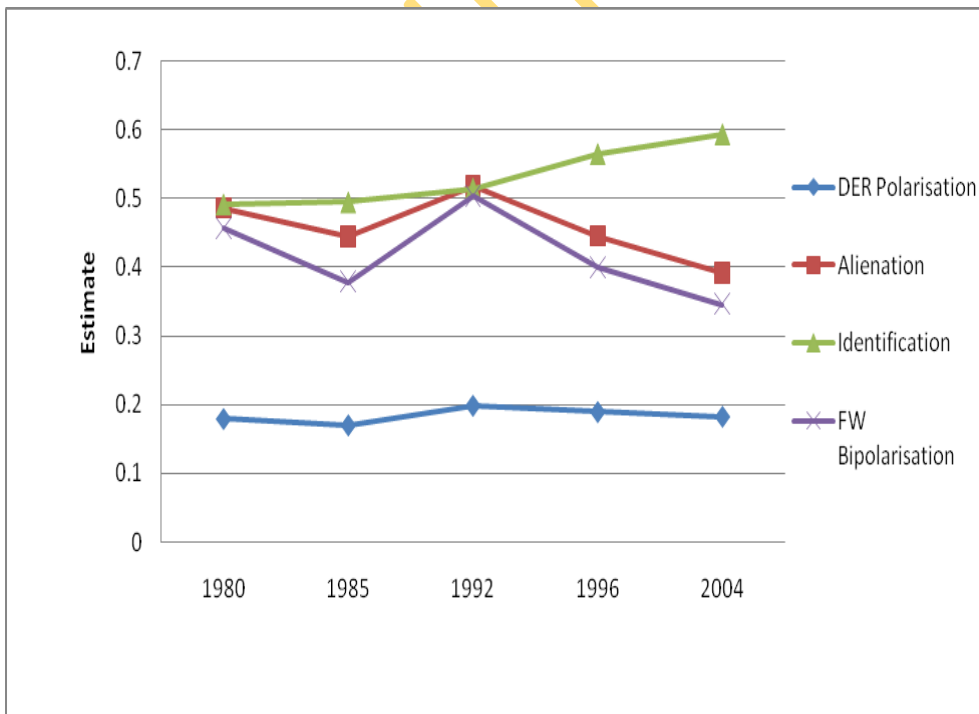
Fig. 15. Bi/Polarisation within female household heads

female-headed households. Gender has been an issue of concern in economic empowerment and income redistribution policies. The finding in this study tends to support the argument that such policies should be tailored to favour women more than men.

4.3.2.6 Polarisation and bipolarisation within wage and non-wage

Figures 16 and 17 show polarisation and bipolarisation of households that are of wage and non-wage employment respectively. Wage employment households, Figure 16, shows a departure from the pattern of polarisation seen so far. Polarisation was 0.1659, 0.1797, 0.1742, 0.1733 and 0.1799 while bipolarisation was 0.4037, 0.3650, 0.5233, 0.4674 and 0.3422 in 1980, 1985, 1992, 1996, and 2004 respectively. Alienation reduced from 0.4380 to 0.3846 while identification increased from 0.4981 to 0.5938 between 1980 and 2004. The households become more identified and less alienated among waged households for less antagonism which explains low polarisation. This implies that households inequality in terms of wage reduced, with increased identification within the upper group and lower group on the wage scale and reduced alienation between the two groups. This perhaps informed the increase in polarisation that is not so pronounced while bipolarisation reduced within the same period. Income distribution among wage employed households reflects diminishing bipolarity. This implies that in terms of wage employment, rural households were not alienated from each other between 1992 and 2004. This may be due to the low rate of wage employment in the rural areas as most of the household heads are of non-wage employment.

Among non-wage employment, Figure 17, polarisation, alienation, identification and bipolarisation reduced between 1980 and 2004. Polarisation was 0.2294, 0.1798, 0.2199, 0.1951 and 0.1833 while bipolarisation was 0.4306, 0.3357, 0.4393, 0.3583 and 0.3463 in 1980, 1985, 1992, 1996, 2004 respectively. Increased spread (polarisation) and increased polarity (bipolarisation) scaled down between 1980 and 2004, which implies that there was more middle income group along non-wage employment as there was among the wage employment.

However, whem Figures 16 and 17 are compared, non-wage employment has higher polarisation throughout the period, lower bipolarisation in 1985, 1992 and 1996,
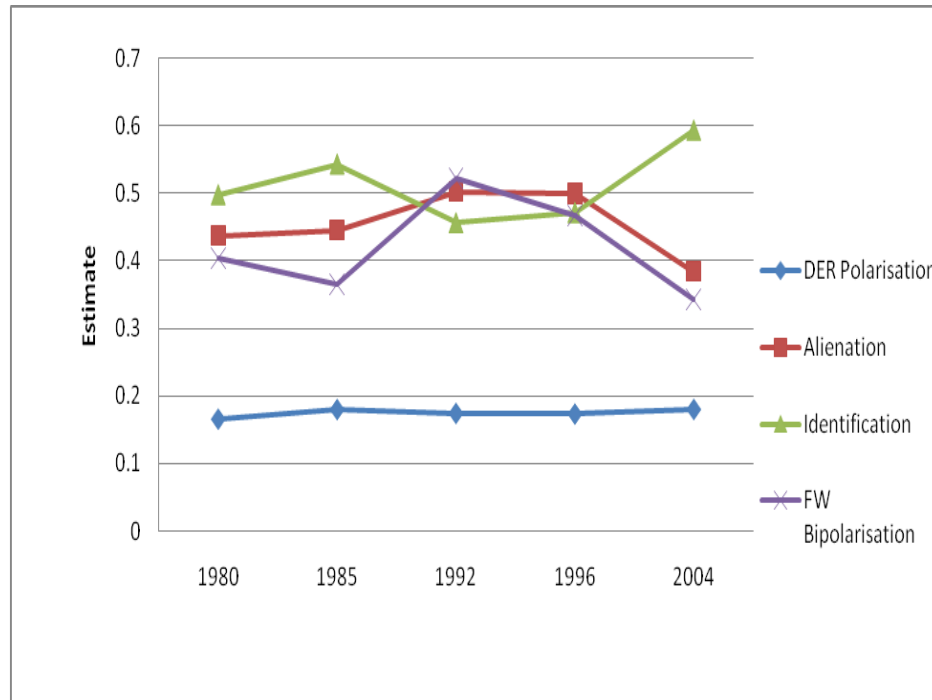
Fig. 16. Bi/Polarisation within wage employment household heads
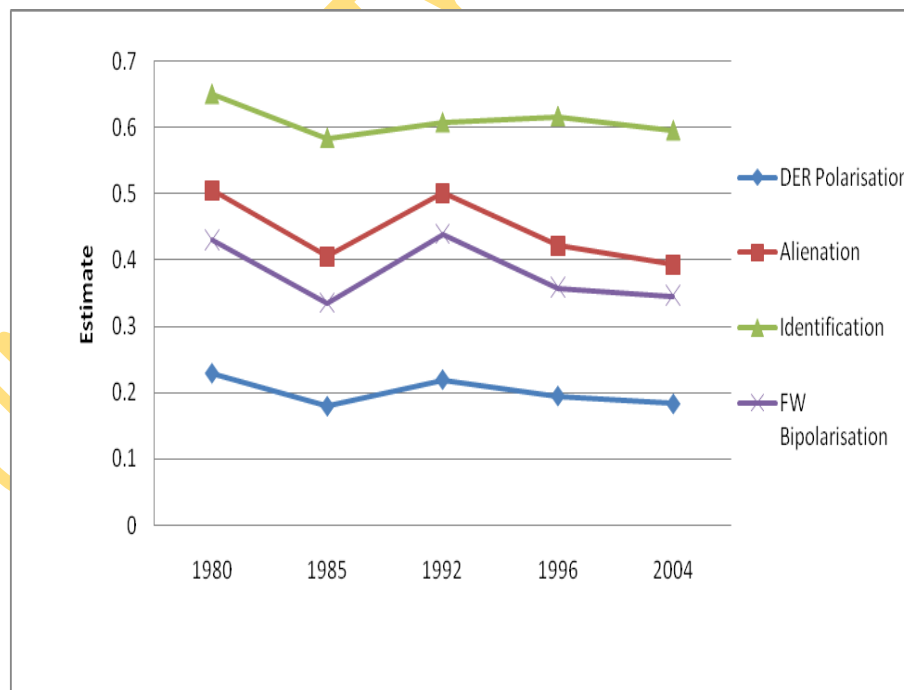
Fig. 17. Bi/Polarisation within non-wage employment household heads

and higher bipolarisation in 1980 and 2004 than the wage employment; which means there was more middle class among the wage employment household heads. Wage employment is somehow necessary in the rural area to reduce both polarisation and bipolarisation.

4.3.2.7 Polarisation and bipolarisation within formally educated and non-formally educated household heads

Figure 18 shows the polarisation and bipolarisation among households with minimum of primary education. Within the five periods of the research, primary education was the minimum level required in the country. Among these educated households, polarisation and bipolarisation reduced between 1980 and 2004. Similar patterns were observed among non-educated households (households with no formal education) as shown in Figure 19. Also, alienation and identification forces of polarisation declined between the period under consideration. Among the educated as shown in Figure 18, polarisation was 0.2135, 0.1798, 0.2140, 0.1882 and 0.1805 in 1980, 1985, 1992, 1996 and 2004 respectively. Bipolarisation among the educated was 0.4177, 0.3383, 0.4468, 0.3463 and 0.3372 for the same years.

Also, in Figure 19 among non-formally educated, polarisation was 0.2254, 0.1822, 0.2120, 0.2025 and 0.1867 while bipolarisation was 0.4441, 0.3470, 0.4452, 0.3728 and 0.3560 in the year 1980, 1985, 1992, 1996 and 2004 respectively. Polarisation follows the pattern of identification and alienation forces over the five-year period. This is an indication that bigger middle class was created in 2004 within educated and non-educated household heads. When Figures 18 and 19 in 2004 were compared, polarisation was higher (0.1867) among non-educated than educated (0.1805) and bipolarizaion was higher among non-educated (0.3560) than the educated (0.3372). Notwithstanding the estimate for bipolarisation, education will remain one factor that influences income distribution as the non-formally educated were more polarised in income distribution.

4.3.2.8 Overwiew of implications of polarisation and bipolarisation estimates within the households' demographic featues

The Tables 9 and 10 show the matrix of changes in middle class as reflected by DER polarisation and FW bipolarisation respectively in Figures 10 to 19 along the
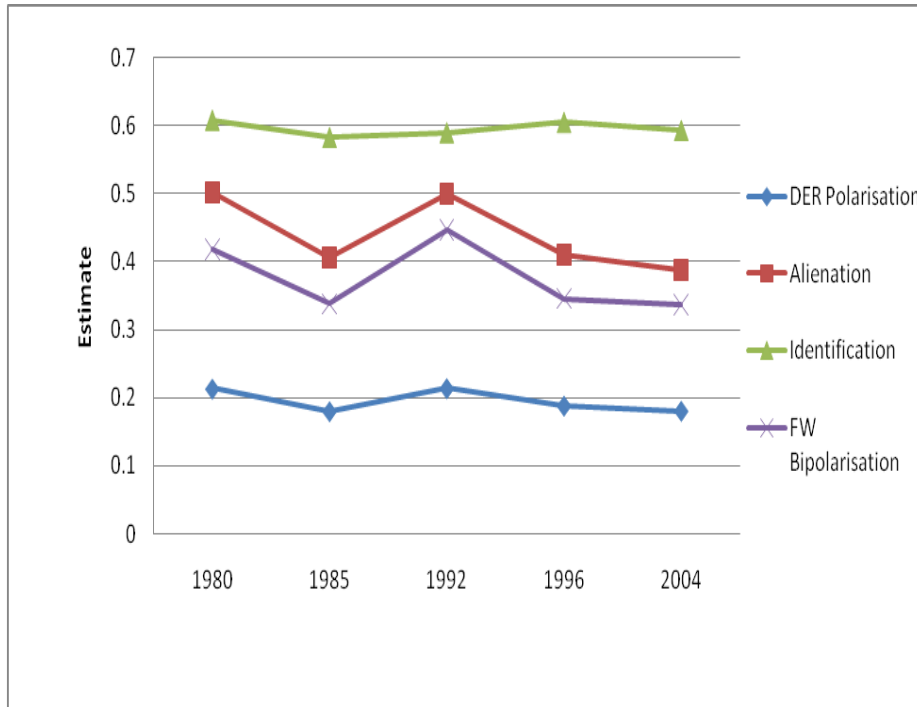
Fig. 18. Bi/Polarisation within formally educated household heads
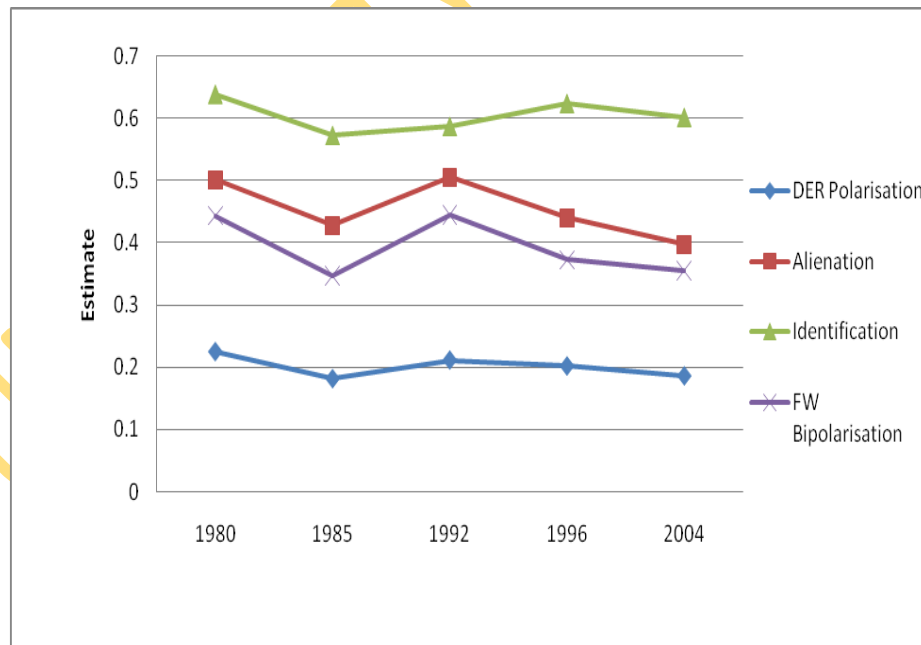
Fig. 19. Bi/Polarisation within non-formally educated household heads

Table 9. Implication of DER polarisation pattern across sub-populations

Demographic Sub-population	Year			
	1985	1992	1996	2004
Farming	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Non-farming	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
North	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
South	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Male	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created

Female	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Wage	Middle Class Reduced	Middle Class Created	Middle Class Created	Middle Class Reduced
Non-wage	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Formally educated	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Non-formally educated	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created

Source: Author's interpretation of polarisation estimates

Table 10. Implication of FW bipolarisation pattern across sub-population

Demographic Sub-population	Year			
	1985	1992	1996	2004
Farming	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Non-farming	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
North	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
South	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Male	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created

89

Female	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Wage	Middle Class Created	Middle class Reduced	Middle class Created	Middle class Created
Non-wage	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Formally educated	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created
Non- formally educated	Middle Class Created	Middle Class Reduced	Middle Class Created	Middle Class Created

Source: Author's interpretation of bipolarisation estimates

selected demographic features discussed earlier. In Table 9 by DER polarisation estimates, starting from 1980 as the reference year, middle class (MC) was created in 1985, 1996 and 2004 but MC reduced in 1992 among farming households. Within non-farming, the north and the south, MC reduced in 1992 but was created in 1985, 1996 and 2004. Among males and females, MC was also created in 1985, 1996 and 2004 but reduced in 1992. However, there is a different pattern among wage employment; MC reduced in 1985 and 2004 but was created in 1992 and 1996. Among non-wage, educated and non-educated, Table 9 shows that MC was created in 1985, 1996 and 2004 but reduced in 1992.

The direct implications of bipolarisation estimates in Figures 10 to 19 are shown in Table 10. Middle class (MC) was created in 1985, 1996 and 2004 but reduced in 1992 among farming, non-farming, north, south, male and female. Also, within wage employment household heads, MC was created in 1985, 1996 and 2004 but reduced in 1992. The MC behaviour among the waged households under bipolarisation differs from that of DER polarisation (Table 9) in which MC was created in 1992 and 1996 but reduced in 1985 and 2004. Moreover, among non-wage, educated and non-educated household heads, MC was created in 1985, 1996 and 2004 but reduced in 1992. The creation of more middle class in 2004 in all the demographic groups attest to the favourable policy and economic environment in the country with programmes like FADAMA, and Community and Social Development Project having helped in boosting rural income and closing income gaps between the rich and the poor.

This interpretation is on the basis that polarisation is the disappearance of the middle class. The MC is not only in the urban areas of Nigeria, it is also in the rural area since the rural individuals have income inequality (Aigbokhan, 2008) of 0.36, 0.42, 0.47 and 0.519 in 1985, 1992, 1996 and 2004 respectively. More especially, NBS (2007) reports that there is no significant difference between the size of the urban and rural middle classes because of the low level of urbanisation and Nigeria's population that is mostly rural. Consequetly, the interpretation of polarisation and bipolarisation as done is tenable. However, the interpretation may be taken with caution as households were not the same for all the five-year points.

4.3.3 Income polarisation and bipolarisation within the six geopolitical zones

As shown in Table 11, polarisation and bipolarisation followed the same pattern in all the zones as both decreased between 1980 and 1985, increased in 1992, and then moved down through 1996 to 2004. In 1980, 1985, 1992, 1996 and 2004, polarisation was 0.2019, 0.1753, 0.2286, 0.1966 and 0.1822 for the north-central (NC); 0.2074, 0.1765, 0.2150, 0.1952 and 0.1828 in the north-east (NE); 0.2209, 0.1818, 0.2308, 0.1885 and 0.1830 in the north-west (NW); 0.2128, 0.1915, 0.2373, 0.1915 and 0.1810 in the south-east (SE); 0.2551, 0.1991, 0.2165, 0.2147 and 0.1757 in the south-south (SS); 0.2210, 0.1912, 0.2119, 0.2076 and 0.1851 for the south-west (SW) in the stated years respectively.

Also shown in Table 11, for NC, bipolarisation was 0.3573, 0.3367, 0.4515, 0.3824, and 0.3342; NE had 0.3988, 0.3317, 0.4299, 0.3680 and 0.3050; NW bipolarisation was 0.3084, 0.3161, 0.4177, 0.3153 and 0.3083 in 1980, 1985, 1992, 1996 and 2004 respectively. The SE had bipolarisation of 0.4181, 0.3226, 0.4516, 0.3359 and 0.3183; SS bipolarisation was 0.5767, 0.3851, 0.4277, 0.3923 and 0.3344 while SW had 0.4111, 0.3726, 0.4560, 0.3552 and 0.2770 in the same five-point period.

There is relationship between these polarisation estimates with the inequality estimates of Aigbokhan (2008) and poverty estimates of NBS (2005). NC had inequality of 0.41, 0.39, 0.50 and 0.393; NE had 0.39, 0.40, 0.49 and 0.469; NW had 0.41, 0.43, 0.47 and 0.371; SE had 0.44, 0.40, 0.39 and 0.449; SS had 0.48, 0.39, 0.46 and 0.507; while SW inequality was 0.43, 0.40, 0.47 and 0.554 in 1985, 1992, 1996 and 2004 respectively (Aigbokhan, 2008). NBS (2005) reports poverty as NC: 32.2, 50.8, 46.0, 64.7 and 67.0; NE: 35.6, 54.9, 54.0, 70.1 and 72.2; NW: 37.7, 52.1, 36.5, 77.2 and 71.2; SE: 12.9, 30.4, 41.0, 53.5 and 26.7; SS: 13.2, 45.7, 40.8, 58.2 and 35.1 and SW: 13.4, 38.6, 43.1, 60.9 and 43.0 in 1980, 1985, 1992, 1996 and 2004 respectively. Poverty and inequality reduced from 1996 to 2004, so do polarisation and bipolarisation in the zones. In 2004, poverty was lower but inequality was higher while polarisation and bipolarisation were relatively higher in the southern zones than in the northern zones. Inequality and polarisation may move in the same or opposite directions (Wolfson, 1997), while poverty will lead to more polarisation if the poor and non-poor groups are significantly sized with disappeared middle class to oppose each other (Esteban and Ray, 1994).

The south-south (SS) geopolitical zone had the highest bipolarisation of 0.5767, 0.3851, 0.4277, 0.3923 and 0.3344 throughout the years of consideration, except in 1992 when that of the south-west (SW) was highest with 0.4560. The least bipolarisation came from the north-west (NW) with 0.3084, 0.3161, 0.4177, 0.3153 in 1980, 1985, 1992 and 1996 respectively, while in 2004, the south-west recorded the smallest bipolarisation (0.2770). These results are comparable to that of Awoyemi *et al*., (2009) for 1996 and 2004 that report bipolarisation of 0.51 and 0.35 for the north-east (NE), 0.44 and 0.38 for the north-west, 0.53 and 0.53 for the south-east (SE), and for the south-west, 0.51 and 0.51 for the two year periods respectively.

The reasons for higher bipolarisation in the south-south zone may be due to low level of education as the majority had below primary education. Neglect of the rural areas over the years through insufficient and ineffective government funding of agriculture, education and health could also have been responsible. Another possible factor may be the exploitation of the rural areas for oil with attendant problems like pollution, low agricultural productivity and the subsistence level of production. All these must have weakened the households' means of livelihood with low income-generating capacities and functionings. The consequence is the high income bipolarisation between the majority of the households and the few rich. These higher levels of bipolarisation in the south-south zone than in others support the report of Oyekale (2011) that the zone has higher multidimensional poverty than other geopolitical zones. Nevertheless, bipolarisation reduced in all the zones from 1996 to 2004. The various programmes like LEEMP and FADAMA aimed at improving rural income needs to be sustained to further reduce bipolarisation from 2004. If bipolarisation should rise as estimated in 1992, there might be repetition of the demonstrations witnessed during that time which would disrupt economic activities.

Polarisation from Table 11 shows that for 1980, 1985, and 1996, south-south zone had the highest estimates of 0.2551, 0.1991 and 0.2147 while in 1992 and 2004 highest polarisation estimates of 0.2373 and 0.1851 came from south-east and south-west zones respectively. The least polarisation in 1980, 1985, 1992, 1996 and 2004 of 0.2019, 0.1753, 0.2119, 0.1885 and 0.1757 came respectively from north-central, north-central, south-west, north-west and south-south. The reasons for higher bipolarisation in the south-south

zone, which include low level of education and neglect of the rural areas on agriculture, education and health, low land productivity due mostly to oil exploitation, are also responsible for the high polarisation observed in the zone. The higher polarisation in the south-south zone also supports Oyekale (2011) that the zone had the highest level of multidimensional poverty compared with other zones. For the northern zones, the low bipolarisation and polarisation indicates an income distribution that has the middle income group not depleted compared with the southern zone. This may be due to effective funding of the rural sector in areas of agriculture, education and health from the various governments of the northern zones. Also, the zones do not have low land productivity for agriculture resulting from pollution and erosion as in the southern zones.

However, the overall pattern of polarisation is similar in all the zones. Where the alienation is highest, polarisation is highest and where it is lowest, polarisation is lowest as shown in Table 11. Generally, bipolarisation estimates are higher than polarisation throughout the period and for all the zones. Polarisation estimates for 1996 and 2004 are higher than that of Awoyemi *et al*. (2009) because DER polarisation estimate here is based on identification parameter, alpha = 1.0 while that of the mentioned author is 0.5 with the estimates for north-central, north-east, north-west, south-east, south-south and south-west as 0.25, 0.25, 0.24, 0.23, 0.24 and 0.24 in 2004 respectively. The results as presented in Table 11 show perhaps that an emerging level of bipolarisation and polarisation are becoming evident within Nigerian geopolitical zones and is higher in the southern zone than in the northern zone, except in 2004, probably emanating from the response of households to and effect of socio-economic policies and programmes like NAPEP and FADAMA.

In 1980, SS had highest polarisation (0.2551) and bipolarisation (0.5767) while NC had the least polarisation (0.2019), and the least bipolarisation (0.3084) was from NW. In 1980, the economy was stable with low poverty level of 27.2 per cent for the country and 13.2, 12.9 and 37.7 per cent for SS, SE and NW respectively (NBS, 2005). The result implies that there was a larger middle class in the SE and NW in 1980. In that1980, Nigeria macroeconomic indicators were positive with non-poor of 72.8% (NBS, 2005).

Table 11. Polarisation and bipolarisation in the six geopolitical zones

Zone	Item/Year	1980	1985	1992	1996	2004
North-Central	FW Bipolarisation	0.3573	0.3367	0.4515	0.3824	0.3342
	Std. Error	0.0143	0.0185	0.0204	0.0107	0.0052
	DER Polarisation	0.2019	0.1753	0.2286	0.1966	0.1822
	Std Error	0.0098	0.0054	0.0102	0.0045	0.0024
	Alienation	0.4392	0.4079	0.5153	0.4251	0.3994
	Identification	0.6286	0.5563	0.6176	0.6067	0.5694
North-East	FW Bipolarisation	0.3988	0.3317	0.4299	0.3680	0.3050
	Std. Error	0.0250	0.0200	0.0240	0.0108	0.0044
	DER Polarisation	0.2074	0.1765	0.2150	0.1952	0.1828
	Std Error	0.0092	0.0066	0.0109	0.0049	0.0019
	Alienation	0.4764	0.3705	0.4960	0.4306	0.3492
	Identification	0.6013	0.6020	0.5887	0.6031	0.6582
North-West	FW Bipolarisation	0.3084	0.3161	0.4177	0.3153	0.3083
	Std. Error	0.0187	0.0149	0.0173	0.0077	0.0040
	DER Polarisation	0.2209	0.1818	0.2308	0.1885	0.1830
	Std Error	0.0092	0.0063	0.0104	0.0058	0.0022
	Alienation	0.4233	0.3861	0.4950	0.3951	0.3609
	Identification	0.7423	0.6177	0.6577	0.6338	0.6450
South-East	FW Bipolarisation	0.4181	0.3226	0.4516	0.3359	0.3183
	Std. Error	0.0301	0.0249	0.0337	0.0117	0.0046
	DER Polarisation	0.2128	0.1915	0.2373	0.1915	0.1810
	Std Error	0.0107	0.0099	0.0154	0.0062	0.0021
	Alienation	0.4677	0.3940	0.5563	0.4119	0.3654
	Identification	0.6169	0.6376	0.6196	0.6175	0.6225

Zone	Item/Year	1980	1985	1992	1996	2004
South-South	FW Bipolarisation	0.5767	0.3851	0.4277	0.3923	0.3344
	Std. Error	0.0354	0.0211	0.0187	0.0119	0.0053
	DER Polarisation	0.2551	0.1991	0.2165	0.2147	0.1757
	Std Error	0.0104	0.0113	0.0079	0.0058	0.0041
	Alienation	0.5405	0.4573	0.4778	0.4433	0.3432
	Identification	0.6632	0.5988	0.6238	0.6598	0.6442
South-West	FW Bipolarisation	0.4111	0.3726	0.4560	0.3552	0.2770
	Std. Error	0.0199	0.0196	0.0204	0.0173	0.0071
	DER Polarisation	0.2210	0.1912	0.2119	0.2076	0.1851
	Std Error	0.0164	0.0090	0.0073	0.0085	0.0023
	Alienation	0.4978	0.4291	0.4913	0.4351	0.3751
	Identification	0.6394	0.5955	0.5700	0.6525	0.6221

Source: Author's estimates

In 1985, highest polarisation (0.1991) and bipolarisation (0.3851) were from the SS while lowest polarisation (0.1753) and bipolarisation (0.3161) came from the NC and NW respectively. NBS (2005) reports poverty levels of 50.8, 54.9, 52.1, 30.4, 45.7 and 38.6 per cent in NC, NE, NW, SE, SS and SW respectively. This implies that there was less middle class in the southern zone than the north during the time.

In 1992, the least polarisation (0.2119) and bipolarisation (0.4177) were obtained in the SW and the NW while highest polarisation (0.2373) and bipolarisation (0.4560) were from the SE and the SW respectively. Poverty profile then was 46.0, 54.0, 36.5, 41.0, 40.8 and 43.1 per cent in NC, NE, NW, SE, SS and SW respectively. This was post-SAP era when the Nigerian economy failed to positively yield to the policies and programmes aimed at meeting the needs of the poor. From the estimates, there was more middle class in the north than in the south in 1992. However, one would have expected polarisation to be higher where poverty was higher, but it seems not so between 1980 and 1992. For polarisation and bipolarisation estimates to be high, the two opposing groups emerging must be sizeable enough to engender antagonism through alienation between the two groups and identification within each group. If few (many) individuals are poor such that their group is very small (large) relative to the rich individuals, polarisation may not be pronounced as effective antagonism resulting from an interplay of identification and alienation forces may be low. A larger rich group or population proportion pushes the middle income level towards the upper end whereas a lager poor population proportion moves the middle income level to the lower end of the income distribution. This may be a limitation to polarisation measure as it could reflect low values translating to more middle class in a situation where the middle income is towards the lower or upper end of the income distribution. This is a distribution of a tiny fraction or a very small group of the population against a very large group with low polarisation (Esteban and Ray, 2004)

However, a point to note is that in 1996, SS had the highest bipolarisation (0.3923) and polarisation (0.2147) among all the zones. That year was in the period of the Ogoni people and the south-south struggle. One of the effects of polarisation is conflict which was pronounced in the zone between the people and the State made up of the leaders belonging to the upper income group. The conflict emanated from increasing identification within the people forming into a group with high poverty level of 58 per

cent (NBS, 2005) in the zone. The non-poor of 42 per cent of which the State is a part, is a reasonable population proportion from which the poor people felt alienated. This alienation of the poor from the state with environmental degradation and poor land productivity negatively affected their income. The effective combination of identification and alienation forces led to demonstrations and conflicts.

In 2004, poverty level by zones was 67.0, 72.2, 71.2, 26.7, 35.1 and 43.0 (NBS, 2005) while polarisation estimates were 0.1822, 0.1828, 0.1830, 0.1810, 0.1757, and 0.1851 in NC, NE, NW, SE, SS, and SW respectively. These levels of polarisation and poverty show a relationship that indicates that where poverty is high polarisation is high. This shows that there were more middle class in the southern zones than in the northern zones in 2004. The polarisation estimates are comparable with that of Awoyemi and Abdelkrim (2009) in 2004 with alienation parameter, alpha = 0.5 of 0.25, 0.25, 0.24, 0.23, 0.24 and 0.24 for NC, NE, NW, SE, SS, and SW zones respectively. The report states that the northern zone seems to be more polarised than the southern zone in 2004 probably as a result of high level of similarities in attributes within the zones and the positive feelings towards the group as reflected by high levels of identification which Table 11 also reflected. Looking at the Table 11 generally, it seems polarisation is more of the southern zones, especially in the SS, than the northern zones when all the five years are considered. Also the bipolarisation estimates indicate that more middle class is created in the SW zone of the country in 2004.

4.3.4 Polarisation within socio-economic dimensions in the six geopolitical zones

There exist varying patterns of polarisation across the zones along the socio-economic dimensions under consideration as shown in Figures 20 to 29. The following abbreviations are relevant for discussion in this sub-section: north-central (NC), north-east (NE), north-west (NW), south-east (SE), south-south (SS) and south-west (SW). Since this study was not set out to compare polarisation and bipolarisation, the former was considered in order to establish its extent and pattern across the sub-population in each of the zones of the country.

4.3.4.1 Polarisation among farming households across zones

Among farming households in the north-central (NC), as shown in Figure 20, polarisation was 0.1846, 0.1687, 0.2057, 0.1857 and 0.1758 in 1980, 1985, 1992, 1996 and 2004 respectively. In the north-east (NE), polarisation was 0.1873, 0.1661, 0.1802, 0.1852 and 0.1750 among farming households. Within the same sub-group in the north-west (NW), it was 0.1796, 0.1741, 0.2036, 0.1847 and 0.1802 for the same years respectively. Polarisation was 0.1831, 0.1640, 0.1825, 0.1743 and 0.1733 in the south-east (SE); 0.2494, 0.1760, 0.1980, 0.2005 and 0.1824 in the south-south (SS); 0.1572, 0.1764, 0.1945, 0.1925 and 0.1630 in the south-west (SW) for the stated years respectively. SS had the highest estimate of 0.2494 in 1980 and the least (0.1572) was from the SW. In 1985, polarisation increased in the SW but reduced in other zones among farming households as shown in Figure 20.

By 1992, polarisation increased and reduced through 1996 to 2004. It was highest (0.2057) in the NC in 1992 and lowest (0.1630) in the SW in 2004. This result may be due to the high rate of poverty that increased from 43% to 69% in 1992 and 1996 (Okojie *et al*., 2001). Relatively higher polarisation was witnessed in 1992 if all the zones are considered together as shown in Figure 20. The upward movement of polarisation between 1985 and 1992 may be connected to the failure of SAP (NBS, 2005) in enhancing rural income. Polarisation decreased in 2004, which indicates the creation of more middle class. The size of the middle class among farming households was 31.41% and 26.85%, that of the lower class was 53.33% and 62.08 while upper class was 15.26% and 11.08% in 1996 and 2004 (NBS, 2007). The polarisation shows that there is need to sustain existing programmes like FADAMA in the rural areas to further boost the reduction in polarisation.

4.3.4.2 Polarisation among non-farming households across zones

Figure 21 shows the polarisation among non-farming households in all the six geopolitical zones of Nigeria. In the NC, the highest polarisation estimate of 0.2208 was in 1992 while the lowest was 0.1762 in 1985. In the NE, the highest estimate was 0.2465 in 2004 and the least (0.1934) in 1980. In the NW, the largest estimate was 0.2408 in 1980 while the smallest (0.1634) was in 1985. For SE, the highest estimate occurred in 1996

99
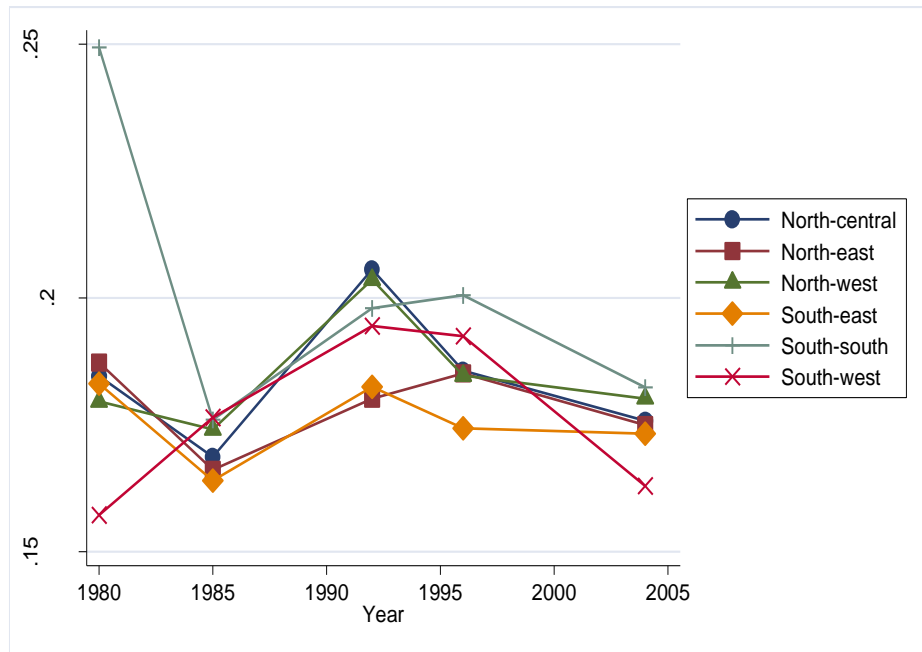
Fig. 20. DER polarisation within farming households across geopolitical zones
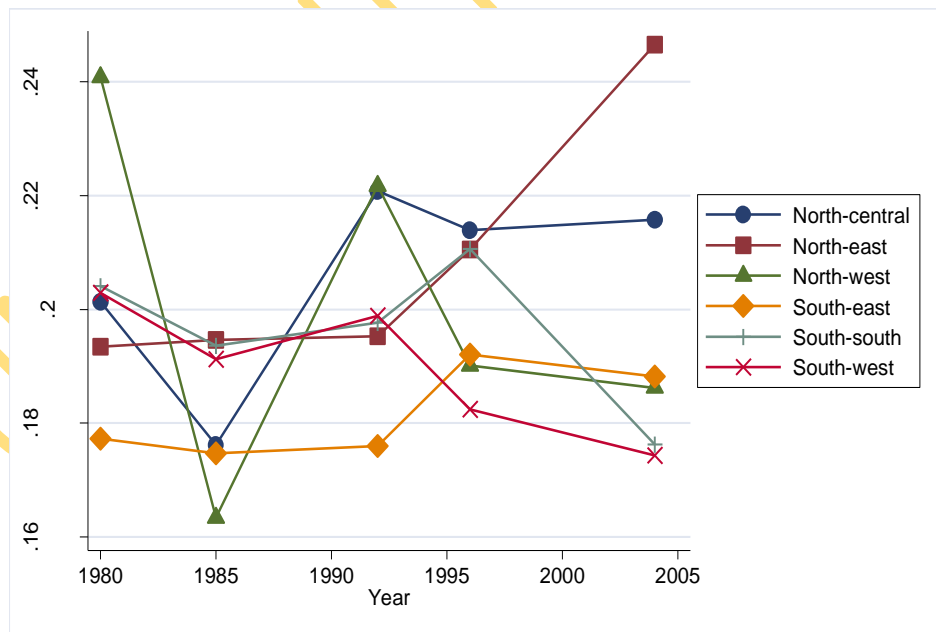
Fig. 21. DER polarisation within non-farming households across geopolitical zones

with the value 0.1921 while the least was 0.1747 in 1985. In SS, polarisation was highest in 1996 of 0.2106 and least in 2004 with 0.1763. In the SW, polarisation was highest with the value 0.2029 in 1980 and least in 2004 of 0.1743 as shown in Figure 21. This shows that the pattern of polarisation differed among non-farming households across the geopolitical zones in Nigeria with the middle class having thinned out more in the NE in 2004 with polarisation of 0.2465 than other zones. Households that were non-farming were probably on wage employment or non-wage employment in other economic activities of the informal sector like carpentry. The wage employment requires skills from formal education which most of the household heads did not have. Also only very few individuals are usually involved in informal activities in the rural areas with low economic activity and income. These could have increased the gap between the poor and the rich. NE and NC require more attention in bringing polarisation down. Attention should be paid more to this zone to encourage the size of the middle class among non-farming individuals. In 2004, a comparison of Figures 20 and 21 showed that polarisation was less among farming than non-farming households in all the zones, except in SS where it was higher among farming than non-farming households. NBS (2005) reports that poverty level was 62% among farming and 54% among non-farming households, which somehow explains the levels of polarisation as obtained.

4.3.4.3 Polarisation among retirement age and non-retirement age across zones

Among the household heads that were of retirement age as presented in Figure 22, for the NC, polarisation was highest (0.2028) and least (0.1746) in 1992 and 1985 respectively. In the NE, polarisation was 0.1667 as least estimate in 1985 and highest in 1980 with the value of 0.1917. In the NW, highest estimate of 0.2082 was witnessed in 1992 and the least of 0.1719 in 1985. For SE, the largest polarisation index occurred in1980 and 1992 with the value 0.1815 while the smallest was 0.1709 in 1985. In the SS, polarisation was highest in 1980 with the value of 0.2188 and least in 2004 with 0.1788. However, for the SW, polarisation was highest (0.1932) in 1992 and least (0.1586) in 2004. It was only in the SW that the middle class was largest in 2004 among the retirement age with least polarisation estimate. This may not be unconnected with the
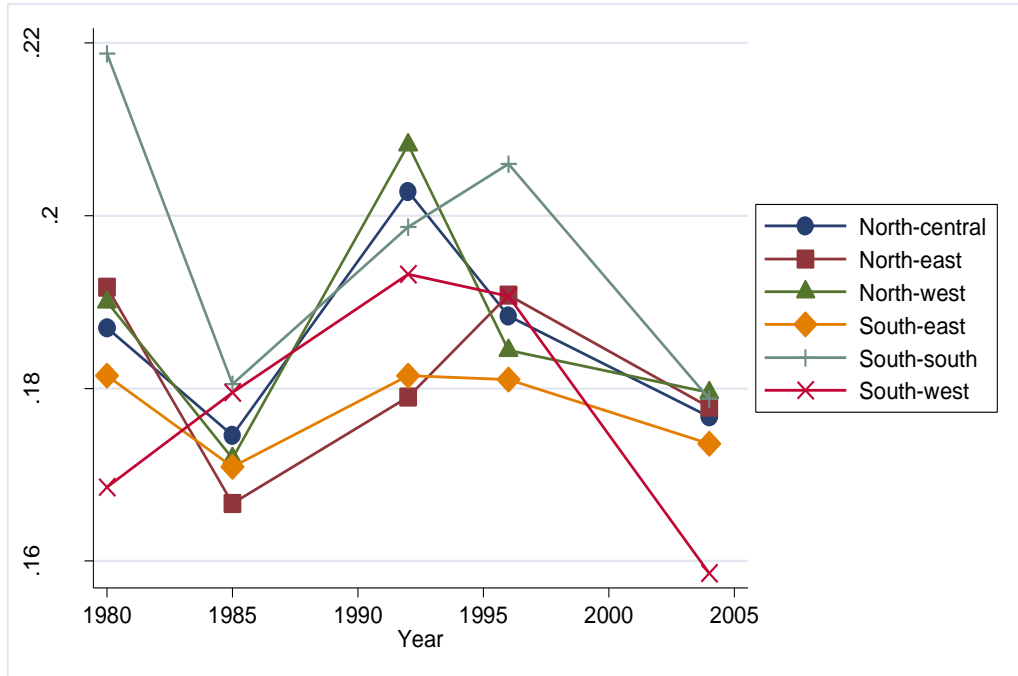
Fig. 22. DER polarisation within retirement age household heads across geopolitical zones
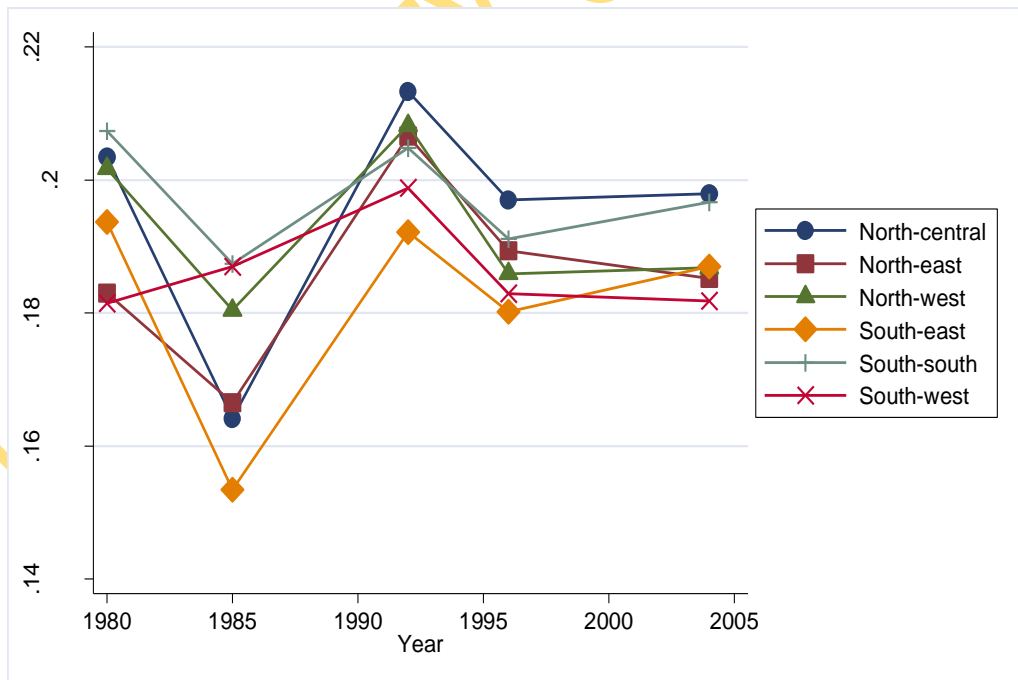
Fig. 23. DER polarisation within non-retirement age household heads across geopolitical zones

various government initiatives at ameliorating the socio-economic problems of that zone which includes Lagos State. NBS (2007) reports that 42.34 per cent and 60.32 per cent of the retired aged and other dependant individuals (students, unemployed and inactive) were in the lower class while 26.43 per cent and 24.97 per cent were in the middle class in 1996 and 2004 respectively. The middle class estimates were very low in this group of individuals. However, the estimates of polarisation considered only the retired and indicated that more middle class was created among them in the rural area in 2004. The rural household heads in the retirement age are somehow homogeneous in terms of formal education, productivity and income which could have been possible reason for the low polarisation between them.

However, among household heads that were below the retirement age, that is, of active age as depicted in Figure 23, in the NC, polarisation was least and highest with the values of 0.1641 and 0.2133 in 1985 and 1992 respectively. In the NE, the highest polarisation was 0.2066 in 1992 and the least was in 1985 with the value of 0.1665. In the NW, the highest polarisation was 0.2082 while the least was 0.1804 in 1992 and 1985 respectively. For SE, polarisation was highest in 1980 with value of 0.1937 while the least was 0.1534 in 1985. But in the SS, highest polarisation was 0.2074 in 1980 and the least 0.1874 in 1985. In the SW, highest polarisation was 0.1988 in 1992 and the least estimate was 0.1815 in 1980. These estimates reveal that there was an appreciable improvement in income distribution towards year 2004 but there was higher income polarity in NC and SS compared with other zones among active age individuals. The creation of more middle class in 2004 in all the zones corroborates NBS (2007) that among working group, more middle class, about 7% and upper income group, about 4% were created in the economy.

In 2004, when Figures 22 and 23 were compared, the polarisation estimates in all the zones were below and above 0.1800 among the retirement and non-retirement age respectively. The reason for this could have been the high rate of unemployment for the active age and neglect of farming activities by individuals in the active age for wage or non-wage employment activities that were not readily available, thus leading to high polarisation among those in active age.

4.3.4.4: Polarisation among male and female household heads across zones

Among male-headed households as shown in Figure 24, polarisation estimate was highest in 1992 with the value 0.2044 and least with 0.1719 in 1985 in the NC. Within the NE among the male-headed households, the largest polarisation of 0.1919 occurred in 1980 and the smallest 0.1646 in 1985. For NW, the least polarisation was 0.1759 in 1985 and the highest in 1992 of the value 0.2099. In the SE, polarisation was largest in 1980 with the value 0.1833 and smallest in 1985 with the value 0.1665. SS has the highest polarisation of 0.2219 in 1980 and lowest 0.1803 in 2004. For the SW, largest polarisation was 0.1929 and smallest 0.1631 in 1992 and 2004 respectively. This reveals that the males have not fared well as such during the years under consideration on polarisation with the highest polarisation occurring in the 1980s and 1990s. Efforts may have to be sustained in all the zones to further reduce polarisation among the males. The trend shows that more middle class households were being created among male headed households across the geopolitical zones between 1990 and 2004 in the rural area, though Awoyemi and Abdelkrim (2009) report that polarisation was higher among male than female for the entire country.

Among female household heads however (Figure 25), in the NC, polarisation was highest in 1980 with 0.2208 and least in 1985 with the value 0.1587. It was highest in 1980 and lowest in 2004 with 0.1967 and 0.1775 in the NE zone. For the NW, polarisation was least in 2004 with the value of 0.1801 and highest in 1996 with 0.3315; which was the highest in the entire Figure 25. This may be connected with the high poverty level of 71.2% (NBS, 2005) that could have affected the females in the NW among all the zones in 1996. In the SE, polarisation was largest in 1992 with the value 0.1882 and smallest, 0.1683 in 1985. SS has the largest index of 0.2426 in 1992 and smallest estimate of 0.1744 in 1985. In the SW however, polarisation index of 0.2203 in 1992 was the highest and 0.1637 lowest in 2004. All the zones witnessed improved income distribution among the female towards 2004 especially in SS and NC. Aigbokhan (2000) reports that polarisation was more pronounced among the entire country's females while males (66.51%) are poorer than females (55.39%) in the country (NBS, 2005). When Figures 24 and 25 are compared, the polarisation estimates for both male and female are very close in all the zones, though those of the female are higher, which somehow indicates that the
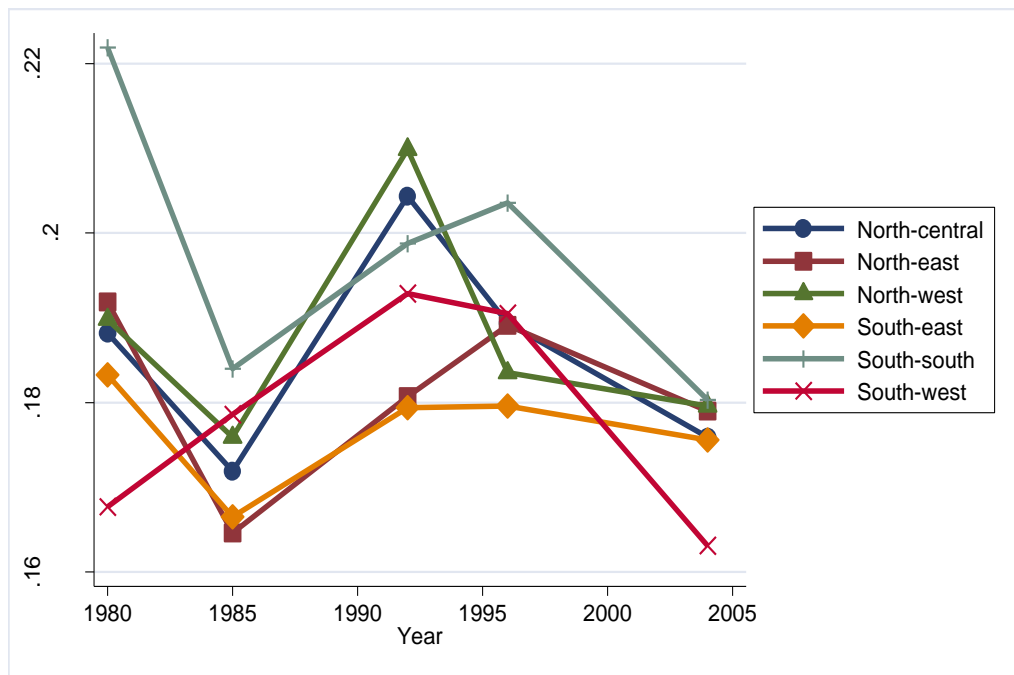
Fig. 24. DER polarisation among male household heads across geopolitical zones
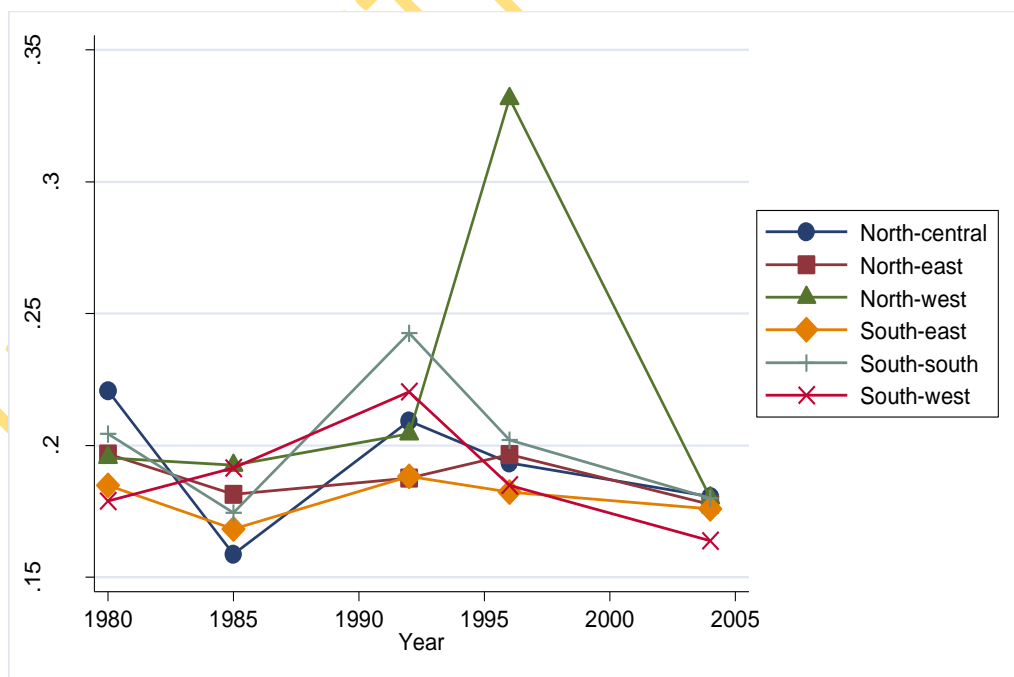
Fig. 25. DER polarisation among female household heads across geopolitical zones

level of the disappearance of the middle class may be similar. This may not be unconnected with Olaniyan and Awoyemi's (2005) views that inequality index is similar no matter the gender of the household head in the rural area as the Gini index for both sexes is 50.8, and that gender inequality is not a prominent factor in overall expenditure inequality because the between group component is less than 1 per cent.

From Figure 25, females had large polarisation values of 0.3315 and 0.1801 in 1996 and 2004 in the NW respectively. In 2004, the female group had 0.1803 in the SS and 0.1637 in the SW as the males (Figure 24) had 0.1631 also in the SW. The observed higher polarisation among the females may be due to their lagging behind in human development and economic empowerment (British Council Nigeria, 2012). Also it was in the analysed data that more females than males had no formal education. Thus, the higher polarisation among the female than the male may be due to disadvantaged female gender in education and economic empowerment.

4.3.4.5 Polarisation among formally educated household heads across zones

As shown in Figure 26, among educated households in the NC, polarisation was highest in 1992 with the value 0.2064 and least in 1985 with the value 0.1700. In the NE, polarisation was highest in 1980 with the value 0.1926 and lowest in 1985 with 0.1659. For NW, polarisation was highest in 1992 with the value 0.2018 and least in 1985 with the value 0.1737. SE had an estimate of 0.1927 as the highest in 1992 and the lowest estimate of 0.1649 in 1985. Also Figure 26 shows that in the SS, polarisation was highest in 1980 with the value 0.2244 and least in 1985 of the value 0.1801. However for SW, polarisation was highest in 1992 with 0.1936 and lowest in 1980 with the value 0.1617. Among the educated households, income polarisation has improved favourably for the middle class, especially towards 2004. Aigbokhan (2008) reports that poverty increased between 1980 and 1996 and decreased between 1996 and 2004 across all education groups, but poverty is more pronounced among non-educated individuals. This somehow partly explained the decline in polarisation between 1996 and 2004 among the educated household heads.

4.3.4.6 Polarisation among non-formally educated household heads across zones

Among the household heads with no formal education, Figure 27 shows that in the

106
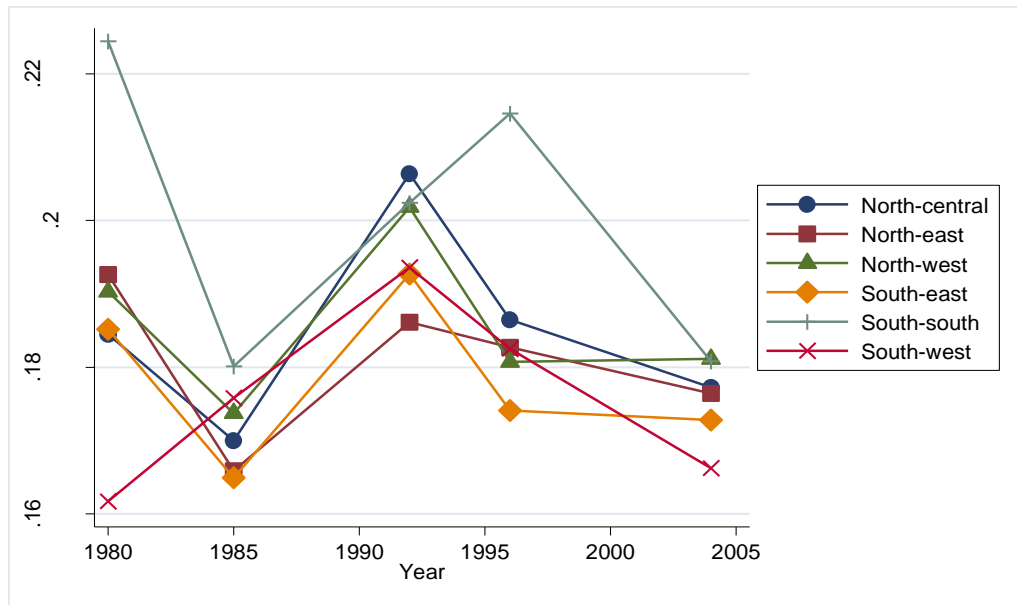
Fig. 26. DER polarisation within formally educated household heads across
geopolitical zones
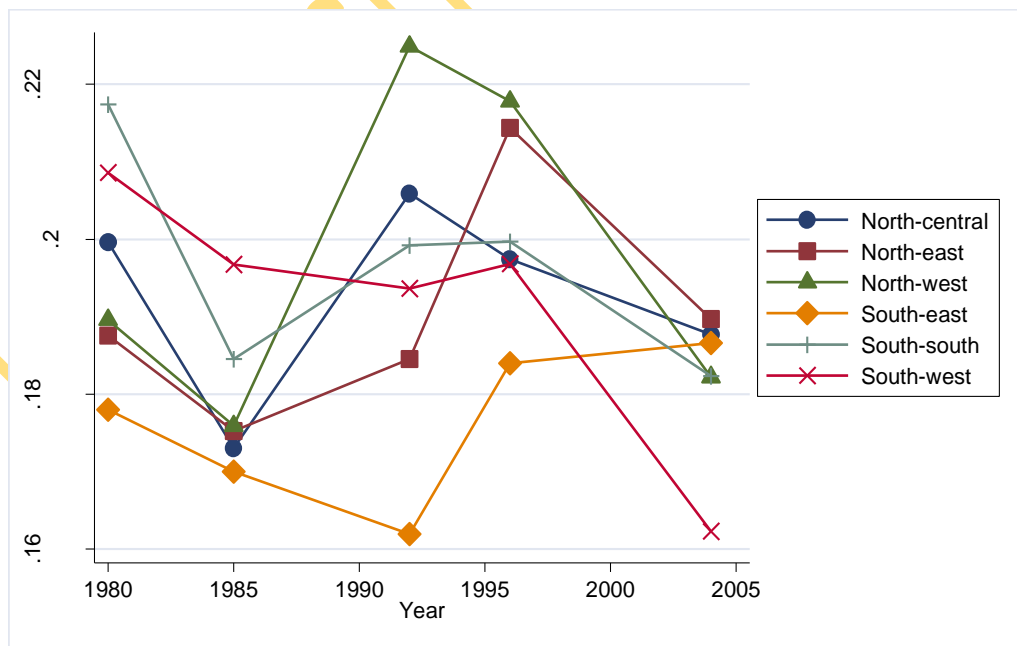
Fig. 27. DER polarisation within non-formally educated household heads across
geopolitical zones

NC, polarisation was highest in 1992 with the value 0.2059 and lowest 0.1730 in 1985. In the NE, the highest polarisation occurred in 1996 with the value 0.2144 and the least in 1985 of 0.1752. For NW, the largest index was 0.2249 in 1992 and 0.1759 in 1985 as the smallest. SE witnessed the highest polarisation of 0.1866 and the least value of 0.1619 in 2004 and 1992 respectively. In the SS, polarisation was highest in 1980 and least in 2004 with the values 0.2174 and 0.1823 respectively. But in the SW zone, largest polarisation index was 0.2086 in 1980 and the smallest 0.1623 in 2004. Households without education experienced reductions in income polarity between 1980 and 2004 in all the zones but better in SW, SS and NW zones. This overall trend of reduction agrees with the reports of poverty (NBS, 2005) and inequality (Aigbokhan, 2008) which reduced between 1996 and 2004 indicating that income distribution was better in 2004 than in the previous years. If Figures 26 and 27 are compared, polarisation was generally higher among non-formally educated than formally educated individuals in all the zones, considering all the years. Poverty incidence was higher among non-educated with 30.2, 51.3, 46.4, 72.6 and 68.7, while those with primary education was 21.3, 40.6, 43.3, 54.4 and 48.7 per cents in 1980, 1985, 1992, 1996 and 2004 respectively (NBS, 2005). Income distribution has somewhat not favoured the non-educated. The non-educated household heads of below primary education constituted the majority of the rural households in the analysed data.

4.3.4.7 Polarisation among wage employment household heads across zones

Figure 28 shows income polarisation among household heads in wage employment in all the geopolitical zones. In the NC, income polarisation was highest in 1980, with 0.2682 and it was least in 1985 with 0.1746. For NE, the highest value was 0.2380 in 1996 and the lowest was 0.1811 in 2004. In the NW, polarisation was highest in 1996 with the value 0.3299 and least in 1985 with the value 0.1780. SE experienced the highest polarisation in 1992 with the value 0.1813 and lowest polarisation of 0.1710 in 1985 and same in 2004. In the SS, largest polarisation was 0.2656 in 1996 and smallest (0.1793) in 2004. SW had highest polarisation of 0.2064 in 1992 and least estimate of 0.1650 in 2004. This shows that SE and SW zones experienced improved income distribution towards 2004. Of particular note is 1996 in the SS when polarisation was highest among wage employment households. This possibly can be attributed to the time the Shell Petroleum
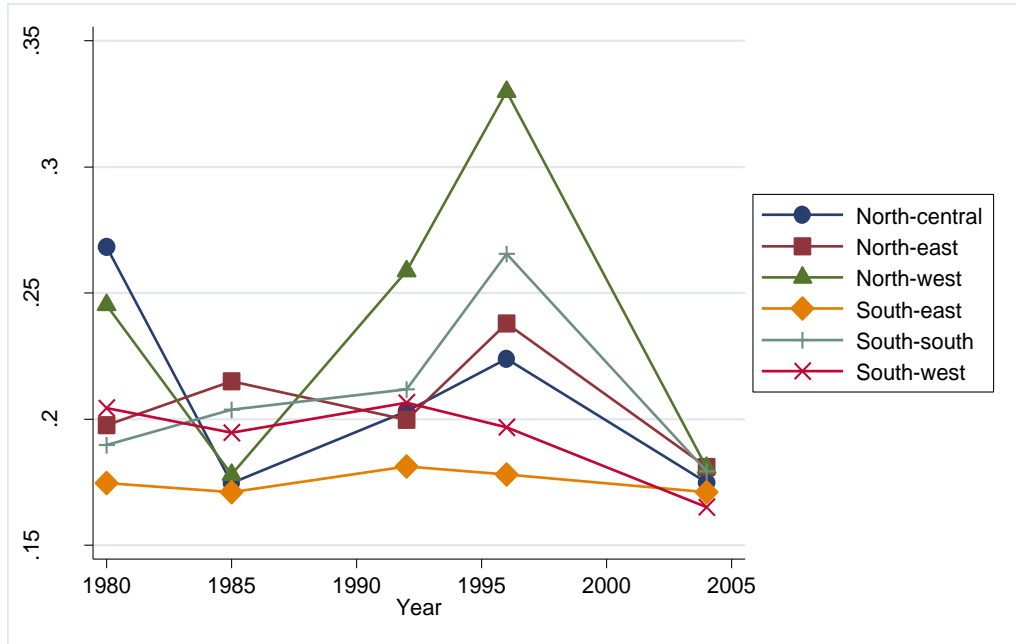
Fig. 28. DER polarisation among wage employment household heads across geopolitical zones
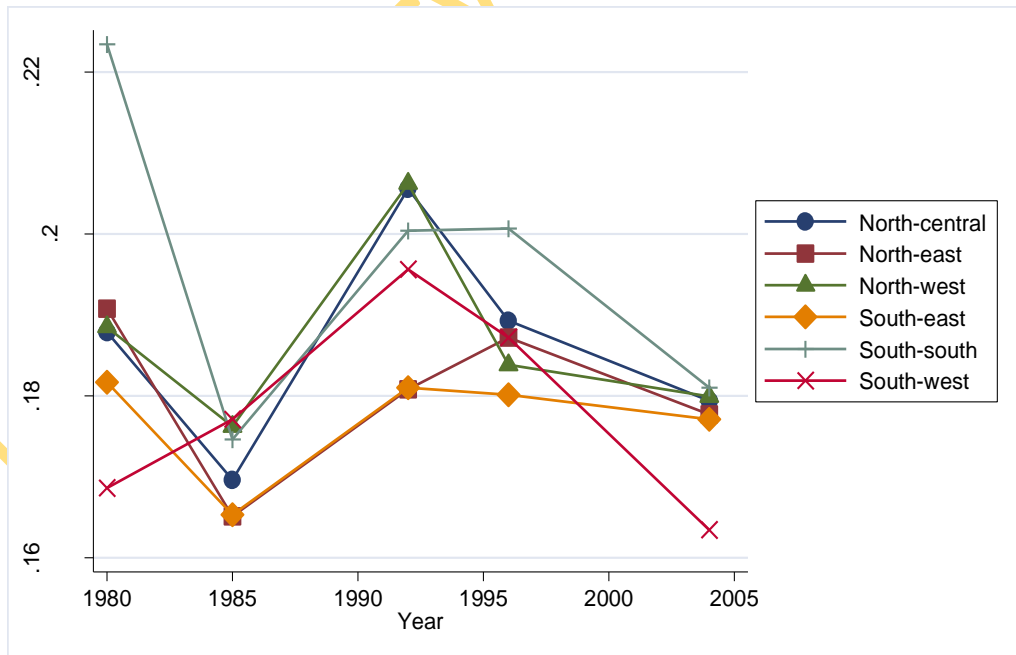
Fig. 29. DER polarisation among non-wage employment household heads across across geopolitical zones

had problems with the Ogoni people in SS Niger Delta, which caused a lot of agitations, killings and disruption of economic activities in the area. Demonstrations and conflicts are direct consequences of polarisation (Duclos *et al*., 2004).

In 1996, polarisation in all the zones increased among the wage employment households except in SE and SW. In that year, the country was a pariah nation with low inter-sectoral economic activities and high rate of unemployment (Adamson, 2007). In that year, the SE and the SW had relatively better situation in terms of economic activities especially on trading. These might be responsible for the upturn in polarisation in 1996 in the NC, NE, NW and SS. However, 2004 witnessed the return of democracy with improved economic activities and stability, declined unemployment rate and upward review of wages, which partly explain the decline in polarisation that year.

4.3.4.8 Polarisation among non-wage employment household heads across zones

In NC, polarisation was largest 0.2056 in 1992 and smallest, 0.1696, in 1985. In the NE, the highest polarisation was 0.1908 in 1980 and the lowest was in 1985 with the value 0.1651. NW witnessed polarisation estimates of 0.2062 and 0.1762 as the highest and the lowest estimates in 1992 and 1985 respectively as shown in Figure 29. In the SE, polarisation was highest in 1980 and least in 1985 with the value 0.1817 and 0.1653. For SS, the largest polarisation was 0.2234 in 1980 and smallest in 1985 with the value 0.1746, while in the SW, polarisation was highest in 1992 with the value 0.1956 and lowest in 2004 with the value 0.1634. Among the non-wage employment households in the six zones, there was reduced polarity between 1980 and 2004 but SW witnessed the least polarisation in 2004.

The non-wage employment is basically farming. Efforts by the government had been on to improve rural farm income. The reduced polarisation among the non-wage between 1996 and 2004 may be due to the effectiveness of programmes like NAPEP, CSDP, LEEMP and FADAMA that have boosted the income generating abilities of the rural people. Income redistribution in the zones would have to be sustained and improved upon to maintain the trend. More middle class is created within non-wage employed households between 1992 and 2004. NBS (2007) reports that among the professional or technical occupation group, those that can be assumed to be part of non-wage employment

in the rural sector, lower class declined from 46.29 to 37.60, middle class reduced from 33.98 to 32.38 while the upper class appreciated from 19.72 to 30.03 per cent in 1996 to 2004 respectively.

A comparison of Figures 28 and 29 shows that in the NE, NW and SW, polarisation is higher among waged employment than non-waged employment for all the years. In 2004, non-waged employment has higher polarisation compared with waged employment in NC, SE, and SS. These differences in the behaviour of polarisation along wage and non-wage may be due to observed disparity in minimum wage in Nigeria. NBS (2007) reports that there exists wage disparity in Nigeria and that wage rate that is expected to increase the middle class should be fixed based on inflation rate to decrease income inequality between the low and high income groups.

The high polarisation among the wage in 1996 in all the zones may be due to high inflation rate of 72.8% in 1985 (Ekpo and Umoh, 2012) which eroded real income. NBS (2007) reports that real minimum wage declined in 1981 to 1999 and then in 2003, and there was increase in the proportion of core poor (110.78%) and a decrease of 40% on the non-poor in 1999. The economy was stagnant with high political unrest in 1996 (Adamson, 2007) and poverty increased from 43% to 69% (Okojie *et al*., 2001) between 1992 and 1996. All these may be responsible for the high polarisation in 1996 among the waged employment.

4.3.4.9 Implications of pattern of polarisation estimates on middle class within the demographic features across the six geopolitical zones

Table 12 shows the implication of the pattern of polarisation within each demographic sub-population across the geopolitical zones. For farming, middle class (MC) was created in all the zones except SW in 1985 while it reduced in all the zones in 1992. By 1996 MC reduced in NE and SS. But in 2004 MC was created in all the zones. Among non-farming, middle class reduced in 1985 in the NE, it reduced in all zones in1992, reduced in the NE, SE, and SS in 1996 and also reduced by 2004 in the NC and NE. This implies that the MC consistently declined in the NE among non-farming between 1980 and 2004. The zone comprising Adamawa, Bauchi, Borno, Gombe, Yobe and Taraba States is of lower population, economic activities and predominantly of civil

111

Table 12. Implications of DER polarisation estimates within sub-population across the six geopolitical zones

Household Characteristics	Year	Middle Class Creation					
		NC	NE	NW	SE	SS	SW
Farming	1980			Reference year			
	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCC	MCC	MCR	MCC
	2004	MCC	MCC	MCC	MCC	MCC	MCC
Non-farming	1985	MCC	MCR	MCC	MCC	MCC	MCC
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCC	MCR	MCR	MCC
	2004	MCR	MCR	MCC	MCC	MCC	MCC
Retirement Age	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCC	MCC	MCR	MCC
	2004	MCC	MCC	MCC	MCC	MCC	MCC
Below Retirement Age	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCC	MCC	MCC	MCC	MCC
	2004	MCR	MCC	MCR	MCR	MCR	MCC
Male	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCC	MCR	MCR	MCC

	Year						
	2004	MCC	MCC	MCC	MCC	MCC	MCC
Female	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCR	MCC	MCC	MCC
	2004	MCC	MCC	MCC	MCC	MCC	MCC
Formal Education	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCC	MCC	MCC	MCR	MCC
	2004	MCC	MCC	MCR	MCC	MCC	MCC
No formal Education	1985	MCC	MCC	MCC	MCC	MCC	MCC
	1992	MCR	MCR	MCR	MCC	MCR	MCC
	1996	MCC	MCR	MCR	MCR	MCR	MCR
	2004	MCC	MCC	MCC	MCR	MCC	MCC
Wage	1985	MCC	MCR	MCC	MCC	MCR	MCC
	1992	MCR	MCC	MCR	MCR	MCR	MCR
	1996	MCR	MCR	MCR	MCC	MCR	MCC
	2004	MCC	MCC	MCC	MCC	MCC	MCC
Non-wage	1985	MCC	MCC	MCC	MCC	MCC	MCR
	1992	MCR	MCR	MCR	MCR	MCR	MCR
	1996	MCC	MCR	MCC	MCC	MCR	MCC
	2004	MCC	MCC	MCC	MCC	MCC	MCC

Key: MCC – Middle Class Created; MCR – Middle Class Reduced

Source: Author's interpretation of polarisation estimates

servants compared with north-west and north-central zones. These with low level of education of the people might have reduced the non-farming household heads' income generating capacities and activities (they would be involved in trading and other informal sector activities since they were not farmers) with the consequence of declining middle class among them. The zone has been reported to be consistently high in poverty level next to the north-west between 1980 and 1996, but higher (72.2%) than that of the northwest (71.2%) in 2004 (NBS, 2005).

Within the household heads in retirement age, middle class reduced in SW in 1985, reduced in all zones in 1992, in the NE and SS in 1996, while among non-retirement age, MC reduced in the SW in 1985, reduced in all zones in 1992 but more was created in the NE and SW in 2004. Among the male household heads, MC reduced in 1980 only in the SW, reduced in all zones in 1992, increased in the NC, NW and SW in 1996, while more was created in 2004 in all the zones. However for females, SW witnessed a reduction in MC in 1985, MC reduced in all the zones in 1992, more was created in the NC, SE, SS and SW in 1996 and in all the zones in 2004.

Formally educated individuals have more MC created in all the zones except SW in 1985 and less in 1992 in all the zones. MC reduced only in the SS in 1996 and NW in 2004. But for non-formally educated, MC was created in all zones in 1985 and only in the SE and SW in 1992 which is a departure from previous patterns. In 1996, MC was created in the NC as it reduced in other zones, while in 2004, MC reduced only in the SE.

Wage employment household heads have their MC reduced in the NE and SS in 1985. In 1992, MC was created only in the NE as it reduced in all other zones; but in 1996, MC was created in the SE and SW, while in 2004, there was more MC in all the zones. However, among the non-wage, MC reduced in the SW in 1985, in all zones in 1992, in the NE and SS in 1996 but more MC was created in all zones in 2004. The interpretation of polarisation in terms of the middle class may be taken with caution as polarisation depends on the relative significant sizes of the two opposing groups in the income distribution brought about by the disappearance of the middle class (Esteban and Ray, 1994).

4.4 Poverty and income bipolarisation among the rural households

4.4.1 Relationship between poverty and income bipolarisation

There appears to be a positive relationship between poverty and bipolarisation as shown in Table 13. When poverty incidence/gap increases, bipolarisation increases and when it decreases, bipolarisation decreases. By poverty line of 2-3rd of mean expenditure, the poverty gap and bipolarisation estimates moved in the same direction; as poverty increases/decreases, bipolarisation increases/decreases. Poverty incidence reduced from 0.8044 to 0.5039 while poverty gap reduced from 0.4481 to 0.1927 and bipolarisation declined from 0.2502 to 0.1419 in 1980 to 2004 respectively. This indicates that the more the poverty incidence and gap, the more income bipolarisation.

In rural Nigeria therefore, there are those that are poorer among the rural poor population as it has been reported that 54.5 and 69 per cent of the Nigerian population in 2004 and 2010 respectively are poor and the majority live in the rural areas (NBS, 2012). Accordingly, the results show that income is bipolarised in rural Nigeria and there are poorer people among the rural population. As households become poorer they move away from the middle income level where the majority should be, to the tail end of the income continuum, while fewer and fewer households are left in the middle level and of course the upper end of the income distribution continuum is usually of very few households.

4.4.2 Income polarisation and poverty in all the states of Nigeria in 2004

According to Table 14, the highest estimate (0.2183) of polarisation came from Kogi State while the least (0.1568) was from Bayelsa and Oyo States. Polarisation in Lagos State and the Federal Capital Territory (Abuja) were 0.1987 and 0.1724 respectively. The estimates of alienation and identification show that the two combined together are positively related to the polarisation estimates and the higher their estimates, the higher the polarisation estimate. If this is linked with states' poverty profiles (NBS, 2005), Kogi State had the highest poverty gap level of 0.5346 while Bayelsa and Oyo States were among those with the least poverty gap of 0.0994 and 0.0585 respectively. Lagos and Abuja had 0.3473 and 0.1787 poverty gap respectively. These somehow show that poverty is positively related to polarisation in Nigeria and justifies the use of relative poverty in the analysis. However, rural poverty gap estimates for Kogi, Bayelsa, Oyo,

Table 13. Poverty and income bipolarisation among the rural households

Poverty incidence ($\gamma = 0$)	Poverty gap ($\gamma = 1$)	LU bipolarisation ($\alpha = 1.6$; $\beta = 1.0$)
0.8044	0.4481	0.2502
0.6695	0.2955	0.1939
0.7160	0.3603	0.2110
0.6276	0.2665	0.1816
0.5039	0.1927	0.1419

Source: Author's estimates

Table 14. Income polarisation and poverty in rural Nigeria by states in 2004.

Serial No.	Name of State	DER (α=1) Polarisation	Alienation	Identific -ation	FW Bipolari- sation	NBS Poverty Gap*
1	Abia	0.1704	0.3530	0.5988	0.2971	0.0904
2	Adamawa	0.1816	0.3828	0.5963	0.3731	0.3149
3	Akwa Ibom	0.1719	0.3718	0.5792	0.3431	0.1584
4	Anambra	0.1715	0.3410	0.6289	0.2987	0.0768
5	Bauchi	0.1584	0.2996	0.6372	0.2589	0.3220
6	Bayelsa	0.1568	0.3478	0.5629	0.2799	0.0994
7	Benue	0.1928	0.4293	0.6322	0.3138	0.1543
8	Borno	0.1599	0.3085	0.6342	0.2711	0.1889
9	Cross River	0.2078	0.4313	0.6620	0.3478	0.1969
10	Delta	0.1784	0.3466	0.6419	0.3271	0.2222
11	Ebonyi	0.1654	0.3527	0.5814	0.2950	0.1806
12	Edo	0.1900	0.3784	0.6553	0.3565	0.1568
13	Ekiti	0.1670	0.3373	0.6104	0.3121	0.1181
14	Enugu	0.1777	0.3638	0.6320	0.3062	0.1118
15	Gombe	0.1738	0.3321	0.6644	0.2910	0.2936
16	Imo	0.1830	0.4082	0.5971	0.3236	0.0871
17	Jigawa	0.1713	0.3358	0.6325	0.2864	0.4413
18	Kaduna	0.1696	0.3193	0.6793	0.2613	0.1155
19	Kano	0.1749	0.3448	0.6368	0.2890	0.1530
20	Katsina	0.1847	0.3462	0.6974	0.2861	0.2351
21	Kebbi	0.1582	0.2924	0.6575	0.2441	0.3968
22	Kogi	0.2183	0.4473	0.6673	0.4146	0.5346
23	Kwara	0.2174	0.5231	0.6181	0.4148	0.4236

24	Lagos	0.1987	0.4301	0.6597	0.5002	0.3473
25	Nassarawa	0.1705	0.3312	0.6569	0.2718	0.1582
26	Niger	0.1676	0.3325	0.6234	0.2943	0.2099
27	Ogun	0.1738	0.3745	0.6056	0.3293	0.1023
28	Ondo	0.1656	0.3606	0.5712	0.3159	0.1539
29	Osun	0.1690	0.3763	0.6223	0.2633	0.0757
30	Oyo	0.1568	0.3053	0.6415	0.2526	0.0585
31	Plateau	0.1742	0.3714	0.5977	0.2962	0.2003
32	Rivers	0.1669	0.3681	0.5638	0.3177	0.1498
33	Sokoto	0.1641	0.3108	0.6344	0.2793	0.3333
34	Taraba	0.1808	0.3619	0.6232	0.3244	0.2112
35	Yobe	0.1640	0.3344	0.5889	0.3015	0.3178
36	Zamfara	0.1627	0.3110	0.6502	0.2676	0.3264
37	Abuja, FCT	0.1724	0.3664	0.6030	0.2932	0.1787

Poverty gap* estimates adopted from NBS (2005)

Source: Author's estimates

Lagos and Abuja were 0.1868, 0.1269, 0.0878, 0.2533 and 0.1306 respectively.

Poverty gap was used for this relational analysis as it shows the depth or how far the poor households are from the poverty line. The more households are far from the mean expenditure, the more they get polarised. But poverty incidence only shows the percentage of the households below the poverty line. It should not be a surprise that Lagos and Abuja were included as they also have rural areas. Lagos State Government has Ministry of Rural Development while the Federal Capital Territory Administration has Agriculture and Rural Development Secretariat. This study adopted the households tagged 'rural' by the National Bureau of Statistics for the analysis.

4.5. Regression analysis of the relationship between polarisation, poverty status and socio-economic characteristics

4.5.1 DER polarisation Tobit regression results

As shown in Table 15, the diagnostic features show that the regression is a good fit. The log likelihood ratio chi-square of 2,986.18 (df = 26) with a p (probability) value of 0.0000 indicates that the model as a whole fits significantly better than an empty model, that is, a model with no predictors. The Pseudo R-Square is -0.0125. The pseudo R-square is so called because there are no direct equivalents of R-square (from OLS regression) in non-linear model. For continuous distributions as used here, the log-likelihood is the log of a density function. Since density functions can be greater than 1, the log-likelihood can be positive or negative, and mixed continuous/discrete likelihood like Tobit, according to Sribney (1997), can also have positive log- likelihood. Pseudo-R^2 can give answers greater than one or less than zero. For continuous or mixed continuous/discrete likelihoods like Tobit, pseudo-R^2 makes no sense (Sribney, 1997). The formula for pseudo-R^2 is nothing more than a reworking of the model chi-squared. Thus, even for discrete distributions where $0 \leq$ pseudo-$R^2 \leq 1$, it is still better to report the model Chi-Square and its p value - not the pseudo-R^2. The equation as applied is neither truncated nor censored since the dependent variable is continuous and all the observations were captured. The value of coefficients, standard errors, the t-statistic, associated p values, 95% confidence interval of the coefficients and the marginal effects of 100% (a unit) change in the

119

predictor's value on polarisation are presented in Table 15. Only the variables that are significant are, however, discussed.

4.5.2: Variables that affect income polarisation
4.5.2.1 Effects of household head's age on income polarisation

Age has positive impact on polarisation by the sign of the coefficient as shown in Table 15 and follows the *a priori* expectation. If the age of the household head increases by one year, polarisation will increase by 0.00006 on the average. This assumes linear relationship between age and polarisation which may not hold. However, age square indicates that the relationship is not linear; as age of household head increases, income polarisation increases at a decreasing rate, gets to the peak and start reducing. This is evidenced by the negative sign of the coefficient (-0.000001) and the marginal effect (-0.000001) of age square as a variable. This implies that as individuals get older, income polarisation would decline. This is related to the graphical analysis of Figures 22 and 23 which show that in 2004, polarisation was lower among household heads in retirement age than those below.

4.5.2.2 Effects of household size on income polarisation

Household size has positive effect on income polarisation and agrees with the expectation on the sign of the coefficient. If household size increases by one unit, polarisation will increase by 0.00007 as shown in Table 15. This implies that the more the individuals in a given household, the more the per capita expenditure declines, which would make such household to move further away from the middle income level.

4.5.2.3 Effects of household's father's and mother's years of formal education on income polarisation

The years of household's father's and mother's formal education have negative impact on income polarisation by the sign of the coefficient which agrees with *a priori* expectation. This means that, as year of education increases, polarisation decreases. The marginal effect shows that if father's or mother's years of education increase by one,

120

Table 15. DER polarisation Tobit regression estimates

DER Polarisation	Coef	Std. Err	T	P>/t/	Marginal Effect
Age of Household Head in Years (X_1)	0.000080	0.00001	8.03	0.000*	0.000060
Age Square (X_1^2)	-0.000001	0.00000	-2.24	0.025*	-0.000001
Household Size – X_2	0.000100	0.00003	3.15	0.002*	0.000070
Fathers Formal Education in Years (X_3)	-0.000110	0.00002	-7.02	0.000*	-0.000070
Mothers Formal Education in Years (X_4)	-0.000100	0.00001	-5.11	0.000*	-0.000040
Household Poverty Status -Poor Dummy (X_5)	0.010150	0.00115	8.81	0.000*	0.007260
Gender of Household Head –Female Dummy (X_6)	0.001000	0.00019	5.20	0.000*	0.000700
H.H. Marital Status – Married Dummy (X_7)	-0.003790	0.00029	-13.08	0.000*	-0.002720
H.H. Religion Status –Christian/Muslim Dummy (X_8)	0.000700	0.00050	1.40	0.162	0.000490
H.H. Occupational Group- Farming Dummy (X_9)	-0.001390	0.00028	-4.90	0.000*	-0.000990
H.H. Membership of Socio-Economic Group (X_{10})	-0.000250	0.00025	-0.99	0.321	-0.000170
H.H. Retirement Age Status- $\geq$ 60 years Dummy (X_{11})	-0.000060	0.00042	-0.15	0.882	-0.000040
H.H. Wage Employment Status –Wage Dummy (X_{12})	-0.000510	0.00022	-2.38	0.017*	-0.000360
H. Geographical Location- South Dummy (X_{13})	-0.001300	0.00020	-6.51	0.000*	-0.000910
H.H. Credit Status- Credit Access Dummy (X_{14})	-0.000140	0.00022	-0.64	0.525	-0.000100

Poor-Age (X_5X_1)	0.000140	0.00002	8.83	0.000*	0.000100
Poor-Household Size (X_5X_2)	-0.000570	0.00005	-12.51	0.000*	-0.000400
Poor-Fathers' Education (X_5X_3)	-0.000220	0.00002	-11.69	0.000*	-0.000150
Poor-Female (X_5X_6)	0.001710	0.00030	5.77	0.000*	0.001220
Poor-Married (X_5X_7)	-0.006270	0.00046	-13.75	0.000*	-0.004270
Poor- Christian/Muslim (X_5X_8)	0.001790	0.00081	2.21	0.027	0.001270
Poor- Farming (X_5X_9)	-0.004550	0.00047	-9.63	0.000*	-0.003160
Poor- Membership of Socio-Group (X_5X_{10})	-0.000510	0.00038	-1.34	0.180	-0.000360
Poor- Retirement Age (X_5X_{11})	-0.000480	0.00068	-0.71	0.475	-0.000340
Poor- Wage Employment (X_5X_{12})	-0.000050	0.00032	-0.17	0.869	-0.000040
Poor-South Located (X_5X_{13})	-0.001130	0.00033	-3.45	0.001*	-0.000790
Poor- Access to Credit (X_5X_{14})	-0.000240	0.00033	-0.71	0.481	-0.000170
Female-Age (X_6X_1)	0.000020	0.00001	2.50	0.012*	0.000020
Female- Fathers Formal Education (X_6X_3)	0.000020	0.00002	0.89	0.376	0.000010
Constant	0.174930	0.00072	241.59	0.000	----------
/Sigma	0.01411	0.00005			

LR CHI^2(26) = 2986.18   Prob > chi^2 = 0.0000   Log likelihood = 120865.98

Pseudo-R^2 = -0.0125   Uncensored observations 42525   Right/Left-censored observations 0

t_{tab}:1% = 0.005; 5% = 0.025; 10% = 0.05 where * indicates p values less than 5% (significant at 5%)

** Significant at 10 %   H.H. = Household Head

Source: Computed from the 2004 NLSS data

polarisation will reduce by 0.00007 or 0.00004 respectively. Education is important for human development and empowerment. The higher the education level of an individual, the more the opportunities the individual has of earning more income. For all households, more years of education of household heads would bring down polarisation. This supports the findings in Figures 18 and 19 that polarisation was higher among non-formally educated than those that were formally educated.

4.5.2.4 Effects of household's poverty status on income polarisation

The poverty status of households has a direct positive impact on income polarisation in agreement with *a priori* expectation. The marginal effect shows that if poor households increase by 1 unit, polarisation will rise by 0.00726. In Table 15, poor dummy variable has the highest positive marginal effect on income polarisation among all the variables. As more households move below the poverty line of 2/3 mean per capita expenditure of households, income polarisation becomes aggravated. The beta coefficient of the poverty dummy (coefficient of X_5) also indicates that the polarisation of the poor households is higher on the average than that of the non-poor by the value 0.01015. As a household becomes poor, it moves away from the middle class, thus making polarisation to scale up.

4.5.2.5 Effects of household head's gender on income polarisation

Female gender has positive effects on income polarisation, evidenced by the positive sign of the coefficient in line with the *a priori* expectation in Table 3. The marginal effect shows that if one increases female household head by 1 unit, average polarisation will rise by 0.0007. The coefficient of gender dummy (X_6) indicates that the average polarisation among the female household heads is higher than that of the male household heads by 0.001. The male takes on the value of the constant, 0.17493. This may be due to the problems of the female that lags behind in education and empowerment in line with the findings in Figures 14 and 15 that the female household head has higher polarisation than the male household head.

4.5.2.6 Effects of household head's marital status on income polarisation

Being married has negative impact on income polarisation from the sign of the coefficient (-0.00379) that is negative in line with the *a priori* expectation. The marginal effect, from Table 15, shows that one unit increase in married household heads will reduce polarisation by 0.00272. The value of the beta coefficient indicates that the income polarisation of the married household heads is lower than that of the household heads that were single or divorce by the value 0.00379. As a married household head, the spouse could be earning income that augments that of the partner, which may have income equalising effect among all the households as those that are married increase in number.

4.5.2.7 Effects of farming on income polarisation

The sign of the coefficient, -0.00139, shows that farming occupation has negative impact on income polarisation as expected. If farming households increase by 1 unit, average polarisation reduces by 0.00099 as shown under the marginal effect in Table 15. The beta coefficient shows that the average polarisation of the farming households is lower by 0.00139 than the polarisation of the households that were of non-farming. Usually the majority of farming households tend to be similar in terms of income as explained for Figures 10 and 11. This perhaps explains why polarisation reduces as one move from non-farming to farming households. The non-farming household may occasionally be involved in farming for additional income which could have a reducing effect on polarisation.

4.5.2.8 Effect of wage employment household head on income polarisation

Wage employment in the rural area is additional to on-farm income and it is capable of having income equalising effect that will suppress polarisation. The marginal effect reveals that a unit increase in wage employment households reduces polarisation by 0.00036. This shows that wage employment has negative impact on polarisation and supports the *a priori* expectation in Table 3. The beta coefficient, -0.00051 also shows that the polarisation of the wage household heads is less than that of the non-wage employment. This implies that the non-wage employment household heads were more polarised than the wage employment households in 2004. The majority of the rural

households were of farming, which is non-wage employment and a household that is of wage employment has the opportunity of enhanced income to reduce polarisation.

4.5.2.9 Effects of household geographical location on income polarisation

The south location dummy has positive impact on polarisation as the marginal effect shows that a unit increase in households located in the south reduces average polarisation by 0.00091. This agrees with the *a priori* expectation. Also, the beta coefficient of -0.00130 shows that the average polarisation of household located in the south is lower than the polarisation among households in the north. This means that the households in the north were more polarised, that is, as one move from the north to the south, polarisation declines. The southern part of the country is reported to have better income distribution over the years than the northern part of the country (NBS, 2005). This is reflected in this study and the effects of south location on polarisation also agree with the results in Figures 12 and 13.

4.5.2.10 Poor and non-poor households' polarisation, given age of household head, household size, and father's years of formal education

From Table 15, the slope of income polarisation of the poor households with respect to age (X_5X_1) is significantly higher by the value of the beta coefficient of 0.00014 than that of the non-poor. Simply put, a unit change in the age of poor household heads will lead to more changes in polarisation than a unit change in the age of non-poor household heads. One would recall that the average polarisation of the poor households is higher by 0.01015 (the value of the poverty dummy intercept beta coefficient) than the average polarisation of the non- poor households. As the age of poor and non-poor household head increases, income polarisation becomes more with the poor than the non-poor households. This implies that the rate of change of polarisation with respect to age is higher for the poor than the non-poor households.

The slope of the polarisation of the poor households with respect to household size (X_5X_2) is significantly less by the value of the beta coefficient -0.00057 than that of the non-poor. This means a unit change in the household size of the non-poor will lead to more change in polarisation than that of the poor households. This indicates that the rate

125

of change of polarisation with respect to household size is different between the poor and the non-poor households and that of the poor is lower.

Also, the slope of the polarisation function of the poor households with respect to father's education (X_5X_3) is -0.00022 and significantly less by this value than that of the non-poor households. A unit change in father's years of formal education of the poor will lead to less change in polarisation than that of the non-poor households. This implies that the income polarisation function with respect to father's years of education significantly differs between the poor and the non-poor households and is higher for the non-poor households.

4.5.2.11 Female and male household heads' polarisation, given the age of household heads

From Table 15, the slope coefficient of X_6X_1 (0.00002) shows that the rate of change of income polarisation with respect to age for the female household head is significantly higher by 0.00002 than that of the male household head. This means a unit change in the age of household head leads to more changes in polarisation for the female than the male household head. With the female dummy intercept coefficient of 0.001 indicating that female polarisation is higher than that of male as well, it can be concluded that polarisation is higher among the females than males.

4.5.3 Total interaction effect of variables that affect polarisation

The differential intercept coefficients of the dummy variables have shown, for instance, that the average polarisation of females is higher than that of males whether they are poor or non-poor; which may be misleading. To guide against this, the value of the beta coefficient of each of the dummies were considered in additive and multiplicative forms, and their total interaction effect on polarisation was computed, as shown in Table 16.

4.5.3.1 Total effect of poor-female household head on polarisation

As shown in Table 16, the sum interaction effect of poor-female of 0.01286 is higher than the value of poverty difference alone (0.01015) and female gender difference

alone (0.001). Their sum interaction effect implies that the average polarisation of poor-female household heads is higher by 0.01286 than that of the poor household heads, female household heads or non-poor male household heads.

4.5.3.2 Total effect of poor-married household head on polarisation

From Table 16, the poor-married household heads have total interaction effect of 0.00009, showing that the average polarisation of poor-married household heads is higher by this value than that of the poor, married or non-poor single household heads. The poor-married total interaction value of 0.00009 is between that of poverty difference, 0.01015 and marital difference, -0.00379 if considered separately. This means that household heads that were poor and married have higher polarisation than the poor household heads, married household heads or non-poor single/divorced household heads.

4.5.3.3 Total effect of poor-farming household on polarisation

The sum interaction effect of 0.00421 for poor-farming household heads from Table 16, implies that their average polarisation is higher by this value than the average polarisation of the poor households, farming households or non-poor non farming households. This means that polarisation is higher for poor-farming households than poor households, farming households and non-poor non-farming households. However, the poor-farming sum interaction effect of 0.00421 is between poverty difference alone (0.01015) and farming occupation difference alone (-0.00139).

4.5.3.4 Total effect of poor-wage employment on polarisation

The total interaction effect from Table 16 shows that poor-wage employment household heads have average polarisation higher by 0.00959 than the poor household heads, wage employment household heads or non-poor non-wage employment household heads. The value 0.00959 is however between the beta intercept coefficients of poverty difference (0.01015) and wage employment difference (-0.00051). This implies that polarisation is higher for household heads that are poor and on wage employment than those that are poor or on wage employment and higher than those that are non-poor non-wage employment. As discussed earlier, the poverty difference and wage employment

Table 16. Sum interaction of dummy variables that affect polarisation

Interactive Dummies	Sum of Differential Intercepts and Multiplicative Coefficients	Total Interaction Effect
Poor-Female Household (X_5X_6)	0.01015 + 0.00100 + 0.00171	0.01286
Poor- Married Household (X_5X_7)	0.01015 - 0.00379 - 0.00627	0.00009
Poor- Farming Household (X_5X_9)	0.01015 - 0.00139 - 0.00455	0.00421
Poor- Wage employment (X_5X_{12})	0.01015 - 0.00051 - 0.00005	0.00959
Poor- South Located (X_5X_{13})	0.01015 - 0.00130 - 0.00113	0.00772

Source: Computed from DER polarisation Tobit regression estimates

128

difference indicate that the poor households have higher polarisation than the non-poor households while wage employment households have lower polarisation than the non-wage employment.

4.5.3.5 Total effect of poor south-located on polarisation

According to Table 16 the poor south-located households have total interaction effect of 0.00772 and their average polarisation is higher by this value than the average polarisation of poor households, south-located households or non-poor north-located households. However, this sum interaction of 0.00772 for the poor south-located households lies between that of poverty dummy (poor status) difference of 0.01015 and south dummy (south-located) difference of -0.0013.

4.5.4 Implications of polarisation regression findings

The regression results which include the signs and values of the coefficients, and the marginal effects of the variables on polarisation, show that poor status has the highest positive impact on polarisation, having the highest marginal effect of 0.00726, followed by female household head, household size and age. Average polarisation of the poor households is significantly different and higher than that of the non-poor households. When other variables interact with poor status dummy, similar effect of poverty is revealed as they all show higher average polarisation than the respective variables if taken separately. Whereas, years of formal education, married status, farming occupation, wage employment and south location negatively affect polarisation, polarisation is significantly related to socio-economic variables of households.

4.6. Regression analysis of the relationship between FW bipolarisation, poverty status and socio-economic features of households
4.6.1 FW bipolarisation Tobit regression results

As shown in Table 17, the diagnostic features of the FW bipolarisation Tobit regression shows the log likelihood ratio chi-square of 5818.92 (df=26) with a *p* value of 0.0000 indicating that the model as a whole fits significantly better than a model with no

predictors. In Table 17, one would see the coefficients and standard errors, t-statistic, associated *p* values and the 95% confidence interval of the coefficients as well as the marginal effect of 1 unit change in the regressor's value on the dependent variable. Since bipolarisation has been observed to move in the same direction with poverty, the expected signs of the coefficients of the regressors are shown in Table 3.

4.6.2 Variables that affect income bipolarisation

4.6.2.1 Effects of age of household head on income bipolarisation

Age has positive impact on income bipolarisation as shown by the sign and value of the marginal effect. One unit increase in the age of household head increases bipolarisation by 0.00014. This marginal effect is based on linearity relationship between age and bipolarisation which may not hold throughout the life period of the individual. This is confirmed by age square with negative sign of coefficient, which shows that income bipolarisation increases with age at a decreasing rate and gets to a peak and starts to decline like diminishing return curve. At old age, capacity to earn income will have declined and all the old individuals will be more or less homogeneous in terms of income level, which makes bipolarisation to decline.

4.6.2.2 Effects of household size on income bipolarisation

The sign of the coefficient of household size shows that it has negative effect on bipolarisation and if household size increases by one unit, bipolarisation will decrease by 0.00037. This is contrary to *a priori* expectation of positive relationship. The reason may be due to bipolarisation being the case in which households cluster at either side of the middle level of the income distribution which is possible with per capita income that reduces as household size increases.

4.6.2.3 Effects of household's father's and mother's years of formal education on income bipolarisation

As shown in Table 17, years of education of father and mother have negative effects on bipolarisation in line with the *a priori* expectation. If father's or mother's years of formal education increases by one, bipolarisation will reduce by 0.00027 or 0.00013 respectively. This indicates that the higher the years of formal education of household

130

Table 17. Foster-Wolfson bipolarisation Tobit regression estimates

Foster-Wolfson Bipolarisation	Coef	Std. Err	T	P>/t/	Marginal Effect
Age of Household Head in Years (X_1)	0.000170	0.00003	6.34	0.000*	0.000140
Age Square (X_1^2)	-0.000003	0.00000	-3.41	0.001*	-0.000002
Household Size – X_2	-0.000450	0.00008	-5.51	0.000*	-0.000370
Father's Formal Education in Years (X_3)	-0.000340	0.00004	-8.49	0.000*	-0.000270
Mother's Formal Education in Years (X_4)	-0.000160	0.00003	-5.83	0.000*	-0.000130
Household Poverty Status -Poor Dummy (X_5)	0.030730	0.00303	10.13	0.000*	0.025200
Gender of Household Head –Female Dummy (X_6)	0.001460	0.00050	2.93	0.003*	0.001190
H.H. Marital Status – Married Dummy (X_7)	-0.007750	0.00076	-10.18	0.000*	-0.006360
H.H. Religion Status –Christian/Muslim Dummy (X_8)	0.000100	0.00131	0.07	0.943	0.000080
H.H. Occupational Group- Farming Dummy (X_9)	-0.008390	0.00074	-11.28	0.000*	-0.006970
H.H. Membership of Socio economic Group (X_{10})	-0.000620	0.00065	-0.96	0.329	-0.000510
H.H. Retirement Age Status- ≥ 60 years Dummy (X_{11})	-0.002020	0.00110	-1.84	0.066	-0.001630
H.H. Wage Employment Status –Wage Dummy (X_{12})	-0.001310	0.00057	-2.31	0.021*	-0.001050
H. Geographical Location- South Dummy (X_{13})	0.014030	0.00053	26.74	0.000*	0.011500
H.H. Credit Status- Credit Access Dummy (X_{14})	0.000390	0.00057	0.68	0.494	0.000320

Poor-Age (X_5X_1)	0.000510	0.00004	11.90	0.000*	0.000410
Poor-Household Size (X_5X_2)	-0.001260	0.00012	-10.62	0.000*	-0.001020
Poor-Fathers' Education (X_5X_3)	-0.000720	0.00005	-14.63	0.000*	-0.000580
Poor-Female (X_5X_6)	0.005990	0.00078	7.70	0.000*	0.004920
Poor-Married (X_5X_7)	-0.021180	0.00120	-17.65	0.000*	-0.016520
Poor- Christian/Muslim (X_5X_8)	0.005720	0.00213	2.69	0.007*	0.004650
Poor- Farming (X_5X_9)	-0.013110	0.00124	-10.55	0.000*	-0.010480
Poor- Membership of Socio-Group (X_5X_{10})	-0.001300	0.00099	-1.31	0.191	-0.001050
Poor- Retirement Age (X_5X_{11})	-0.003140	0.00178	-1.77	0.077	-0.002520
Poor- Wage employment (X_5X_{12})	-0.000750	0.00085	-0.84	0.382	-0.000600
Poor-South located (X_5X_{13})	-0.007190	0.00087	-8.30	0.000*	-0.005690
Poor- Access to Credit (X_5X_{14})	-0.001580	0.00088	-1.81	0.071	-0.001280
Female-Age (X_6X_1)	0.000030	0.00002	1.44	0.149	0.000030
Female- Father's Formal Education (X_6X_3)	0.000100	0.00005	2.09	0.037*	0.000080
Constant	0.174930	0.00191	161.17	0.000*	----------
/Sigma	0.03520	0.00012			

LR CHI^2(26) = 5818.92   Prob > chi^2 = 0.0000   Log likelihood = 79722.16

Pseudo-R^2 = -0.0379   Uncensored observations 42525   Right/Left-censored observations 0

t_{tab}:1% =0.005; 5% =0.025; 10% =0.05 where * indicates p values less than 5% (significant at 5%)

** Significant at 10 %   H.H. = Household Head

Source: Computed from the 2004 NLSS data

heads, the less bipolarisation becomes. The more educated individuals are, the more opportunities the households would have of earning more income which could make identification force within the households to increase while alienation force between the households goes down. Being more educated creates more middle class. This agrees with Figures 18 and 19, which show that in 2004, bipolarisation was higher among the non-educated than the educated household heads.

4.6.2.4 Effects of household's poverty status on income bipolarisation

Poor status of households has positive impact on bipolarisation. The marginal effect shows that if poor household head increases by 1 unit, bipolarisation will rise by 0.0252. The marginal effect of poor status is the highest marginal value of all variables that affect bipolarisation. The beta coefficient reveals that the average bipolarisation of poor households (X_5) is higher by 0.03073 than that of the base category, the households that are not poor that take the value of the constant, 0.17493. This is not surprising as the more households become poor, the more bipolarised income distribution becomes.

4.6.2.5 Effects of household head's gender on income bipolarisation

Female gender dummy has positive impact on bipolarisation as shown in Table 17. If female household head increases by 1 unit, bipolarisation will rise by 0.00119. The beta coefficient reveals that female (X_6) have average bipolarisation that is higher by 0.00146 than the male category which takes on the value of the constant. This supports an earlier finding that the females are disadvantage in income distribution. It also confirms what Figures 14 and 15 depict that bipolarisation was higher among female- than male-headed households in 2004.

4.6.2.6 Effects of household head's marital status on income bipolarisation

The married dummy status of household has negative effects on bipolarisation. A unit increase of married household heads will make average bipolarisation to decline by 0.00636, which is the marginal effect. However, the beta coefficient indicates that the household heads that were married (X_7) have average bipolarisation of 0.00775 lower than their base category, the single or the divorce. A married individual has the opportunity of

the spouse supporting him/her in income-generating activities, which enhances the family income and this can bring more households to move closer to the middle level income.

4.6.2.7 Effects of farming on income bipolarisation

From Table 17, farming occupation has negative impact on bipolarisation. The marginal effect of the variable is that one unit increase in farming households leads to a decline of 0.00697 in bipolarisation. The sign and value of the beta coefficient mean that the households that were of farming occupation (X_9) have average bipolarisation of 0.00839 lower than their base category, the non-farming that takes the value of the constant.

4.6.2.8 Effects of wage employment household head on income bipolarisation

Wage employment has negative impact on income bipolarisation. If one increases the wage employment households by 1 unit, bipolarisation will decline by 0.00105. The beta coefficient of wage employment (X_{12}) means that the households that were of wage employment have average bipolarisation of 0.00131 lower than their base category, the non-wage employment. Wage employment in the rural area normally serves as an additional source of income to farming which tends to close income gaps among households.

4.6.2.9 Effects of household geographical location on income bipolarisation

Unlike for polarisation, south location dummy has positive effects on bipolarisation contrary to the *a priori* expectation. This simply means that in 2004, more households tend to cluster at the two ends of the income distribution continuum in the south than in the north. According to Table 17, the marginal effect shows that if households located in the south are increased by one unit, bipolarisation will rise by 0.01150. The beta coefficient also shows that the households that were south-located (X_{13}) have average bipolarisation of 0.01403 higher than their base category, the households in the north that have average bipolarisation that takes the value of the constant, 0.17493. This is related to Figures 12 and 13 that show that in 2004, bipolarisation is higher in the south than in the north.

4.6.2.10 Poor and non-poor households' bipolarisation, given age of household head, household size, and father's years of formal education

From Table 17, the slope coefficient of 0.00051 for X_5X_1, shows that the effect of age on income bipolarisation is significantly higher by this value for the poor households than for the non-poor households. This indicates that a unit change in age of the poor household head leads to a higher change in bipolarisation than that of the non-poor household head. This implies that the effect of age on bipolarisation is different between the poor and the non-poor households, and that of the poor is higher.

Moreover, the slope coefficient of (X_5X_2) which is -0.00126 shows that the effect of household size of the poor households on bipolarisation is significantly lesser by this value than those of the non-poor. This means that 1 unit change in household size of the poor (non-poor) household leads to a lower (higher) change in bipolarisation than that of 1 unit change in the household size of the non-poor (poor) households. This, coupled with the poor status intercept beta coefficient of 0.03073 that is significant, indicates that bipolarisation with respect to household size behaves differently among the poor and the non-poor, and it is higher for the non-poor.

The slope coefficient (-0.00072) for X_5X_3 shows that the effect of the father's years of formal education on bipolarisation among the poor households is less than that of the non-poor households and the difference is significant. If one changes the father's years of formal education of the poor households by 1 unit, the resulting change in bipolarisation will be lesser than that of 1 unit change in the father's year of formal education of the non-poor households. This implies that income polarisation with respect to the father's year of education differs between the poor and the non-poor households, and that of the non-poor is higher.

4.6.2.11. Female and male household heads' bipolarisation, given father's years of formal education

From Table 17, the effects of the father's years of formal education on bipolarisation among the female household heads (X_6X_3) is revealed by its coefficient, 0.0001. This coefficient implies that the effect of the father's years of education on bipolarisation among the female is significantly higher than that of the male household

135

heads. If the father is formally educated and the female is the household head, income bipolarisation will be higher than if the father is the household head.

4.6.3 Total interaction effect of variables that affect bipolarisation

The beta coefficients of the dummy variables have shown, for instance, that whether poor or non-poor, bipolarisation is higher for married household heads than the base category, the single. This may not be tenable and, to account for such differences, the poor dummy variable was interacted with other dummy variables in multiplicative form and their total interaction effect computed as shown in Table 18.

4.6.3.1 Total effect of poor-female household head on bipolarisation

Table 18 reveals the total interaction effect of 0.03818 for poor female. This indicates that the poor-female household heads have average bipolarisation higher by 0.03818 than the average bipolarisation of the poor household heads, female household heads or non-poor male household heads. Also, this total interaction effect (0.03818) of the poor-female is higher than poor status difference (0.03073) and gender dummy difference (0.00146) when considered alone and separately. This means that being poor and being a female household head have higher positive effect on bipolarisation than being a poor, female or non-poor male household head.

4.6.3.2 Total effect of poor-married household head on bipolarisation

According to Table 18 the poor-married household heads have total interaction effect of 0.0018 which means that the average bipolarisation of poor-married household head is higher by 0.0018 than that of the poor, married or non-poor single household head. The value 0.0018 is however between poverty dummy intercept coefficient of 0.03073 and marital dummy intercept coefficient of -0.00775 when the two dummy variables are taken separately.

4.6.3.3 Total effect of poor-farming household on bipolarisation

As shown in Table 18, the poor-farming total interaction effect of 0.00923 shows that the

136

Table 18. Sum interaction of dummy variables that affect bipolarisation

Interactive Dummy	Sum of Differential Intercepts and Multiplicative Coefficients	Total Interaction Effect
Poor-Female Household (X_5X_6)	0.03073 + 0.00146 + 0.00599	0.03818
Poor- Married Household (X_5X_7)	0.03073 - 0.00775 - 0.02118	0.00180
Poor- Farming Household (X_5X_9)	0.03073 - 0.00839 - 0.01311	0.00923
Poor- Wage employment (X_5X_{12})	0.03073 - 0.00131 - 0.00075	0.02867
Poor- South Located (X_5X_{13})	0.03073 + 0.01403 - 0.00719	0.03757

Source: Computed from FW bipolarisation Tobit regression estimates

household heads that are poor and of farming occupation have average bipolarisation higher by 0.00923 than the poor household heads, farming household heads or their base category, the non-poor non-farming household heads. But the total interaction value, 0.00923, is between poverty difference (0.03073) and farming difference (-0.00839).

4.6.3.4 Total effect of poor-wage employment on bipolarisation

From Table 18, the total interaction effect, 0.02867, of being poor and in wage employment (X_5X_{12}) indicates that such households have average bipolarisation higher by 0.02867 than the poor, wage employment or non-poor non-wage employment households. The poor-wage employment total interaction value of 0.02867 is however between poor status difference (0.03073) and wage employment difference (-0.00131) when taken separately.

4.6.3.5 Total effect of poor south-located on bipolarisation

As shown in Table 18, the total interaction effect of poor south- located households of the value 0.03757 implies that the average bipolarisation of these households is higher by the value than the bipolarisation of the poor households, south-located households or non-poor non-south-located households. This means that a household head that is poor and located in the south has higher bipolarisation than the household head that is poor, located in the south or non-poor north-located. The poor south-located total interaction value of 0.03757 is however higher than the poor status difference alone (0.03073) and south-located difference alone (0.01403).

4.6.4. Implications of bipolarisation regression findings

Age, poor status, female gender and south location influences bipolarisation positively while household size, years of education, marital status, farming occupation and wage employment negatively affect bipolarisation. Average bipolarisation of the poor households is significantly different and higher than that of the non-poor households. Interactively poor status influences higher bipolarisation and poverty accounts for highest level of bipolarisation. With female as household head and formally educated father,

income bipolarisation is higher than if the father is the household head. This implies that years of education and female gender significantly affect bipolarisation. For bipolarisation to reduce the female household heads would have to be formally educated. Bipolarisation has significant relationship with the socio-economic characteristics of households and differs between poor and non-poor households.

CHAPTER FIVE
SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary

Income distribution analysis will continue to attract the attention of researchers, especially when issues are about the middle income group and level of poverty in the society. One feature of income distribution is polarisation, which is the disappearance of the middle class. When the middle class disappears, there is likely to be tension between the poor and the rich due to identification and antagonizing forces within and between the two groups resulting from the polarisation. Polarisation makes more people to move to the tail end of the distribution and there would be feelings of dissatisfaction, envy and deprivation which could lead to anger and social revolt with disruption and destruction of socio-economic infrastructure and facilities. Such situation could even lead to war. Apparently, there is growing poverty level in Nigeria with over 70 per cent of the population living in the rural area. A disappeared middle class in the country would lead to demonstrations with monumental effects. Rural-urban migration would be aggravated, rural production would be disrupted and more socio-economic problems like inflation, poverty and deaths would occur. Based on this, income polarisation and its linkage with poverty were investigated in the rural Nigeria.

However, income polarisation is different from income inequality as the latter refers to the overall dispersion of the distribution. The two could move in the same or opposite directions in the same socio-economic policy environment. There are two variants of income polarisation; that of increasing spread called polarity when the individuals in the median income are moving away to the ends and the second type, an extreme case, is when individuals in the income distribution continuum are clustering at the polar ends called increasing bipolarity. The former is called polarisation while the latter is bipolarisation. The movements of individuals away from the median income could be as a result of socio-economic characteristics, policy implementation, structural imbalance or unfavourable local or global economic conditions. Polarisation is positively related to poverty. Poverty as a feature of income distribution is a situation where an individual cannot meet his daily minimum subsistence requirements of food, water,

140

shelter, clothing, school and health care among others. But poverty in this study is taken to mean a state of an individual's income that is inadequate for his basic needs.

The study examined the pattern of polarisation over the periods 1980, 1985, 1992, 1996 and 2004, using the national consumer survey data of those years and the National Living Standards Survey data of 2004 in the entire rural Nigeria. Household's real per capita consumption expenditure was used for the analysis. Analysis was done across the geopolitical zones of the country along socio-economic dimensions. Households below two-thirds of the mean per capita consumption expenditure were considered poor. The relationship between polarisation and socio-economic factors including poverty of household heads was also examined. STATA 10.1 and Distributive Analysis Software were used for the analysis.

Many indices of polarisation estimation are available but the study made use of Duclos, Esteban and Ray (DER) Polarisation Index, Foster-Wolfson (FW) Bipolarisation Index, Tsui and Wang (TW) Bipolarisation Index as well as Lasso de la Vega and Urrutia (LU) Bipolarisation Index. This is in line with past studies on polarisation that applied multiple indices in their studies. Bipolarisation was linked with poverty using LU Bipolarisation Index and Foster-Greer-Thorbecke (FGT) Poverty index at poverty gap level of alpha equal to one. Regression analysis was also used with Tobit model that captured analysis of covariance (ANCOVA). This is due to the categorical (dummy) variables used in the analysis as the model helped to explain the differences that existed between the households' categories like female-headed and male-headed households, poor and non-poor households. Whereas polarisation index could not be measured or generated for each household and because all the five data sets emanated from different households, the index was generated for each geographical state in Nigeria with 2004 data point. The estimate for each state was then adopted for all the households in that state as their polarisation indices. This gave polarisation as continuous dependent variable with the socio-economic variables and poverty status of households as the explanatory variables.

The pattern of polarisation was similar to that of bipolarisation in the entire rural country. Polarisation by Duclos-Esteban and Ray (DER) index at the degree of identification, alpha, taken as 1.0, revealed the estimates of 0.2389, 0.2111, 0.2371, 0.2189 and 0.1874 in 1980, 1985, 1992, 1996 and 2004 respectively. DER Index of alpha

0.5 gave similar trends and higher values than that of 1.0 and all explanations were based on the latter. Bipolarisation through FW gave estimates of 0.6125, 0.4067, 0.4775, 0.4108 and 0.3529 for the same years respectively. LU Bipolarisation Index of identification parameter (alpha =1.6) and alienation parameter (beta = 1.0) gave estimates of 0.1676, 0.1430, 0.1610, 0.1460, and 0.1383 for the same years as well. Other values of alpha and beta gave higher estimates. Inequality estimates also followed similar patterns. These showed that polarisation and bipolarisation diminished towards 2004, implying that middle class appreciated in size towards that year. The results obtained in the research were comparable with those of past studies of Aigbokhan (2000) and Awoyemi *et al*. (2009). Along demographic features, no-formal-education, farming, non-farming, retirement age and wage employment explained highest polarisation and bipolarisation in the rural country. In 2004, polarisation was higher among farming households, in the north, among female, wage employment and no-formal-education than non-farming households, south, male, non-wage and formally educated. However, bipolarisation was higher among non-farming households, in the south, among female, non-wage and educated than farming households, north, male, wage and non-formally educated.

Among the six geopolitical zones, both polarisation and bipolarisation follow the same pattern as they decreased between 1980 and 1985, increased to 1992, then nose-dived through 1996 to 2004. Polarisation in 1980, 1985, and 1996, showed that the south-south (SS) zone had the highest estimates of 0.2551, 0.1991 and 0.2147 while in 1992 and 2004, the highest polarisation estimates of 0.2373 and 0.1851 came from the south-east (SE) and the south-west (SW) zones respectively. The least polarisation in 1980, 1985, 1992, 1996 and 2004 of 0.2019, 0.1753, 0.2119, 0.1915 and 0.1757 came respectively from the north- central (NC), NC, SW, SE and SS. However, the overall pattern was similar in all the zones and polarisation was generally higher in the southern zones than in the northern zones.

For NC, bipolarisation was 0.3573, 0.3367, 0.4515, 0.3824, and 0.3342 for the years 1080, 1985, 1992, 1996 and 2004. SS geopolitical zone had the highest bipolarisation of 0.5767, 0.3851, 0.4277, 0.3923 and 0.3344 throughout the years of consideration, except in 1992 when that of SW was highest with 0.4560. The least bipolarisation came from north-west (NW) of 0.3084, 0.3161, 0.4177, 0.3153 and 0.3050

for the respective stated years though in 2004, SW recorded the smallest bipolarisation of 0.2770 while north-east (NE) and SE experienced 0.3050 and 0.3283 in that order.

Bipolarisation linked with poverty status shows that income was bipolarised in rural Nigeria and as poverty level increased, bipolarisation also increased. As more households became poor, they moved away from the middle income level where a majority should be in an equitable distribution, to the tail end of the income continuum with fewer and fewer households left in the middle. The upper end of the income distribution representing upper income group is usually of very few households.

Moreover, analysis of covariance achieved through Tobit regression revealed that age, household size, poor status, and female gender had significant positive effects on income polarisation whereas father's and mother's years of education, farming occupation and wage employment had negative significant effects on income polarisation. Also, age, poor status and female gender had significant positive effects on income bipolarisation while years of education, farming and wage employment had negative effects on income bipolarisation. The highest significant marginal contributions to polarisation and bipolarisation of 0.00726 and 0.02520 were from poverty respectively. Interactively, all other variables considered as covariates with poverty had positive total interactive effects on polarisation and bipolarisation. Polarisation has significant relationship with the socio-economic characteristics of households. Also, the polarisation index of the poor households is significantly different and higher than those of non-poor households.

5.2 Conclusion of the study

There was evidence of polarisation in rural Nigeria. Though it reduced between 1980 and 2004 along all the socio-economic dimensions considered, the study has drawn attention to some socio-economic variables that drive income polarisation. These factors include age, poverty, formal education, wage, farming occupation, and female gender. Both polarisation and bipolarisation were higher among females than males. Poverty had the highest marginal contribution to polarisation and bipolarisation; implying that poverty drove polarisation and bipolarisation most among the factors.

5.3 Contribution to knowledge

The study has contributed to knowledge by establishing that the middle income class was gradually bouncing back in Nigeria in 2004 because income polarisation reduced in rural Nigeria between 1980 and 2004. Also, though estimates of polarisation varied between 1980 and 2004, the pattern of polarisation remained the same across some socio-economic characteristics and the six geopolitical zones. The study equally established that poverty significantly drives income polarisation while poverty and polarisation move in the same direction and that some factors like formal education reduce income polarisation while age and poverty enhance income polarisation. The study has added to the lean literature on income polarisation in Nigeria.

5.4 Policy implications and recommendations

Reduce poverty among households

Poverty is a factor which has highest positive contribution to polarisation. As more households become poor, polarisation increases. Efforts should further be geared at reducing poverty. Programmes targeted at reducing poverty like National Poverty Eradication Programme and FADAMA should be stepped up by government. A drastic reduction in rural poverty would reduce polarisation. A reduction in polarisation brings more household heads to the middle income level and the country's income distribution would pose less source of conflict that could arise from polarisation.

Boost households' access to formal education

More people should be encouraged to have formal education as the study established that polarisation is lower among the educated than the non-educated. Perhaps this is because education is an important factor in the acquisition of skills and knowledge capital but it is not available; and where available, it is expensive. This erodes households' income and does not encourage the size of the middle class. With rising cost of education plus individual's provision of household power domestically, income polarisation may continue to be higher in Nigeria. Therefore, to sustain the decreasing polarisation, formal education should be made accessible and affordable to the middle class and the poor households by government. In this connection, government can also increase the

Universal Basic Education Policy to compulsory free twelve years of education like in China as against the present nine years.

Provide social protection for individuals

Since the study showed that polarisation increases with age, government should design and implement financial social protection for all individuals. Government should introduce the payment of certain amounts of subsistence monetary allowance to the unemployed. These will redistribute income and reduce income polarisation against the majority who are below the retirement age. Also, the decline in polarisation among the old does not imply improved income; it is rather a manifestation of low productivity and income among them. Subsistence monetary allowance should be provided for the old as presently being done in Osun State. The social protection system should be designed and implemented by government and the private sector to ensure that people have at least subsistence income throughout their life cycle.

Encourage small household size

Since polarisation increases with household size, there is need for all tiers of government to improve on family planning programme for rural households to have less number of children for improved income distribution. Small household size would engender higher per capita household income.

Provide income support for the female

Income distribution policy should be implemented and streamlined in favour of women as the study revealed that polarisation is higher among women. Government can improve on FADAMA programme to favour women while women's economic empowerment programmes like Better Life for Rural Women should be re-introduced by all tiers of government. This would improve the women in terms of income generating capacity and perhaps close the income gap among them and between the women and men.

5.5 Suggestions for further study

In spite of the findings on income polarisation which is the disappearance of the middle class and the recommendations made in this study, there exist avenues for further research. The growing importance of poverty and polarisation as important features of income distribution would continue to bring out interests for research endeavours. Such

research could look into three co-variables on polarisation, study the size or proportion of individuals that spread out from the middle income level and at what rate. The higher level of poverty in the last one decade also calls for more studies on income polarisation. Such studies could explore probability analysis of different marginal effects of changes in socio-economic variables on polarisation. A study like this could be extended to the recently released 2010 Household Living Standards Survey Data. Studies could also be made on non-income polarisation pertaining to other welfare indicators until equitable income distribution with large middle class and small or no lower class is achieved towards an egalitarian society.

REFERENCES

Achia, T. N. O., Wangombe, A. and Khadioli, N. 2010. A logistic regression model to identify key determinants of poverty using demographic and health survey data. *European Journal of Social Sciences*, Vol. 13.1: 38-45. Retrieved May 10, 2011 from http://www.eurojournals.com/ejss_13_1_05.pdf.

Adamson, K. 2007. Naira re-denomination: A decade of stable instability. African Development Management Network. *The Guardian Magazine*, Oct. 14. Retrieved Aug. 12, 2012, from www.adamson-economics.org/id28.html.

Adegeye, A. J. and Ditto, J. S. 1985. *Essentials of agricultural economics*. 1st Edition. Ibadan, Nigeria. Impact Publishers Nig. Ltd. Pp 16 – 17. ISBN 978-2386-00-6.

Aigbokhan, B. E. 2000. Poverty, growth and in-equality in Nigeria: a case study. African Economic Research Consortium, Nairobi, AERC Research paper 102. Pp 1- 43

Aigbokhan, B. E. 2008. Growth, inequality and poverty in Nigeria. Discussion Paper No. 3, Economic Commission for Africa, ACGS/MPAMS, Addis Ababa, Ethiopia. Retrieved Aug. 1, 2012, from www.uneca.org/eca_programmes/acgd/mdgs /Growth Inequality Poverty.pdf.

Akerele, D. and Adewuyi, S. A. 2011. Analysis of poverty profiles and socioeconomic determinants of welfare among urban households of Ekiti State, Nigeria. *Current Research Journal of Social Sciences,* Vol. 3.1: 1-7. ISSN: 2041-3246.

Akinyele, I. O. 2009. Ensuring food and nutrition security in rural Nigeria: an assessment of the challenges, information needs, and analytical capacity. Nigeria Strategy Support Program (NSSP) Background Paper No. NSSP 007**.** *International Food Policy Research Institute Publication,* Series No. 7, Nov**.** Retrieved Nov. 10, 2010 from http://www.ifpri.org/publication/ensuring-food-and-nutrition-security-rural-Nigeria.

Alayande, B. 2003. Decomposition of inequality reconsidered: some evidences from Nigeria. Paper presented at the UNU/NIDER Conference on inequality, poverty and human wellbeing in Helsinki, Finland. 29th-31st, May.

Amao, J. O., Awoyemi T. T., Omonona, B. T and Falusi, A. O. 2009. Determinants of poverty among fish farming households in Osun State, Nigeria. *International Journal of Agricultural Economics and Rural Development,* Vol. 2.2: 14-25.

Anyanwu, J. C. 2010. Poverty in Nigeria: a gendered analysis. *The African Statistical Journal,* Vol. 11: 38-61, Nov. Retrieved October 20, 2011 from http://www.afdb. org/fileadmin/uploads/afdb/Documents/Publications/Poverty%20in%20Nigeria%2 0A%20Gendered%20Analysis.pdf.

Anyanwu, J. C. and Oaikhenam, H. E. 1995. *Modern macroeconomics: Theory and application in Nigeria*. 1st edition. Onitsha, Nigeria. Joanee Educational Publishers Ltd. Pp 50-75. ISBN: 978-2784-16-8.

Apata, T. G., Apata, O. M., Igbalajobi, O. A. and Awoniyi, S. M. O. 2010. Determinants of rural poverty in Nigeria: evidence from small holder farmers in South-western, Nigeria. *Journal of Science and Technology Education Research*, Vol. 1.4: 85- 91, Sept.

Asogwa, B. C., Okwoche, V. A. and Umeh, J. C. 2012. Analysing the determinants of poverty severity among rural farmers in Nigeria: A censored regression model approach. *American International Journal of Contemporary Research*, Vol. 2.5: 166-176.

Awoyemi, T. T. and Abdelkrim, A. 2009. Explaining polarisation and its dimensions in Nigeria. A DER decomposition approach. *Paper prepared for the 4th Annual Conference on Econometric Modelling for Africa, Abuja, Nigeria*. 8-10 July. Retrieved Aug. 8, 2012, from www.Africametrics.org/documents /conference09/ papers/Awoyemi_ Araar.pdf.

Awoyemi, T. T. and Adeoti, A. I. 2004. The decomposition of income inequality by sources of income: The rural Nigeria experience. *African Journal of Economic Policy*, Vol. 11.1:1-16.

Awoyemi, T. T. 2004. Explaining income inequality in Nigeria: A regression-based approach. Department of Agricultural Economics, University of Ibadan, Nigeria. Retrieved July 14, 2008, from http://www.aercafrica.org/aes/papers/group_A/A9-Timithy%20Awoyemi.pdf.

Awoyemi, T. T. 2011. Rural non-farm incomes and poverty reduction in Nigeria. University of Ibadan, Ibadan, Nigeria. African Economic Research Consortium (AERC), Nairobi. AERC Research Paper 224. Jan.

Awoyemi, T. T., Busayo, O. I., and Adewusi, O. 2006. Inequality, polarisation and poverty in Nigeria. *Research proposal presented to PEP Network at 6th PEP Research Network general meeting*. Retrieved Dec. 5, 2007, from http://www.pep-net.org/NEW-PEP/HTML/Meetings/Lima/Fichiers%20pdf/pmma10832-Awoyemi.pdf.

Awoyemi, T. T., Busayo, O. I., and Adewusi, O. 2009. Inequality, polarisation and poverty in Nigeria. PEP Network, Canada Working paper. Pp 1-45. Retrieved Dec. 5, 2009, from http://www.pep-net.org/NEW-PEP/HTML/workingpaper/20pdf /Awoyemi.pdf.

Ayoade, A. R., Ogunwale, A. B. and Adewale, J. G. 2011. Impact of the national special programme for food security on poverty alleviation among women in Oyo State, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, Vol.

11.4: 5064-5082. Jul. www.ajol.info/index. php/ajfand/article/download /69174/57212.

Babatunde, R. O. 2008. Income inequality in rural Nigeria: evidence from farming households survey data. *Australian Journal of Basic and Applied Sciences,* 2(1): 134-44. ISSN 1991-8178.INSINET publication. Retrieved June 2, 2008, from www.insinet.net/ajbas/2008/134-140.pdf.

Blackorby, C. and Donaldson, D. 1980. A theoretical treatment of absolute inequality. *International Economic Review*, Vol. 21.1:107-136.

Bowden, E. V. 1986. *Economics: the science of common sense.* 1st Edition. Cincinnati, Ohio. South-Western Publishing Co. Pp 82-627. ISBN: 0-538-08980-6.

Brambor, T., Clark, W. R. and Golder, M. 2005. Understanding interaction models: Improving empirical analyses. *Political Analysis,* 13:120doi:10.1093/pan/mpi014. Political Analysis Advance Access published May 18. Retrieved Jan. 30, 2012, from http://www.fsu.edu.

Braumoeller, B. F. 2004. Hypothesis testing and multiplicative interaction terms. Harvard University, Department of Government, Littauer Center, North Yard Cambridge. Retrieved Jan. 31st, 2012, from www.cc.rochester.edu/ college/psc/ clarke/405/Braumoeller.pdf.

British Council Nigeria. 2012. Improving the lives of girls and women in Nigeria: Issues Policies Action. Gender in Nigeria report 2012, 2nd edition. Retrieved Oct. 10, 2012 from http://www.dfid.gov.uk/Documents/publications1/Gender-Nigeria 2012.pdf.

Canagarajah, S., Ngwafon, J. and Thomas, S. 1997. The evolution of poverty and welfare in Nigeria, 1985-92. World Bank Policy Research Working Paper No. 1715. Jan. Retrieved Jan. 10, 2008, from http://www-ds.worldbank.org/external/.

Central Bank of Nigeria 1999. Nigeria's development prospects: Poverty assessment and alleviation study. Central Bank of Nigeria in collaboration with the World Bank, Abuja, Nigeria.

Chakravarty, S. R. and Majumder, A. 2001. Inequality, polarisation and welfare: Theory and applications. Blackwell publishers Ltd, 108 Cowley Road, Oxford OX4 1JF *Australian Economic papers* 40:1-13.

Chakravarty, S. R., Majumder, A. and Roy, S. 2007. A treatment of absolute indices of polarisation. *The Japanese Economic Review*, Vol. 58.2: 273 - 292.

Cowell, F. A. 1998. Measurement of inequality. STICERD. London School of Economics. Retrived Mar. 21, 2008, from http://sticerd.lse.ac.uk/dps/darp/ darp36 .pdf.

Cowell, F. A. 2000. *Measuring inequality*. 3rd edition. Wheatshef. Prentice Hall. Retrieved Mar. 20, 2008 from http://darp.lse.ac.uk/papersDB/Cowell_measuring inequality3.pdf.

Cowell, F. A. 2003. Theil, inequality and the structure of income distribution. London School of Economics and Political Science. Retrieved Mar. 20, 2008, from http://sticerd.lse.ac.uk/dps/darp/darp67.pdf.

Cowell, F. A. 2006. Inequality: Measurement. London School of Economics. Retrieved Mar. 20, 2008, from http://eprints.lse.ac.uk/2686/1/Inequality_Measurement.pdf.

de Neeve, E. 2012. Income distribution in economic growth: Ideas from Bernard Lonergan. Thomas More Institute, Montreal. Retrieved Jan. 15, 2012 from eileendeneeve.com/lonergan.html.

Duclos, J., Arrar, A. and Fortin, C. 2008. *DAD 4.5*. A software for distributive analysis. International Development Research Centre, Government of Canada and CREFA, University of Laval, Laval.

Duclos, J., Esteban, J. and Ray, D. 2004. Polarisation: concepts, measurement, estimation. *Econometrica*, Vol. 72.6: 1737-1772. Nov. Retrieved July 28, 2008, from http://cc .msnscache.com/cache.aspx.

Ekpo, A. H. and Umoh, O. J. 2012. An overview of the Nigerian economic growth and development. Retrieved Aug. 8, 2012, from www.onlinenigeria.com/economics

Ennin, C. C. Nyarko, P.K., Agyeman, A., Mettle, F.O. and Nortey, E.N.N. 2011. Trend analysis of determinants of poverty in Ghana: Logit approach. *Research Journal of Mathematics and Statistics*, Vol. 3.1:20-27. ISSN: 2040-7505

Esteban, J., Gradin, C. and Ray, D. 1999. Extensions of a measure of polarisation with an application to the income distribution of five OECD counties. Working paper No. 218:1-31. Retrieved July 28, 2008, from http://www.lisproject. org/ publications/liswps/218.pdf.

Esteban, J. and Ray, D. 1994. On the measurement of polarisation. *Econometrica*, Vol. 62 .4: 819-851.

Ezcurra, R. 2009. Does income polarisation affect economic growth? The case of the European regions. Regional Studies. Vol. 43.2: 267 – 285.

Foster, J., Greer, J. and Thorbecke, E. 1984. A class of decomposable poverty measures, *Econometrica*, 52: 761–766.

Foster, J. E. and Shneyerov, A. A. 2008. A general class of additively decomposable inequality measures. Retrieved March 20, 2008 from http://www.princeton.edu /~rpds/downloads/foster_ general_inequalities.pdf.

Foster, J. E. and Wolfson, M. C. 1992. Polarization and the decline of the middle class: Canada and the U.S. *Mimeo*, Vanderbilt University.

Friedrich, R. J. 1982. In defence of multiplicative terms in multiple regression equations. *American Journal of Political Science*, Vol. 26.4: 797-833. Retrieved Jan. 13, 2012, from http://www.jstor.org/stable/2110973.

Giovannomi, O. 2010. Functional distribution of income, inequality and the incidence of poverty: Stylized facts and the role of macroeconomic theory. The University of Texas Inequality Project (UTIP). Working paper No 58. Retrieved Nov. 30, 2011, from utip.gov.utexas.edu/papers/utip_58.pdf.

Gradin, C. 2000. Polarisation by sub-populations in Spain 1973-91. *Review of Income and Wealth*, Series 46.4: 457 - 474. Dec.

Gradin, C. and Rossi, M. 2006. Income distribution and income sources in Uruguay. *Journal of Applied Economics,* Universidad del CEMA, Buenos Aires, Argentina. Vol. 9.1: 49-69. ISSN 1514-0326.

Gravelle, H. and Rees, R. 2004. *Microeconomics*. 3rd Edition. Harlow Essex, England. Pearson Education Limited. Prentice Hall Financial Times. Pp 4-5. ISBN 0 582 404878.

Gujarati, D. N. and Porter, D. C. 2009. *Basic econometrics*. 5th edition. McGraw-Hill, New York. Pp 277-290, 574-576. ISBN: 978-007-127625-2.

Hargens, L. 2006. Interpreting product-variable models of interaction effects. Working Paper no. 67. Center for Statistics and the Social Sciences. University of Washington, Seattle. Nov 8. Revised Feb 2008. Retrieved Jan. 30, 2012, from www.csss.washington.edu/Papers

Hever, S. 2007. The disappearing middle class in Israel. *Alternative Information Centre* (AIC), Vol. 23.2.

Hornby, A. S. 2001. Oxford advanced learner's dictionary of current English. 6th Edition. Ed. Wehmeier, S. Oxford. Oxford University Press.

Ibrahim, H. and Umar, H. S. 2008. Determinants of poverty among farming households in Nasarawa State, Nigeria. *Journal of Production Agriculture and Technology*, Vol 3.2:11-21. ISSN: 0794-5213.

Kolm, S. C. 1976. Unequal inequalities I. *Journal of Economic Theory*, 12: 416–442.

Lasso de la Vega, M. C. and Urrutia, A. M. 2006. An alternative formulation of the Esteban-Gradín-Ray extended measure of polarization. *Journal of Income Distribution,* 15: 42-54.

Lee, S. and Shaw, L. 2008. From work to retirement: tracking changes in women's poverty status. Institute of Women's Policy Research. AARP Public Policy Institute, Washington D. C. Pp 1-25. Retrieved July 10, 2011 from http://assets.aarp.org/rgcenter/econ/2008_03_poverty.pdf

Lipsey, R. G. and Chrystal, K. A. 2005. *Economics*. 10th Edition. New York. Oxford University Press Inc. Pp 117-248.

McConnell, C. R. and Brue, S. L. 2005. *Economics: principles, problems and policies*. 16th Edition. New York. McGraw-Hill/Irwin. Pp 79-703. ISBN-10 0-07-281935-9.

McDonald, J. F. and Moffitt, R. A. 1980. The uses of Tobit analysis. *Review of Economics and Statistics*, 62: 318-321.

Mussard, S., Seyte, F. and Terraza, M. 2003. Decomposition of Gini and generalised entropy inequality measures. Retrieved Mar. 20, 2008, from http://economics bulletin.vanderbilt.edu /2003/volume4/EB-03D30001A.pdf.

National Bureau of Statistics. 2005. *Poverty profile in Nigeria*. NBS. Abuja, Nigeria. Pp 1 -98. Retrieved Aug. 27, 2007 from   www.nigerianstat.gov.ng/ nlss/2006/survey0 /output Information/prereport.pdf.

National Bureau of Statistics. 2006. The Nigerian statistical facts sheets on economic and socio development. National Bureau of Statistics, Federal Republic of Nigeria, Abuja. Nov. Pp 21-86.

National Bureau of Statistics. 2007. *The middle class in Nigeria: Analysis of profile, Determinants and characteristics (1980 -2007).* Economic Reform and Governance Project, (ERGP). Federal Republic of Nigeria. July. Pp 1-95.

National Bureau of Statistics. 2010. News. Information on Nigeria's GDP in 2009. Retrieved Aug. 27, 2010, from www.nigerianstat.gov.ng/home.

National Bureau of Statistics. 2012. The Nigeria poverty profile 2010 report. NBS press briefing on Nigeria poverty profile 2010 report. Retrieved Mar. 3, 2012, from reliefweb.int/sites/reliefweb.int/files/resources/b410.

Norton, E. C., Wang, H. and Ai, C. 2004. Computing interaction effects and standard errors in logit and probit models. *The Stata Journal*, Vol. 4.2:154–167. Retrieved Aug. 12, 2012, from www.ageconsearch.umn.edu.

Okojie, C. E., Anyanwu, J. C., Ogwumike, F. O., and Alayande, B. A. 2001. Nigeria: gender, dimension, access to social services and labour market issues. Final Report of Collaborative Research Study on Poverty, Income Distribution and Labour Market Issues in Sub-Saharan Africa. Submitted to the African Economic

Research Consortium, Nairobi Kenya.

Olaniyan, O. and Awoyemi, T. T. 2005. Inequality in the distribution of household expenditure in rural Nigeria. A decomposition analysis. *Draft final research report submitted to the African Research Consortium, Nairobi for the 2nd phase collaborative Poverty Research Project*. Retrieved Aug. 5, 2012, from www.sarpn.org/documents/d0002271.

Omonona, B. T. 2001. The determinants of poverty among farming households in Kogi State, Nigeria. Unpublished PhD Thesis, Department of Agricultural Economics, University of Ibadan, Ibadan, Pp 26-91.

Omonona, B. T. and Okunmadewa, F. Y. 2009. Determinants of poverty among farming households in Kogi State of Nigeria. *Journal of Income Distribution, An International Quarterly,* Vol. 18.2:16-34, June.

Omonona, B. T., Oni, O. A. and Uwagboe, A. O. 2006. Adoption of improved cassava varieties and its welfare impact on rural farming households in Edo State, Nigeria. *Journal of Agriculture and Food Information*, Vol. 7.1:39–55. The Haworth Information Press. ISSN: 1049 – 6505.

Olayemi, J. K. 2004. *Principles of microeconomics: for applied economic analysis*. 1st Edition. Ibadan, Nigeria. SICO Publishers. ISBN 978-006-432-X.

Oyekale, T. O. 2011. Impact of poverty reduction programs on multidimensional poverty in rural Nigeria. *Journal of Sustainable Development in Africa*, Vol. 13.6:1-11. ISSN: 1520-5509.

Oyekale, A., Adeoti, A. I. and Oyekale, T. O. 2006. Measurement and sources of income inequality among rural and urban households in Nigeria. University of Ibadan. PMMA Working paper No. 2006-20.

Rodriguez, J. G. 2004. Measuring polarisation, in-equality, welfare and poverty. Centra: Fundacion Centro de Estudios Andaluces. E2004/75: 1-30. Retrieved Dec. 6, 2007, from http://public.centrodeestudiosandaluces.es/pdfs/E200475.pdf.

Rodriguez, J. G. 2006. Measuring bipolarisation, in-equality, welfare and poverty. Society for the Study of Economic In-equality. Working paper series. ECINEQ WP 39:1-29. Retrieved Dec. 6, 2007, from http://www.ecineq.org/milano /WP/ECINEQ 2006 -39.pdf.

Rodriguez, J. G. and Salas, R. 2003. Extended bi-polarisation and inequality measures. Working paper P.T.N. 10-03. Instituto de Estudios Fiscales, Madrid. Retrieved Aug. 20, 2008, from http://www.ief.es/ Publicaciones/PapelesDeTrabajo/pt2003 _10. pdf.

Schmidt, A. 2009. Statistical measurement of income polarisation. A cross-national

comparison. Seminar of economic and social statistics, University of Cologne, Germany. Pp. 1-20. Retrieved Mar. 01, 2009, from http://econpapers.repec.org cpd/2002/95 _Schmidt.pdf.

Sribney, R. W. 1997. Pseudo-R^2 for Tobit : why is the pseudo-R^2 for Tobit negative or greater than one? Stata Corp. *Stata: Data Analysis and Statistical software*. Retrieved June 05, 2010 from www.stata.com/support/faqs/stat/pseudor2.htinl.

Tsui, K. and Wang, Y. 1998. Polarisation ordering and new classes of polarisation indices. *Memo*, the Chinese University of Hong Kong University.

Vanderpuye-Orgle, J. 2002. Spatial in-equality and polarisation in Ghana, 1987-99. Department of Applied Economics and Management, Cornell University, NY. Pp 1–25. Retrieved Mar. 8, 2008 from www.arts.cornell.edu.pdf.

Wang,Y. Q. and Tsui, K. Y. 2000. Polarisation orderings and new classes of polarisation indices. Blackwell publishers Inc. *Journal of Public EconomicTheory* Vol. 2.3: 349–363.

Whisman, M. A. and McClelland, G. H. 2005. Designing, testing, and interpreting interactions and moderator effects in family research. *Journal of Family Psychology*, Vol. 19.1: 111–120. Retrieved Jan. 30, 2012 from www-psychology. concordia.ca/fac/kline/734/whisman.pdf.

Wolfson, M. C. 1994. When inequalities diverge. *American Economic Review*, Vol. 84.2: 353-358.

Wolfson, M. C. 1997. Divergent in-equality: Theories and empirical results. *Review of income and wealth.* Series 43.4: 401-421. Dec.

World Bank. 1996. Nigeria: Poverty in the midst of plenty − The challenge of growth with Inclusion. Report No. 14733-UNI, Washington D.C. May. Retrieved Jan. 10, 2008, from 26 http://www-wds.worldbank.org/servlet.

Zhang, X. and Kanbur, R. 1999. What difference do polarisation measures make? An application to China. Working paper 99-02:1–10. *Department of Agricultural Resource and Managerial Economics, Cornell University, Ithaca, NY*. Retrieved Mar. 20, 2008, from http:// ageconsearch. umn.edu/bitstream/1234567 89/29775/2/ wp990002 .pdf.

Zhang, X. and Kanbur, R. 2001. What difference do polarisation measures make? An application to China. *Journal of Development Studies*, 37: 85–98.

APPENDICES

Appendix A: Definition of terms

The following shall serve as the meaning of the relevant terms of this research.

Gender: Refers to heads and individual members of households whether males or females. This becomes necessary for analysis because men and women, boys and girls do have dissimilar responsibilities inside and outside the household and do have different constraints and different living standard.

Household: All the people who live under the same roof and who take, or are subject to others taking for them, joint financial decisions and feed from the same pot. (Lipsey and Chrystal, 2004).

Household consumption expenditure: This refers to the spending on food and non-food items. The food expenditure covers food purchases and consumption of own produce while the non-food expenditure includes rental values of classes of non-rented homes (owner-occupied houses, rent-free houses, subsidized housing), education (school fees, school uniforms, etc), health (medication, hospitalization), frequent non-food (tobacco, alcohol, clothing, transportation, communication) and infrequent non-food items (small appliances) excluding ceremonial expenditure, taxes and transfers (NBS, 2005).

In this research, household consumption expenditure was used for analysis. This is because of measurement error from under-reporting of income by respondents. Thus conceptually, using income data to measure welfare would be misleading. Though it is being noted that consumption expenditure data of rural households also has limitations arising from household size, within-household distribution of consumption and consumption from own production. To take care of this, necessary adjustments were made for household size to obtain real per capita values over the period of years being considered (Aigbokhan, 2000 and NBS, 2007).

Income: Money earned from work, investment or endowments of a household that is expressed in terms of some numeraire or units of account (Gravelle and Rees, 2004)

Poverty: Poverty is the inability to attain a minimal standard of living (Aigbokhan, 2000).

Income distribution: This refers to how income is divided among different households in the economy, a particular region or sector of the economy. It is the size distribution of

direct financial resources received by households, focusing on receipt of money income of varying sizes among household units.

Income Inequality: The extent to which income is distributed in an uneven manner or the overall dispersion of income distribution among households. It is a characteristic of income distribution.

Income Polarisation: This refers to the clustering of the elements (households) in the income distribution at polar ends. It is another characteristic of income distribution.

Normal Distribution: The distribution with mean zero and standard deviation equal to one.

Real consumption expenditure measurement:

This is in line with the guide demonstrated by NBS (2005).

Prices do vary across regions and time due to inflation and seasonal supply of commodities. So as to account for price differentials, the real consumption expenditure of the household was computed on the basis of a deflator that adopted Laspeyres Index. The deflator was computed per capita household expenditure using:

$$C_{r,t}^L = \sum_{i=1}^{n} w_{i,0,0} \left(\frac{p_{i,r,t}}{p_{i,0,0}} \right) \text{ where,}$$

$C_{r,t}^L = Laspeyres \text{ Price index}$

$w_{i,0,0}$ = the budget share of commodity i at the reference region r(0) and time t(0).

$P_{i,0,0}$ = the reference price for commodity i at the reference region r(0) and time t(0).

$P_{i,r,t}$ = the price for commodity i in a particular season and at a particular time.

The price index expresses prices with reference to a fixed point in time and fixes a basket of goods. The index measures spatial and temporal variations of price by fixing the basket and the reference price. The prices used were that of a national average weighted by the population share attributable to every state. Consumer price index data was the source of price data and where unavailable, price information from other market survey was used. All these data are obtainable from NBS. Aigbokhan (2000) used 16 food items in urban and rural areas in each state for 1985, 1992 and 1996. The Table in Appendix B shows the implicit deflator used for the analysis.

Rural households: These are households found in areas that are basically agrarian in terms of economic specialization, and are characterized by poor infrastructure, low

educational level of the population, low skills, manual activities, low opportunities and longer distances to some key services relative to urban areas with agricultural land, forests, natural areas such as mountains and extreme climate conditions as their natural features. The rural Nigeria is gradually becoming heterogeneous in terms of economic activities.

Rural household income: Money earned from work, investment or endowments of a household in a rural area that is expressed in terms of some numeraire or units of account

Socio-economic characteristics groups: This is the sub-division of the rural population into groups that constitute the dimensions for the analysis whereby the rural households are sub-grouped in terms of socio-economic characteristics. Adegeye and Ditto (1985) mention that agricultural economists are sociologists, political scientists, geographers and economists of the rural sector.

Sources of income: The ways of getting money or money income spent on consumption expenditure by households.

Standard Error: The standard deviation of the sampling distribution of the estimate. The sampling distribution is the distribution of the set of values of the estimator obtained from all possible samples of the same size from a given population.

Standard deviation is the square root of the variance.

Appendix B: Consumer Price Index used in the analysis

Weighted average price and deflator

Year	Weighted Average Price	CPI Implicit Deflator (1980 Base Year)	CPI Implicit Deflator (2004 Base Year)	Per cent Change (1980 Base Year)
1980	47.35	100.00	4.11	0.00
1985	107.33	226.67	9.31	127.00
1992	559.75	1182.15	48.55	1081.00
1996	1060.72	2240.17	92.01	2039.00
2004	1152.91	2434.87	100.00	2333.00

Source: Author's computation

Appendix E1. Difference of Mean of FW and TW Bipolarisation (North-South)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.3995	0.0291	0.0652	0.3187	0.4803
TW	5	0.3545	0.0318	0.0711	0.262	0.4429
Difference	5	0.0449	0.0136	0.0304	0.0072	0.0827

Mean (Difference) = mean(fw − tw)   t = 3.3021   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.0299

Source: Computed from FW and TW Bipolarisation estimates

Appendix E2. Difference of Mean of FW and TW Bipolarisation (Gender)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.4173	0.0283	0.0633	0.3388	0.4959
TW	5	0.3771	0.0306	0.0685	0.2921	0.4621
Difference	5	0,0403	0.0147	0.0329	-0.0006	0.0815

Mean (Difference) = mean(fw − tw)   t = 2.7338   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.0522

Source: Computed from FW and TW Bipolarisation estimates

Appendix E3. Difference of Mean of FW and TW Bipolarisation (Wage-nowage)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.3820	0.0219	0.0491	0.3211	0.4429
TW	5	0.3758	0.0309	0.0690	0.2901	0.4615
Difference	5	0.0063	0.0161	0.0359	-0.0383	0.0508

Mean (Difference) = mean(fw − tw)   t = 0.3898.   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.7165

Source: Computed from FW and TW Bipolarisation estimates

Appendix E4.. Difference of Mean of FW and TW Bipolarisation (Farming-nonfarming)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.4107	0.0196	0.0438	0.3563	0.4651
TW	5	0.3728	0.0303	0.0677	0.2888	0.4569
Difference	5	0.0379	0.0144	0.0321	-0.0020	0.0778

Mean (Difference) = mean(fw − tw)   t = 2.6376   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.0577

Source: Computed from FW and TW Bipolarisation estimates

Appendix E5. Difference of Mean of FW and TW Bipolarisation (Retired-non retired age)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.3824	0.0115	0.0258	0.3504	0.4144
TW	5	0.3729	0.0289	0.0646	0.2927	0.4531
Difference	5	0.0095	0.0261	0.0583	-0.0629	0.0819

Mean (Difference) = mean(fw − tw)   t = 0.3636   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.7346

Source: Computed from FW and TW Bipolarisation estimates

Appendix E6. Difference of Mean of FW and TW Bipolarisation (Education-noeducation)

Variable	Observation	Mean	Standard Error	Standard Deviation	(95% Confidence Interval)	
FW	5	0.3930	0.0215	0.0481	0.3333	0.4527
TW	5	0.3728	0.0304	0.0680	0.2884	0.4571
Difference	5	0.0203	0.0154	0.0344	-0.0224	0.0629

Mean (Difference) = mean(fw − tw)   t = 1.3180   Degree of freedom = 4

H_O: mean (difference) = 0 H_a: mean(difference) ≠ 0   Pr(|t|) > |t| = 0.2579

Source: Computed from FW and TW Bipolarisation estimates