Structural Transformation, Poverty and Inequality in Nigeria: An ARDL Bound Testing Technique

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Abstract

Poverty has been a daunting global issue since the Industrial Revolution. Despite the economic successes achieved in the world, efforts to reduce poverty became prostrating in many countries. Although economists have, for long, recognized the significant role of structural transformation in economic growth and development of any economy, studies linking it with poverty and inequality are quite scanty. This paper uses ARDL bound testing technique to investigate the interrelationship among structural transformation, growth, inequality and poverty using Nigerian data. The results show that despite very low rate of structural transformation in Nigeria, there exists long-run relationship among the variables in the study. The insignificance of the structural transformation variable in the model indicates that the structural transformation is very slow in the country. The transformation that started in Nigeria in the early 1960s was disrupted by the emergence of oil as the mainstay of the economy leading to neglect of the other real sectors by the government. The failure of making best use of revenues from oil to support structural transformation of the economy led to the 'paradox of plenty', a rich country with lots of poor people.

Keywords: structural transformation, Dutch Disease, inequality, poverty, Nigeria

1. Introduction

Since the emergence of development economics as an independent sub-discipline after the end of the World War II, the pendulum of development thinking had been swinging between supporters of perfect market and state intervention. Recently, the new development thinking emphasizes getting the price right by creating a stable market environment, strengthening the institutions necessary for markets to function well and building human capital (Lin, 2012).

Structural transformation (Note 1) refers to "different arrangements of productive activity in the economy especially to different distributions of productive factors among various sectors of the economy, various occupations, geographic regions, types of products, etc." (Machlup, 1991). Structural change also refers to shifts in the relative importance of sectors of the economy on its way to development including changes in location of economic activities (urbanization), and other resulting aspects of industrialization. These are jointly referred to as Structural Transformation (Syrquin, 2007). (Note 2) Also more precisely, Chenery, Robinson and Syrquin (1986) defined structural transformation as the set of changes in the composition of demand, trade, production, and factor use that take place as per capita income increases.

The modern analyses of structural change started with (Fisher, 1935; 1939) and (Clark, 1940) who proposed the division of economic activities into primary, secondary, and tertiary sectors which served as major conceptual framework for quantitative structural analyses (Schmidt, 2005). Also Kuznets, (1971) proposed similar classification of the economy into agriculture, industry, and services sectors anchored with the central idea in sectoral analysis, arguing that long-run economic development is accompanied by shifts in the allocation of resources (especially labor) from primary sector (agriculture) to secondary sector (industry) and subsequently to tertiary sector (services). This has been supported by series of empirical studies on developed and the newly industrializing economies which revealed a steady decline of the share of labor in agriculture sector, a passing

increase and peak in the proportion of labor in manufacturing sector, and a consistent rise in the share of labor in services reflecting the transition from agrarian to post industrial stage (Schmidt, 2005).

This route of sectoral labor transition depends on the effects of sectoral differentials in productivity of labor and differences in income elasticity of sectoral demand in the course of development. As income rises, the elasticity of demand for agricultural products tends to be the lowest compared to that of manufactured goods and services. Consequently, the shares of manufacturing and services sectors in GDP tend to be largest while that of agriculture sector shrinks. Similarly, technological progress has more immediate and efficient impact on the production process of manufacturing than in the agriculture sector, while the technology-induced growth in labor productivity is greater in the agriculture and manufacturing sector than in the service sector. This means that the volume of productivity in service sector would require more labor than in the primary and secondary sectors. Given this situation, the share of agricultural labor in the GDP and demand in agricultural products are expected to decline under rising income levels, while the greater proportion of labor force is allocated to manufacturing sector as the demand for industrial products increases. Larger proportion of demand in labor force will eventually move towards the tertiary sector as technology advances and per capita income rises (Schmidt, 2005).

Although this theory has been empirically established in industrialized countries of Europe, North America and some East Asian Countries, however, it does not hold in most developing countries with different technological, demographic, and political setups which constitute different environment for structural transformation. For instance, many developing countries are having high population growth and by extension labor force that exceeds the absorptive capacity of their manufacturing sector. Consequently, surplus labor released from the agricultural sector may not be directly absorbed in the manufacturing which may compound problems of unemployment, inequality and poverty. However, resource rich countries such as Nigeria have the opportunity of supporting structural change in their economies by making good use of the revenues generated from the sale of the resources in form of investments in the soft and hard infrastructures. Failure to do that could disrupt structural transformation which may lead to perpetuation of poverty and inequality in the country.

The discovery of oil and its taking over as the leading sector in the Nigerian economy in the 1970s and as the major revenue earner to the government since then rather worsen the problems of poverty and inequality in the country. The economy became infected by what is known as "Dutch Disease" where by the focus of the government became focused on the oil sector at the expense of the other real sectors such as agriculture and manufacturing. Prior to the discovery and production of oil in commercial quantity in 1958, Nigerian economy was being driven largely by the agriculture sector contributing more than 60 percent to the GDP. From 1960 when the country became independent, it witnessed rapid changes in economic growth despite various setbacks. Real GDP increased from $12.84 billion (at 2000 constant) in 1960 to $85.6 billion in 2010 while per capita GDP rose not quite significantly from $279.5 (at 2000 constant) in 1961 to $540.34 in 2010 (World Development Indicators). This represented an increase of only 93.3 percent for the GDP in nearly half a century. This appears to be very poor compared to other Sub-Saharan resource poor countries such as, Botswana, Namibia and the Republic of Congo.

Accompanying these changes in aggregate economic activity are the shifts in the economic structures. Over the period, the Nigerian economy gradually shifted away from agriculture to industry and services sectors even though it has not been a smooth and successful transformation as experienced in advanced countries like the U.S.A, Canada, Europe and Australia, or even in East Asian miracle economies including Turkey, Brazil and India, among many others. The emergence of oil as the main driving wheel of Nigerian economy has actually subdued the structural transformation that started in the economy in the 1960s. The industrial sector has been driven by the oil subsector which by nature is not labor intensive while the manufacturing subsector which drives most successful economies in the world was completely neglected in Nigeria.

This failure of the Nigerian economy to transform during the last decades is one of the key factors that led to perpetual increase in the problem of poverty and inequality in the country.

1.1 Previous Studies in This Area Focused on This Subject

This paper analyzes the relationships among structural transformation, growth, inequality and poverty in Nigeria. The rest of the paper is organized as follows: section two present the literature review, section three presents the method of analysis and the data used. Section four discusses the empirical results, while section five concludes the paper.

2. Literature Review

The pendulum of development thought and policy, since the emergence of development as a sub-discipline of

economics after the Second World War, has been swinging between two poles; free play of market forces and state intervention. Over the last 60-70 years, economic history has recorded several instances in support of each side. During the 1980s the pendulum was swinging to the side of free market economy. This led to the prescription and forced implementation of the very unpopular Structural Adjustment Programs (SAP) on many developing countries by Washington Consensus Institutions. However, the miraculous economic performance of the emerging economies such as the BRICS, the Asian miracle economies and many other developing countries over the last few decades and the ironic persistence of high rates of poverty in the face of globalization in addition to the current global economic and financial crisis has called for revisiting economic theory in general and development theory in particular. These have also sensitized renewed interest in structural economics. The new drive in the economic development thought emphasizes active and efficient public participation, giving impetus to the economy where the market fails in providing the required industrial upgrading and improving soft and hard infrastructure (Lin, 2012). The 'new structural economics' as coined by its ardent proponent (Justin Yefu Lin) focuses on the role of structural change in achieving sustainable growth and development, and poverty reduction in developing countries.

There has for long been a convergence among development economists on the idea that economic growth is the main engine for poverty reduction. The traditional view in economics is that the benefits of economic growth (measured in terms of growth of the GDP) trickles down to the poor. Hence economic growth leads to poverty reduction. However, the recent growth experiences in the emerging economies, the growing concern about the rate of poverty during the last few decades, and the reaction of the international community through the Millennium Development Goals (MDGs) testified to the fact that the past growth focused strategies have failed to effectively reduce poverty (Pramanik 1994). Reducing poverty entails improving the average income of the poor as well as reducing income inequality in any given country. But there is some kind of trade-off between distribution and growth in the overall poverty reduction strategy which is the bedrock of development. There is, therefore, the need to strike on the right balance on what the poverty strategy should focus: pro-poor or pro-growth?

Theoretically, Kuznets (1955; 1961; 1971) was the first to explore the relationship between growth and inequality in his famous hypothesis. Ahluwalia, (1976) provided an empirical support for the 'inverted U hypothesis' using cross section data for developing and developed countries. However, this result was challenged by researchers like Anand and Kanbur, (1993) who used the very same data set that Ahluwalia used. They argued that no empirical relationship could actually be established by applying a clean data set and appropriate econometric techniques (Kabur and Lustig 1999). This result was later confirmed by researchers such as, Deininger and Squire (1998). They found no evidence of an 'inverted-U' pattern between income and inequality. On whether there existed a link between fast growth and rising inequality, they did not find any systematic evidence to support that. Ravallion and Chen (1997) also found similar results (see also Li, Squire and Zou, 1998).

Ravallion (2009) using new data for about 80 countries spanning from 1980 to 2000 found little or no correlation between rates of economic growth and changes in inequality except in some countries where growth was accompanied by rising inequality. China for example, is a good example of a country where growth-inequality trade-off happened, where both the mean income and income inequality steeply rise.

There was, however, no consensus in the case of inequality-growth relationship. While some scholars concluded that inequality hampers growth (Alesina and Perotti 1996; Alesina and Rodrik 1994; Galor and Zeira 1993; and Aghion et al. 1999, some suggested that inequality may have positive impacts on economic growth. For instance, it was argued that the marginal propensity to save of the rich is found to be higher than that of the poor as suggested by Kaldor's hypothesis. It follows that if the investment rate is positively related to the saving rate, and growth is positively related to investment, more unequal economies can be expected to grow faster. (Note 3) Another reason why inequality may positively enhance economic growth is that wealth concentration would support new investment which leads to faster growth where huge initial investment is required and there is no access to investment resources through effective capital markets. (Note 4)

Similarly, the results of empirical studies diverged on the link between inequality and growth with some studies finding no relationship between inequality and growth e.g. Barro (2000), and Lopez (2004); while some found negative relationship moving from inequality to growth, e.g. Alesina and Rodrik (1994), Alesina and Perotti (1996), while others found a positive relationship between inequality and growth, e.g. Li and Zou (1998) Forbes (2000) and Lin (2003). Pramanik (2010) on the other hand, found no consistent pattern of relationship. But what was behind these discrepancies? Forbes (2000) attributed the diverging results to the use of different countries, invariant time, omitted variables bias, and length of the period covered by the research. (Note 5)

Since economic growth increases the average income of the poor, it is assumed that the living standard of the poor would increase with the increase in income provided the benefits of growth are fairly distributed across the population. Those that argue for poverty reduction by increased growth paid little attention to the effect of distribution while others argue that growth can only be a source of poverty reduction if it is pro-poor growth (Note 6) i.e. if the poor enjoy the benefits of growth proportionately more than the non-poor (Son, 2004).

Therefore, the impact of economic growth on poverty reduction depends to a large extent on how the benefits of growth are distributed across the segments of the population. This means that growth alone is not enough for poverty reduction; it must be backed up with equitable distribution of income. Reviewing the studies dealing with the relationship between growth, income distribution and poverty, Bigsten and Levin (2000) found that there was no consistent relationship between growth and changes in inequality but countries that produced higher growth and improved income distribution have reduced poverty faster e.g. Taiwan and South Korea.

Taking the case of Malaysia, Pramanik (2010) (Note 7) uses the decomposition analysis of growth elasticity of poverty to investigate the growth effects on poverty and inequality from different perspectives including national, regional, social stratum and race. He finds no common or consistent pattern of long-term relationship between economic growth and inequality. Therefore, to maximize the benefits of growth, he favors the implementation of interventionist policy strategies during the different stages of development. He suggested that "regardless of such factors as the state of development, factor endowments, racial, geographical and regional situation, all of which influence growth, poverty and inequality – it is the degree of distribution of economic as well as intellectual power resources, i.e. economic, social and political democracy centering on human, natural and financial capital concomitant with social overhead capital, that ultimately shapes the long-term relationship between growth, inequality and poverty." (pp. 152).

Policy wise, the studies seemed to conclude that the choice of focusing on either accelerating growth or poverty reduction depends on the specific country and the existing conditions prevailing in the particular country especially, the levels of economic development, the initial poverty, and the level of tolerance of the country to inequality (Lopez 2004).

Despite extensive research conducted in various aspects of this relationship among poverty, growth, structural change and inequality, there are very few empirical studies this respect. Chatterjee (1995) observes the relationship between growth, structural change and poverty alleviation using panel Ordinary Least Squares (OLS) regression analysis. Dietrich (2009) use a panel cointegration analysis while and Cortuk and Singh (2011) time series analysis to estimate bivariate models to examine the relationship between growth and structural transformation. However, since OLS regression may lead to spurious regression due to non-stationary of time series under investigation we employ a time series analysis on Nigerian data.

3. Methodology and Data

We extend the model used by Cortuk and Singh (2011) to multivariate to include inequality, growth, and structural change as dependent variables, and poverty as our dependent variable: Cortuk and Singh's model is given as:

$$Y_t = \alpha + \beta S_{t-1} + Y_{t-1} + \delta_T DU_{Tt} + U_t \tag{1}$$

Where   Y = Log of GDP Per Capita

S = Structural change index

DU_{Tt} = a dummy variable which is 1 if t > T and 0 if otherwise, and

U = random error term

Or

$$LGDPPC_t = \beta_0 + \beta_1 SCINAV_{t-1} + \delta_T DU_{Tt} + \varepsilon_t \tag{2}$$

The general form of our extended model is given as:

$$POV = f(GDPPC, SCINAV, GINI, DUUMY) \tag{3}$$

The econometric version of (1) is given as:

$$POV_t = \alpha_0 + \alpha_1 LGDPPC_t + \alpha_2 SCINAV_t + \alpha_3 GINI_t + DUUMY + e_t \tag{4}$$

where POV is poverty incidence; LGDPPC is Log of GDP Per Capita (constant 2000 US$); SCINAV is structural change index (Norm of Absolute Value); and GINI is Gini Coefficient index, a proxy of inequality and a dummy variable with 1 for a year of structural break and 0 for no structural break.

3.1 Data

The data used in the study come from various national and international sources such as, the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and World Development Indicators (WDI).

Various measures of structural change based on inter-temporal comparison have been proposed in the literature. This study uses the Norm of Absolute Values (NAV) (Note 8) which is as:

$$\text{NAV} = 0.5 \sum_{i=1}^{n} |x_{it} - x_{it-1}| \tag{5}$$

Where x_i is the contribution of sector i at time t and t-1.

SCI on output is calculated and use in this study from GDP data in current domestic prices provided by the CBN. (Note 9) The reason for using GDP at current prices is that although constant prices have the advantage of adjusting for the effect of price changes, however, they have disadvantage of being sensitive to the base year of the constant prices series (Productivity Commission 1998). Clark, Geer and Underhill (1996) and Productivity Commission (1998) argue that SCI data based on current prices have the advantage of:

(i)   Including effect of fluctuations of prices of goods and services produced,

(ii)   "Reflecting the prices in which transactions take place".

The data for agriculture sector consist of all the four components (crop production, livestock, forestry and fishing), while the manufacturing data excludes oil refinery. The data on service consist of (transport, communication, utilities, finance and insurance, hotel and restaurant, real estate and business services, public and community services).

The incidence of poverty (POV) is calculated from 1961 to 2009 based on the assumptions that the poverty incidence is negatively associated with the growth rate of GDP per capita. We use growth rate of GDP, growth elasticity of poverty, and the poverty rates of the Nigerian Living Standard Surveys to forecast and back cast the rate of poverty incidence. This method is popular with the World Bank, the ADB and was also used by the Islamic Development Bank in its Occasional Paper published in May 2010. The growth elasticity of poverty derived by Aigbokhan (2008) is adapted in this study. Aigbokhan calculated the elasticity for Nigeria as: -0.64 as non-distribution-corrected and -0.79 as distribution-corrected. Incidence of poverty calculated using the two figures (for distribution-corrected and non-distribution-corrected generates near perfectly correlated figures. The poverty incidence is expressed as a percent of total population. The Gini coefficients (a proxy of inequality) for the sample period are also calculated following similar assumption and process used in calculating the poverty incidence.

3.2 Empirical Approach

Since we are dealing with a time series data, the OLS method may not suitable for the analysis due to its restrictive assumptions. The first step in time series analysis is to investigate the stationery property of the variables. If all the series are integrated of order one: I(1) we can proceed to conduct co-integration analysis using conventional methods such as the Johansen-Juselius (J-J). However, if one of the variables involved is I(0), other method need to be used, the most popular being the Autoregressive Distributed Lag (ARDL) technique.

The first step in conducting a time series analysis is therefore, conducting unit roots tests to determine the unit roots properties of the variables. Although the ARDL technique does not require conducting unit roots tests, we use the tests to confirm the level of integration of the variables. It is found that the structural change index (SCINAV) is I(0) which support our use of the ARDL methodology. However, the conventional unit root tests have an inherent weakness of lacking the power to distinguish between unit root and near unit root. In other words, they tend to accept the null hypothesis that unit root exists where actually it doesn't. The remedy to this problem is to conduct more than one test to confirm the results. There are various unit root tests but this study adopts only three of them. They are:

(i)   ADF

(ii)   PP and

(iii) KPSS.

All the three tests conducted in this study confirm that the structural change (SCINAV) variable is I(0) which makes it necessary to adopt the ARDL technique proposed by Pesaran et al. (2001). We therefore, apply the ARDL – Bounds testing approach to examine the long-run cointegration relationship between poverty, structural change, economic growth and inequality in Nigeria. This method was developed by M. H. Pesaran in various studies (Pesaran and Shin (1996); Pesaran and Pesaran (1997); Pesaran and Smith (1998); and Pesaran et al

(2001). It has gained a lot of popularity among researchers in the recent years. The ARDL approach addresses the major shortcoming of the JJ approach which requires all the variables to be I(1). It also has a number of advantages over the JJ cointegration method which adds to the former's popularity in the recent time. Firstly, the ARDL model has the advantage of being more flexible as it does not impose restriction of having all the variables to be integrated of the same order like other cointegration techniques. The ARDL technique can be applied irrespective of the variables being integrated of order I(1) or I(0). Secondly, while other cointegrations techniques require large sample size, the ARDL technique is comfortably applied on even small samples. Thirdly, the ARDL method is used for both testing for the long-run relationship and estimating the long-run parameters.

Given the nature of GDP time series data, we use structural break test developed by Bai-Perron (1998) to test for existence of breaks. Studies (Note 10) have shown that time series data are susceptible to structural breaks and failure to accommodate these breaks may lead to a bias that may erroneously allow for a false acceptance or rejection of a null hypothesis of a unit root in the conventional ADF test. Perron proposed a test that extends the ADF to accommodate exogenous structural break. Perron (1997) and Zivot-Andrews (1992) proposed endogenous determination of the break points while Lee and Strazicich (2003) proposed a two breaks unit root test (Glynn et al 2007). Unlike the conventional Chow (Note 11) test the Bai-Perron test has the advantage of detecting the period of the break. We therefore, apply Bai-Perron structural break test to determine the years of breaks in our data.

Our equation (1) is expressed in ARDL model as follows:

$$\Delta POV_t =$$
$$\theta_0 + \alpha_1 POV_{t-1} + \alpha_2 SCINAV_{t-1} + \alpha_3 LGDPPC_{t-1} + \alpha_4 GINI_{t-1} + \sum_{i=1}^{n} \theta_1 \Delta POV_{t-i} + \sum_{i=0}^{n} \theta_2 \Delta SCINAV_{t-i} + \sum_{i=0}^{n} \theta_3 \Delta LGDPPC_{t-i} + \sum_{i=0}^{n} \theta_4 \Delta GINI_{t-i} + \varepsilon_t \qquad (6)$$

where ε_t is the white noise error term and Δ is the first difference operator.

The parameters α_i, i=1,2,3,4 are the long-run multipliers while the θ_i, i=1,2,3,4 are the parameters representing the short-run dynamic coefficients of the underlying ARDL model and n is the optimum lag.

Pesaran and Pesaran (1997) explain two main steps involved in the ARDL procedure. The first step is the determination of the long-run relationships among the variables using F-test which is the underlying statistics in estimating the long-run relationship. F-test indicates which variable should be normalized when long-run relationship is established in the model. The test is conducted by testing the joint significance test in order to test the null hypothesis of no cointegration by joining all the coefficients of the one lagged variables equal to zero ($H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$) against the alternative hypothesis which sets all one lagged variable not equal to zero ($H_0 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$). We then check the estimated F-statistics of the null hypothesis to find out whether the long-run coefficients are jointly equal to zero and then compare the F-statistics based on (1%, 5% and 10%) levels of significance of the respective bound critical values provided by Narayan (2004). The F-statistic which is non-standard (Duasa, 2007) is compared with the upper bound I(1) values and the lower bound I(0) values of the tables given at the appendix of the article of the paper by Narayan (2004). We reject the null hypothesis of no cointegration if the value of F-statistic is greater than the upper bound value in the table and conclude that there exists evidence of long-run relationship among the variable irrespective of the order of integration of the variables. However, if the value of the F-statistic is lower than the upper bound values we cannot reject the null, while if the F-statistics lies between the upper and the lower bounds, it becomes inconclusive until more information about the order of integration of the underlying regressors is obtained.

The second step in the analysis is to estimate the coefficients of the long-run relationship. Once an evidence of cointegration exists among the variable, a long-run model of the following form is estimated:

$$POV_t = \alpha_1 + \sum_{i=1}^{n} \emptyset_{1i} POV_{t-i} + \sum_{i=0}^{n} \theta_{1i} SCINAV_{t-i} + \sum_{i=0}^{n} \varphi_{1i} LGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{1i} GINI_{t-i} + \mu_{1t} \qquad (7)$$

We choose the optimal lags according to least values of the Akaike information criteria (AIC) and Schwarz Bayesian Criteria (SBC). These criteria are more preferable to others due their tendency to define more parsimonious specifications (Pesaran and Shin 1998). The selected model is then estimated by ordinary least squares.

After estimating the long-run model, the short-run elasticity of the variables is estimated through error correction (Pahlavani and Wilson 2005; Duasa 2007). The short-run model will be in the following form:

$$\Delta POV_t = \alpha_2 + \sum_{i=1}^{n} \emptyset_{2i} \Delta POV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta SCINAV_{t-i} + \sum_{i=0}^{n} \varphi_{2i} \Delta LGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta GINI_{t-i} + \Psi ECM_{t-1} + \varepsilon_{1t} \qquad (8)$$

where ECM is the error correction model which is given as:

$$ECM_t = POV_t - \propto_1 - \sum_{i=1}^{n} \emptyset_{1i} POV_{t-i} - \sum_{i=0}^{n} \theta_{1i} SCINAV_{t-i} - \sum_{i=0}^{n} \varphi_{1i} LGDPPC_{t-i} - \sum_{i=0}^{n} \gamma_{1i} GINI_{t-i} \quad (9)$$

After establishing the long-run relationship between the variables the normal VECM is carried out to examine the short-run dynamics of the model. Then Granger Causality Test is conducted to examine the directions of causality among the variables. The diagnostics tests, (Histogram-Normality Test, Serial Correlation LM tests, Ramsey Reset Test, and CUSUM tests) are used to confirm the significance of the estimated equations in the model.

4. Discussion of Results

Table 1 shows the unit roots tests results. The ADF test is based on Schwarz Information Criteria (SIC) and PP and KPSS on Newey-West Bandwidth. Unless otherwise stated, the tests are based on the default setting of lag length for ADF and bandwidth for PP and KPSS by Eviews. The results of the ADF and PP tests are consistent for almost all the variables which show that the hypothesis that each of the variables has a unit root cannot be rejected at 1%, 5% or 10% levels of significance, except for the structural change index (scinav). The ADF for scinav at level shows that the hypothesis cannot be rejected only at 1% but can be accepted at 5% and 10% while the PP test indicates that they cannot be rejected at 1%, 5% and 10% levels. Due to the low power of the conventional tests highlighted by many scholars, a third test (KPSS) which was introduced to complement the former tests is run. KPSS tests the null hypothesis that a series is stationary around a deterministic trend. The KPSS results confirm the ADF and PP results.

Table 1. Unit root tests results

Variable	LEVEL			FIRST DIFFERENCE		
	ADF	PP	KPSS	AD F	PP	KPSS
POV	-2.406	-2.431	0.165[2]**	-7.134	-7.001	0.078
LGDPPC	-1.95029 (2)	-1.9828	0.192[2]**	-4.159**	-4.664	0.079
LGINI	-2.77165	-3.0013	0.1332[1]***	-3.778**	-7.5226	0.0410
SCINAV	-4.105(3)**	-5.366	0.0854[3]	-5.708(3)	-11.540(3)	0.1676**
LAGR	-1.643(2)	-1.735	0. 417[1]	-5.197(1)	-6.451	0.0583[1]
LIND	-0.783(2)	-0.759	0.210**	-5.233(1)	-7.107	0.103
LSERV	-1.503	-1.456	0.444[1]	-4.679(2)	-6.489	0.049

Notes: (...) refers to the number of lags; [...] refers to number of bandwidth; *, **, and *** refer to 1%, 5%, and 10% level of significance, respectively.

Table 2 presents the results of the Bai-Perron Breakpoint Test. The result indicates existence of multiple structural breaks in 1974, 1984, and 1995 in the data. These break points correspond to the periods when some major changes occurred in the country. The first one, 1974, was the year of the first oil price shock which changed the entire economic setup in the country. The military coup that toppled the second democratic government occurred in 1983 and the military took full control of the country beginning of 1984 and started implementing the austerity measures. The period 1995corresponds with in which the structural adjustment program was abandoned by the military government.

Table 2. Bai-perron breakpoint test

Date: 07/28/11 Time: 13:07 Sample: 1961 2009: Included observations: 49						
Breakpoints	0	1	2	3	4	5
BIC	356.0528	318.7843	229.9273	198.8284	202.5170	198.8561
Log-Lik	-168.2969	-139.9331	-85.77500	-60.49601	-52.61076	-41.05073
RSS	2760.599	867.3969	95.10329	33.89164	24.56496	15.32496
N. Coefs	5.000000	10.00000	15.00000	20.00000	25.00000	30.00000
Chosen number of breaks: 3						
Breaks :	1974					
	1984					
	1995					

The result of the unrestricted error correction regression (equation 13) is used to conduct the Wald test from which the F-statistic is obtained and compared with the critical values given by Narayan (2004) as reported in Table 3.

Table 3. F-statistic of Cointegration relationship and bound critical values

Bound Critical Values*				
			Restricted intercept and no trend	
F-Stat	Lag	Sig. level	I(0)	I(1)
10.258		1%	4.428	5.816
	0	5%	3.164	4.194
		10%	2.618	3.532

Notes: *based on Narayan (2004), the number of regressors, k= 3.

The result shows that the F-statistic (10.258) is higher than the upper bound critical values at 1 percent level of significance at restricted intercept without trend meaning that the null hypothesis of no cointegration cannot be accepted at even 1 percent. As such cointegration exists among the variables in the model.

The long-run model (Table 4) shows that all the variables have the expected signs as predicted by economic theory with the income variable (lgdppc) and structural change variable (scinav) having negative sign. According to economic theory, growth reduces poverty incidence by raising the levels of income of the individuals and households. When incomes are raised the ability of individuals and households to acquire more goods and services that improve their welfare is increased. Higher incomes also entail higher demand for public services.

Moreover, due to structural change efficiency increases as labor moves from inefficient sectors like agriculture to more efficient modern sectors. This increases the income of the employees which improves their welfare and distances them away from poverty. However, the result shows that this variable (Scinav) is not statistically different from zero in the model. This is the only variable that is not significant among the independent variables. Our result shows that structural change does not contribute to poverty reduction. This confirms the assertion that one of the major constraints to development of Nigerian economy is the lack of structural transformation over the years (Lamido, 2010).

Table 4. Long-run model

	Independent variables		
	Lgdppc	Scinav	Gini
Dependant variable: (Pov)	-0.348904	-0.001427	2.002351
	(-4.151)	(-0.585)	(4.318)

Note: figures in parenthesis are t-statistics.

The inequality variable (Gini coefficient) is also significant and the positive sign conforms to prediction of economic theory that poverty reduction is more effective in a condition of low income inequality. This explains the condition of high poverty rate in Nigeria despite rising income. Wide income inequality exists in Nigeria where less than 10 percent of the population controls more than 80 percent of the wealth.

4.1 Error Correction Model for Poverty

The results from the cointegration tests permits us to conduct vector error correction model (VECM) the results of which are presented in Table 5.

Table 5. Error correction model for poverty

Dependant Variable d (POV)t	
Independent Variables	Coefficients
Constant	-0.009602 (-0.940640)
DPOV(-1)	-0.402146 (-2.275018)
DLGDPPC(-1)	0.803611 (2.070930)
DSCINAV	-0.006965 (-4.727996)
DGINI	1.952606 (3.685364)
ECT(t-1)	-0.378187 (-3.902267)
Diagnostics Tests	
Breusch-Godfrey Serial Correlation LM Test: (Lag 1)	0.186752
Breusch-Godfrey Serial Correlation LM Test: (Lag 2)	2.257270
Heteroskedasticity Test: ARCH	0.376324
Jarque-Bera	2.183

Note: Figures in parenthesis are t-statistics.

The error correction term (ECT), which is significant, indicates existence of causality in at least one direction. The ECT of the equation is significant at 1 percent and found to be negatively correlated and indicating a moderate rate of convergence to equilibrium. The dummy variable representing the structural breaks is not significant in the model thus it is eliminated.

The results diagnostics tests conducted to satisfy the classical assumptions of ordinary least squares model show no evidence of serial correlation, Autoregressive Conditional Heteroskedasticity (ARCH) effects in the disturbances in 1 percent level of significance. The Jarque-Bera normality test also suggest that errors are normally distributed. Other stability tests conducted which further support the stability of the model include Ramsy RESET test, cumulative sum of the recursive residuals (CUSUM) test and CUSUM of squares test. All the statistics of these tests exceeded the bounds at the 5% significance level (Appendix I).

The result of the Granger causality test (Table 6) shows that the null hypotheses that income, inequality and structural change does not Granger cause poverty cannot be rejected, meaning that there is no evidence of causality from the variables to poverty. However, there is an evidence of causality running from inequality to income at 5 percent level of significance.

Table 6. VECM granger causality test

Dependent Variable	Independent Variables			
	χ^2-statistics of lagged 1st differenced term [p-value]			
	POV	GDPPC	GINI	SCINAV
POV	-	0.087	0.470	1.073
		[0.768]	[0.493]	[0.300]
GDPPC	0.016	-	3.845*	0.760
	[0.899]		[0.050]	[0.383]
GINI	0.807	1.024	-	0.537
	[0.369]	[0.312]		[0.464]
SCINAV	1.990	0.059	0.157	-
	0.158]	[0.809]	[0.692]	

Note: * Significant at 5% level of significance.

5. Summary and Conclusions

Changing structure of production from low productivity to high productivity and the movement of labor between sector also entails increase in wages and in turn incomes of individuals and households which enables them to increase the quantity and quality of goods and services they consume thereby distancing them away from poverty. Structural change is therefore an important aspect of economic growth and poverty reduction. Resource rich countries such as Nigeria have the opportunity of supporting structural change in their economies by making good use of the revenues generated from the sale of the resources in form of investments in the soft and hard infrastructures. Failure to do that leads to the 'paradox of plenty' as we are witnessing in Nigeria, a rich country full of poor people. This paper investigates the relationships among poverty, structural change, growth and inequality.

The results of the empirical analysis indicate the existence of long-run and short run relations between poverty, economic growth, and inequality while the coefficient of structural change variable is found to be not statistically significant despite having the correct sign. Structural change in Nigeria has been very slow since the emergence of oil as the leading sector in the economy. The insignificance of the structural change variable in the model confirms the claims that lack of strong structural transformation is one of the major development issues facing the country (Lamido, 2010).

The stronger coefficient of the inequality variable in the model is an indication that inequality is a major issue in poverty reduction in the country. Inequality-reduction is therefore, found to be the major driving force in reducing poverty in Nigeria. This also supports the view that economic growth alone is not enough for poverty reduction; it must be backed up with fair distribution. In other words, there is the need to pursue inclusive growth policies in order to achieve the desired poverty reduction effect. This is because the benefits of growth do not necessarily 'trickle down' to the poor. Effective policies must be pursued to channel some of the benefits of growth to the masses.

In light of the above, the need for more adequate and effective policy measures towards reducing poverty in the country becomes apparent. This must be implemented under a suitable and effective institutional environment. Nigerian socioeconomic and political institutions have been fraught with rent-seeking activities, endemic corruption and economic mismanagement. This unfortunate condition must be controlled in order to promote a favorable economic environment that would give rise to sustained economic growth, structural transformation and poverty reduction.

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Notes

Note 1. Structural change and structural transformation are use synonymously.

Note 2. It should be noted the two terms (structural change and structural transformation) are synonymously used in this paper.

Note 3. http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPGI/0 accessed on 14/5/2009 See also Marniesse, S .and Peccoud, R. Poverty, Inequality and Growth, What's at Stake for Development Aid? In Poverty, Inequality and Growth. Proceedings of the AFD-EUDN Conference (2003), Paris. www.afd.fr.

Note 4. Ibd.

Note 5. Many scholars also investigated different aspects such as the impact of initial income distribution (Easterly and Robelo 1993; Deininger and Squire, 1998; Birdsall and Londono, 1997; Morawetz, 1978; Ganagarajah, et al., 2000; and Christiaensen, L. et al. 2003), Globalization (Barro 2000; 2008) and technology (Joumotte, et al. 2008).

Note 6. A similar concept that emerged recently is "inclusive growth' (Ali, 2007) other concepts that are open used synonymously or as extension of the pro-poor growth include 'broad-based growth' and 'shared growth' (Ianchovichina and Lundstrom, 2009).

Note 7. See also Christiaensen, L. et al. 2003.

Note 8. This is the most popularly used. See for instance: (Productivity Commission, 1998; Dietrich, 2009; and Cortuk & Singh 2011).

Note 9. CBN (2010) Statistical Bulletin.

Note 10. See Perron 1989; Volgelsang and Perron 1998; Zivot and Andrews, 1992.

Note 11. Chow, G. C. (1960).